Draft

SAN ANSELMO FLOOD RISK REDUCTION PROJECT

Environmental Impact Report

Prepared for
Marin County Flood Control and Water Conservation District

May 2018

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180 Grand Avenue
Suite 1050
Oakland, CA 94612
510.839.5066
www.esassoc.com

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CHAPTER 1
Introduction

1.1 Marin County Planning and Project Review Process

This Draft Environmental Impact Report (EIR) evaluates the potential for the proposed San Anselmo Flood Risk Reduction Project (Project) to result in adverse effects on the environment.

The Marin County Flood Control and Water Conservation District (Flood Control District), a political subdivision of the state of California, is the California Environmental Quality Act (CEQA) Lead Agency for the Project. A Lead Agency is defined by Section 15367 of the State CEQA *Guidelines* as the public agency that has the principal responsibility for carrying out or approving a Project.[1] The Flood Control District intends to use this EIR in a decision process that also involves the Marin County Board of Supervisors, acting as the Flood Control District Board, and Responsible Agencies, to approve the Project and its elements, issue applicable permits, and comply with various agency requirements. The Flood Control District's planning and approval process involves two main steps including (1) circulation of the Draft EIR, and (2) certification of the Final EIR and adoption of findings prior to approval of the Project. Multiple opportunities for the public to comment on the Project will be available during the review process.

On April 6, 2017, the Flood Control District issued a Notice of Preparation (NOP) of a Draft EIR for the Project pursuant to Section 15082 of the State CEQA *Guidelines* to seek comments from responsible and trustee agencies and the public about the scope of the EIR. The 30-day NOP comment period closed on May 8, 2017. During the comment period, on April 20, 2017, the Flood Control District held a public scoping session (meeting) regarding the Project to solicit agency and public input on the range of environmental effects that should be analyzed in the EIR. Oral comments were received at the scoping meeting, and additional written comments were received at and following the meeting. A scoping report containing the NOP and scoping comments received are included in **Appendix A**. The scoping report also identifies the Draft EIR sections that address the scoping issues raised in the comments received.

The Flood Control District is now circulating this Draft EIR to public agencies and members of the public for a 45-day public review period in accordance with State CEQA *Guidelines* Section 15087. Comments should address the adequacy of the Draft EIR. Written comments will be accepted by the Marin County Community Development Agency until 4 p.m. on the closing day of the review period (July 2, 2018). Written comments should be submitted to Rachel Reid,

1 The State CEQA Guidelines are found at California Code of Regulations, title 14, section 15000 *et seq*.

Environmental Planning Manager, Marin County Community Development Agency, 3501 Civic Center Drive, Suite 308, San Rafael, California, 94903 or via e-mail to EnvPlanning@marincounty.org. Oral and written comments will be accepted at a hearing on the Draft EIR by the Flood Control District's Board of Supervisors (Board), to be scheduled prior to the close of the review period.

After the close of the Draft EIR review period, the Flood Control District will assemble all comments received prior to and during the public review period, including oral comments received at the public hearing on the Draft EIR. As required by State CEQA *Guidelines* Section 15088, the Flood Control District will evaluate comments received on the environmental issues, and prepare written responses. The comments and responses will be included in the Final EIR as a separate chapter, as will any revised EIR text.

The Flood Control District will circulate the Final EIR to Responsible and Trustee Agencies that commented on the Draft EIR and all interested parties for a minimum of 10 days to review the responses to comments. The Flood Control District Board will hold a public hearing, at which time it will consider whether the Final EIR complies with CEQA, including reviewing written responses to comments on the adequacy of the Draft EIR. Notice of the public hearing will be provided in compliance with State law and the County's procedures.

Upon the conclusion of the review, the Flood Control District Board will meet to consider whether to certify the EIR. In certifying the EIR, the Flood Control District Board would be affirming that the EIR is adequate and complete pursuant to CEQA requirements. In conjunction with a decision on the project, the Flood Control District Board would also find that it reviewed and considered the information contained in the Final EIR and exercised its independent judgment prior to taking action on the Project or any of the Project elements (State CEQA *Guidelines* Section 15090).

No action can be taken to approve the Project or any of its elements until the Final EIR has been certified. However, certification of the EIR neither requires nor ensures approval of the Project and its elements as evaluated in the EIR. Once the EIR is certified, the Flood Control District Board may consider approval of the Project. At that time, the Flood Control District Board may decide to approve the Project, with mitigation measures specified in the Final EIR incorporated into the Project, to disapprove the Project, or to approve an alternative to the Project or elements of alternatives that have been evaluated in the Final EIR.

1.2 Project Approvals

Although the Flood Control District is the Lead Agency, other agencies will be involved in the ongoing design, planning, environmental review, permitting, and implementation of the Project. Before specific Project elements can be constructed, the Project may require the following approvals and discretionary actions from the Flood Control District and, as appropriate, from responsible agencies or project partners such as the Towns of San Anselmo, Fairfax, and/or Ross:

1. Project element design approval

2. Applicable permits
3. Contract(s) to design and construct the Project elements

Examples of the federal, state and local agencies that could have jurisdiction over Project elements and the various permits and agreements that could be required are listed below. Note that this is not an exhaustive list of all possible permits that could be needed.

1.2.1 Federal Agencies

1.2.1.1 U.S. Army Corps of Engineers (USACE)

Under Section 404 of the Clean Water Act, the USACE regulates discharges of dredged or fill material in waters of the United States, and adjacent wetlands. If any jurisdictional wetlands or other waters of the U.S. would be adversely affected by the Project, a Section 404 authorization from the USACE would be required.

1.2.1.2 U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NOAA Fisheries)

Because the Project would affect federally-protected wildlife species and/or associated protected habitats (e.g., nesting or spawning areas, migration corridors) that fall under USFWS or NOAA Fisheries jurisdiction under the federal Endangered Species Act, one or more Biological Opinions containing Incidental Take Permits are expected to be required. The USFWS and NOAA Fisheries would comment on the USACE permits to recommend actions that avoid or mitigate such disturbance.

1.2.1.3 Federal Emergency Management Agency (FEMA)

Because the Project would occur in a FEMA designated floodway, a No-Rise Certification may be required. To obtain this certification, a hydraulic analysis may be required to demonstrate that the project does not increase flood heights.

1.2.2 State and Local Responsible and Trustee Agencies

1.2.2.1 California Department of Fish and Wildlife (CDFW)

Because the Project would affect fish and wildlife and/or their habitats that are under the jurisdiction of CDFW, as a Trustee Agency, a California Endangered Species Act Incidental Take Permit would be required.[2] In addition, because the Project would substantially alter a stream, it is expected to require a CDFG Section 1600 Lake and Streambed Authorization Agreement (LSAA). CDFW would comment on the EIR and on the USACE permits to seek actions that avoid or mitigate impacts to resources under its jurisdiction.

[2] Pursuant to California Fish and Game Code Section 2081 et seq.

1.2.2.2 San Francisco Bay Regional Water Quality Control Board

The San Francisco Bay Regional Water Quality Control Board (RWQCB) administers the National Pollutant Discharge Elimination System (NPDES) Permit Program, authorized by the federal Clean Water Act, as well as State laws to protect water quality. The Project or its elements may require compliance with the NPDES Permit Program through preparation and approval of a Stormwater Pollution Prevention Plan, and would also require a federal Clean Water Act Section 401 Water Quality Certification from the RWQCB.

1.2.2.3 Local Municipalities

The Town of San Anselmo may be a Responsible Agency in the review of Project elements under CEQA.

1.3 Project EIR

The Flood Control District has determined that an EIR is the appropriate environmental document to evaluate the effects of the overall Project, pursuant to the requirements of CEQA. A Project EIR enables the Flood Control District, as the CEQA Lead Agency, to examine and disclose the significant environmental effects of the proposed course of action of developing the Project, to identify significant cumulative effects, and to take steps to reduce or avoid significant adverse environmental effects. The EIR also fulfills the legal requirement imposed by CEQA to conduct environmental review prior to taking discretionary action. In this case, the initial discretionary action is approval of the Project by the Flood Control District Board.

The timing of the preparation of this project-level Draft EIR does not allow it to tier from the program-level EIR that is currently underway for the Ross Valley Flood Protection and Watershed Program (Program).[3] Instead, the full, project-level assessment of the Project elements in this Project EIR will inform the cumulative impacts analysis of the Program, of which this Project is a part, in the Program EIR. Similarly, the preparation of the Program EIR has involved developing basin-wide information and analysis for the Ross Valley Watershed as a whole that informs the project-level analysis in this Project EIR and has assisted in the environmental documentation of the project-level effects. The Program and Project EIRs will use the pertinent aspects of the same hydraulic modeling, baseline environmental conditions, regulatory settings, source documents, and other background information, because the San Anselmo Flood Risk Reduction Project is within the geographic area of the Ross Valley Flood Program.

The analysis included in this Draft EIR is at a project level of detail. This level of detail is required to identify and evaluate the range of elements and other actions needed to fulfill the Flood Control

[3] "Tiering" under CEQA "refers to the analysis of general matters contained in a broader EIR with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR: and concentrating the later EIR or negative declaration solely on the issues specific to the later project" (CEQA *Guidelines* Section 15152). CEQA encourages agencies to tier environmental analyses as a means to eliminate repetitive discussions of the same issues and focus the later EIR on the actual issues ripe for discussion.

District's objectives for the Project, as described in Section 3-3. The analysis evaluates all reasonably foreseeable impacts of the Project as currently designed.

1.4 Approach to Analysis

The fundamental purpose of an EIR is to inform the public and decision-makers of the potential effects of a proposed project on the physical environment. An EIR must therefore include a description of the "environmental setting" of a project (State CEQA *Guidelines*, Section 15125(a)). The "environmental setting" is defined as "the physical environmental conditions in the vicinity of the project, as they exist at the time the NOP is published…This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (*ibid*). Therefore, the physical conditions of the Project area, the various proposed elements, and the surrounding areas at the time that the NOP was issued constitute the baseline, or point of departure, for the environmental analysis.

1.5 Documents Incorporated by Reference in the EIR

An EIR may, "…incorporate by reference all or portions of another document which is a matter of public record or is generally available to the public" (State CEQA *Guidelines* Section 15150). Portions of the documents that are relevant to the environmental analysis for the Project have been summarized in various sections throughout this Draft EIR, and are described below. All referenced documents are available at the Marin County Department of Public Works, 3501 Civic Center Drive, Suite 304, San Rafael, California, 94903, and on the Project website: http://www.marinwatersheds.org/resources/projects/san-anselmo-flood-risk-reduction-project. Since approval in 2007 of the storm drainage fee for those parcels that drain into the Ross Valley Watershed, the District has done extensive technical and planning studies in the watershed to inform the best approach to reducing the risk of flooding in Flood Zone 9. The findings of those studies have led to the overall Ross Valley Program as well as the San Anselmo Flood Risk Reduction Project that is under evaluation in this Draft EIR. A partial list of the completed and ongoing studies is provided below.

1. Ross Valley Flood Protection and Watershed Program Environmental Impact Report (Draft), ongoing.
2. Phoenix Lake Preliminary Geotechnical Report, Miller-Pacific Inc., May 2010.
3. Corte Madera Creek Flood Study Baseline Report, USACE, December 2010.
4. Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley, Stetson Engineers Inc., May 2011.
5. 10 Year Work Plan Technical Memo, Stetson Engineers Inc., March 2012.
6. Flow Reduction Study, CH2M-HILL, November 2015

1.6 Organization of the EIR

The Draft EIR is organized into seven chapters, preceded by the Table of Contents. A brief summary of the contents of the Draft EIR is presented below.

Chapter 1 – Introduction: The Introduction describes the Marin County Planning and Program review process as it pertains to the Project, presents the technical documents that are incorporated by reference into the Draft EIR (in accordance with State CEQA *Guidelines* Section 15150), and describes the organization of the Draft EIR. The Introduction also includes a glossary of terms and list of acronyms used in this Draft EIR.

Chapter 2 – Summary: The Draft EIR Summary, prepared in accordance with State CEQA *Guidelines* Section 15123, contains an overview of key elements of the Draft EIR, and a summary of the Project description and characteristics. An overview of Project objectives, with reference to the full text version, is provided pursuant to State CEQA *Guidelines* Section 15124. This chapter also presents a comprehensive table of all significant environmental impacts and mitigation measures, along with the level of significance before and after mitigation. This chapter also summarizes impacts of the CEQA alternatives as they compare to the proposed Project. Descriptions of growth-inducing impacts, irreversible environmental changes, and significant and unavoidable impacts are also provided in this chapter. Also discussed are major conclusions, areas of controversy, and issues to be resolved in the Draft EIR. Finally, the Project's s consistency with County plans and policies is summarized.

Chapter 3 – Project Description: The Project Description is prepared pursuant to State CEQA *Guidelines* Section 15124 and contains text, figures, and tables conveying Project attributes. Specifically, this chapter includes the Project objectives, a description of the Project elements and locations, and a description of Project construction, operation, and maintenance.

Chapter 4 – Environmental Setting, Impacts, and Mitigation Measures: Chapter 4 contains the majority of the environmental impact evaluation for the Project. A description of the physical and regulatory setting for each environmental issue is provided, along with disclosure of the anticipated changes to physical conditions after Project implementation. The "environmental setting," for purposes of this Draft EIR, consists of the existing physical conditions of the area affected by the project, including specific sites identified for Project elements and their surroundings.[4] The impact analysis focuses on the potential changes to the physical environment that may result from the Project. Feasible mitigation measures are identified for significant impacts that would result from implementation of the Project, as appropriate.

Environmental impacts are numbered throughout this portion of the Draft EIR, beginning with the chapter section number, followed by sequentially numbered impacts. For example, the first impact in Section 4.3 (Air Quality and Greenhouse Gases) is impact number 4.3-1, and the second impact in this section is 4.3-2. Mitigation measures are numbered to correspond to

[4] State CEQA *Guidelines* Section 15125(a).

impacts; therefore, mitigation measures to address Impacts 4.3-1 and 4.3-2 would be Mitigation Measures 4.3-1 and 4.3-2, respectively.

Chapter 5 – Growth-Inducing and Cumulative Effects: Chapter 5 includes CEQA-mandated sections examining the potential growth-inducing effects of the Project and the Project's significant cumulative impacts. Cumulative impacts refer to two or more individual effects that, when considered together, are considerable or compound other environmental impacts. In accordance with State CEQA *Guidelines* Section 15130, the analysis in Chapter 5 examines the Project's potential impacts in connection with the effects of other related past, present, and probable future projects.

Chapter 6 – Alternatives: In accordance with State CEQA *Guidelines* Section 15126.6, Chapter 6 of the Draft EIR presents a range of reasonable alternatives designed to feasibly attain most of the basic objectives of the Project and avoid or substantially reduce one or more of the Project's significant environmental effects. The potential environmental impacts of the alternatives are discussed in comparison to the impacts that would result from the Project, and the ability of the alternatives to meet the project objectives is presented.

Chapter 7 – Draft EIR Authors, Persons and Organizations Contacted: This chapter identifies the individuals who were involved in the preparation of the Draft EIR.

Appendices: The Draft EIR contains several appendices of technical or procedural materials that are pertinent to the analysis contained in the body of the document. See the Table of Contents for the full list of appendices.

1.7 Acronyms, Abbreviations, and Glossary

The following acronyms, abbreviations, and technical terms are used in the text of the Draft EIR.

1.7.1 Acronyms and Abbreviations

µPa	micro-Pascals
1600 Agreement	Streambed/Lake Alteration Agreement
634-636 San Anselmo Avenue	(formerly known as Bridge Building #2)
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACM	asbestos-containing materials
AR4	Fourth Assessment Report
ASBS	Area of Special Biological Significance
ASF	Age Sensitivity Factor
BAAQMD	Bay Area Air Quality Management District
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin

BASMAA	Bay Area Stormwater Management Agencies Association
Bay Area	San Francisco Bay Area
BayWAVE	Bay Waterfront Adaptation Vulnerability Evaluation
BMPs	Best Management Practices
CAAQS	California Ambient Air Quality Standards
CAL FIRE	California Department of Forestry and Fire Protection
Cal OSHA	California Occupational Safety and Health Administration
CalEEMod	California Emissions Estimator Model
CalEMA	California Emergency Management Agency
California Register	California Register of Historical Resources
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBC	California Building Code
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFCP	California Farmland Conservancy Program
CFR	Code of Federal Regulations
CFS	cubic feet per second
CGP	Construction General Permit
CGS	California Geological Survey
CHRIS	California Historical Resources Information System
CMSA	Central Marin Sanitation Agency
CNDDB	California Nautral Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plants Society
CO	carbon monoxide
CON	Conservation
CoSMoS	Coastal Storm Modeling System
CPUC	California Public Utilities Commission
CRLF	California red-legged frog
CRPR	California Rare Plant Ranking

CUPA	Certified Unified Program Agency
CWA	Clean Water Act
dB	decibels
dBA	A-weighted sound levels
DOC	Department of Conservation
DPM	diesel particulate matter
DWR	California Department of Water Resources
EAP	Energy Action Plan
EIR	environmental impact report
Environmental Checklist	State CEQA Guidelines, Appendix G
EPA	Environmental Protection Agency
ESA	Environmental Science Associates
ESCP	Erosion and Sediment Control Plan
FDS basin	flood diversion and storage basin
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
FIS	Flood Insurance Studies
Flood Control District	Marin County Flood Control and Water Conservation District
FMMP	Farmland Mapping and Monitoring Program
FTA	Federal Transit Administration
g	gravity
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbons
HHW	household hazardous waste
HMBD	Hazardous Materials Business Plan
HRA	health risk assessment
HSWA	Hazardous and Solid Waste Amendments
Hz	Hertz
IPCC	International Panel on Climate Change
LBP	lead-based paint

Ldn	Day-Night Average Level
Leq	Equivalent Sound Level
LID	Low Impact Development
Lmax	Maximum Sound Level
Lmin	Minimum Sound Level
LOS	Level of Service
LU	Land Use
MALT	Marin Agricultural Land Trust
Marin County FCD	Marin County Flood Control District
MBTA	Migratory Bird Treaty Act
MCEP	Marin Climate and Energy Partnership
MCOSD	Marin County Parks and Open Space Department
MCSTOPPP	Marin County Stormwater Pollution Prevention Program
ML	Richter magnitude
MMWD	Marin Municipal Water District
MS4s	Small Municipal Separate Storm Sewer Systems
MTBE	methyl tertiary butyl ether
MTC	Metropolitan Transportation Commission
Mw	Moment Magnitude
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NALs	Numeric Action Limits
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO	nitric oxide
NO2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
NOX	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System Program

NSO	Northern spotted owl
NTU	Nephelometric Turbidity Units
Nursery Basin	flood diversion and storage basin at the former Sunnyside Nursery site
Nursery Basin site	former Sunnyside Nursery site
O&M Plan	Operation and Maintenance Plan
OEHHA	Office of Environmental Health Hazards Assessment
OEMS	Office of Emergency Medical Services
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
PFC	perfluorocarbons
PFS	Public Facilities and Services
PG&E	Pacific Gas and Electric Company
PGA	peak ground acceleration
PM10	particulate matter less than 10 microns in diameter
PM2.5	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PPV	peak particle velocity
PRC	Public Resources Code
PRDs	permit registration documents
Project	San Anselmo Flood Risk Reduction Project
PSHA	probabilistic seismic hazard assessment
RCRA	Resource Conservation and Recovery Act
Region 2	San Francisco Bay Basin
ROG	reactive organic gases
Ross Valley Watershed	also called the Corte Madera Creek Watershed
RWQCB	Regional Water Quality Control Board
SAR	Second Assessment Report
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SCA	Stream Conservation Area
SCAQMD	South Coast Air Quality Management District
SF6	sulfur hexaflouride

SFBAAB	San Francisco Bay Area Air Basin
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLR	sea level rise
SO2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SPL	sound pressure level
STLC	Soluble Threshold Limit Concentrations
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TAM	Marin County Congestion Management Agency
TAM	Transportation Authority of Marin
TMDL	Total Maximum Daily Load
TMP	Traffic Management Plan
TSCA	Toxic Substances Control Act
U.S. 101	United States Highway 101
Unified Program	Unified Hazardous Waste and Hazardous Materials Management Regulatory Program
Update	2017 Climate Change Scoping Plan Update
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VdB	Root mean square velocity
WDRs	Waste Discharge Requirements
WPT	western pond turtle
Zero Waste Marin	Marin Hazardous and Solid Waste Management Joint Powers Authority
ZEV	zero-emission vehicles
µg/m3	micrograms of lead per cubic meter

1.7.2 Glossary

100-year flood event: A flood that statistically has a 1-percent chance of occurring in any given year.

Aggradation: The act of raising the grade or level of a stream bed by depositing detritus, sediment, or the like.

Alluvial strata: Consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.

Anadromous: Characterizes the life cycle of a fish that spawns in fresh water and spends a significant portion of its adult life in the ocean. Salmon and steelhead are anadromous.

A-weighted decibel (dBA): Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies.

Backwater flooding: Upstream flooding caused by downstream conditions such as channel restriction and/or high flow in a downstream confluence stream.

Beneficial reuse: The use of byproducts or waste materials rather than discarding them.

Coarse sediment load: Particulate sediment, varying in size from sand to gravel, that is carried in the body of the flow.

Cofferdam: A watertight enclosure pumped dry to permit construction work below the waterline.

Dam inundation area: The specific areas of land that would become flooded and covered with water if a particular dam were to break or fail.

Emergent groundwater: Groundwater that emerges to the surface of the ground naturally, by an increase in infiltration from stormwater or other water source.

Flood diversion and storage basin: An above-ground, off-channel reservoir for storing diverted floodwaters from a stream.

Floodplain: An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Floodwalls: A primarily vertical artificial barrier designed to temporarily contain the waters of a river or other waterway which may rise to unusual levels during seasonal or extreme weather events.

Hydraulic capacity: The amount of water that can pass through a structure or watercourse.

Hydraulic constriction: A short reach of a creek where the cross-section is reduced.

Groundwater basin: An area underlain by permeable materials capable of furnishing a significant supply of groundwater to wells or storing a significant amount of water.

Landscape levees or berms: an earthen embankment built to prevent the overflow of a river.

Level of service (LOS): A qualitative description of a facility's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. Levels of service range from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

Regulatory floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Riparian: The land adjacent to a natural watercourse such as a river or stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank.

Scour protection: Rock, riprap, or similar materials added to edge of a waterway to protect the banks.

Sediment deposition: The process by which sediment, including soil and rocks, are deposited on the creek bottom due to a loss of kinetic energy in the water.

Shallow seepage cutoff wall: a wall constructed below grade as part of a levee to prevent water from seeping out from below or the sides of the levee.

Sheetflow flooding: Floodwater flows that spread out over a large area at a uniform depth.

Side-weir: A flood control structure used to divert flow from the main channel to another location, such as a FDS basin.

Special-status species: Several species known to occur within the general region of the program area are accorded "special status" because of their recognized rarity or vulnerability to habitat loss or population decline. Some of these species receive specific protection in federal and/or state endangered species legislation. Others have been designated as "sensitive species" or "species of special concern" on the basis of adopted policies of federal, state, or local resource agencies. These species are referred to collectively as "special-status species."

Streamflow gage: A tool to measure stream water height, and thereby measure the amount of water in the stream.

Threshold conveyance capacity: The flow a creek channel can contain before overtopping its banks.

Watershed: The region or area drained by a river, stream, etc.; drainage area.

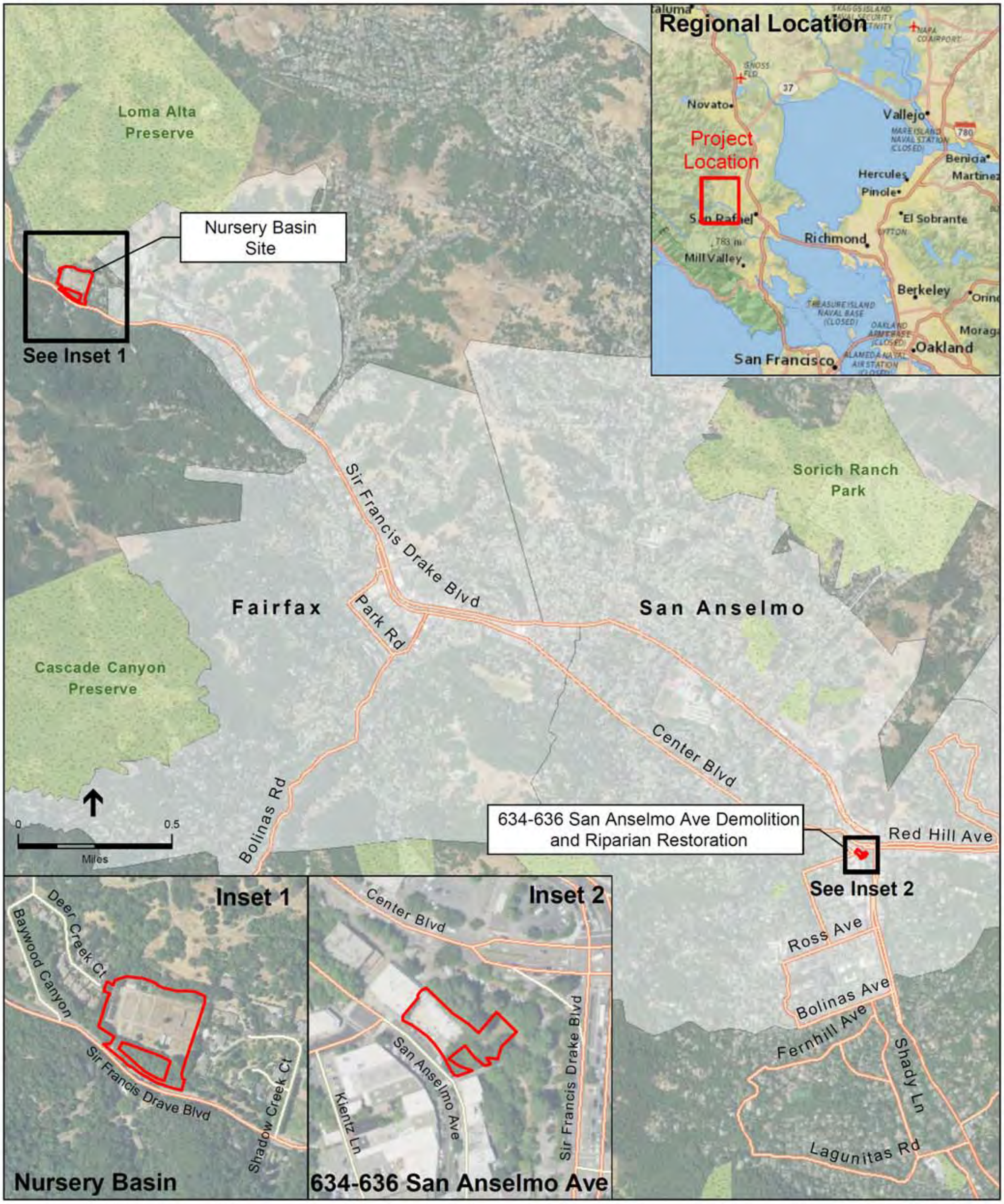
CHAPTER 2
Summary

This summary chapter is provided in accordance with State CEQA *Guidelines* Section 15123. As stated in State CEQA *Guidelines* Section 15123(a), "[a]n EIR shall contain a brief summary of the proposed actions and its consequences. The language of the summary should be as clear and simple as reasonably practical." State CEQA *Guidelines* Section 15123(b) states, "[t]he summary shall identify: (1) Each significant effect with proposed mitigation measures and alternatives that would reduce or avoid that effect; (2) Areas of controversy known to the Lead Agency including issues raised by agencies and the public; and (3) Issues to be resolved including the choice among alternatives and whether or how to mitigate the significant effects." Accordingly, this summary includes a brief synopsis of the proposed Project and project alternatives, environmental impacts and mitigation measures, cumulative effects and mitigation measures, areas of known controversy, and issues to be resolved in the Environmental Impact Report (EIR). **Table 2-1**, at the end of this chapter, presents the summary of potential environmental impacts, their level of significance before mitigation, mitigation measures, and levels of significance with mitigation.

2.1 Summary of Project

The Marin County Flood Control and Water Conservation District (Flood Control District) proposes the San Anselmo Flood Risk Reduction Project (Project). The primary purpose of the Project is to substantially reduce the frequency and severity of flooding within portions of the San Anselmo Creek and Fairfax Creek subwatersheds in Ross Valley, which is another name for the watershed drained by Corte Madera Creek. As described in full in Chapter 3, *Project Description*, the Project would be built and operated in two locations (see **Figure 2-1**). The first (shown in **Figure 2-2**) is at the former site of the Sunnyside Nursery in unincorporated Marin County, adjacent to the western border of the Town of Fairfax. The second location (shown in **Figure 2-3**) is at 634-636 San Anselmo Avenue in downtown San Anselmo along San Anselmo Creek. The Flood Control District would implement this Project to reduce flood risk by (1) reducing peak discharge by attenuating flows through use of a flood diversion and storage (FDS) basin at the former Nursery site along Fairfax Creek, and (2) increasing creek capacity by removing existing obstructions to creek flow (a "building bridge" that spans San Anselmo Creek and has its foundations in the channel) and then regrading and improving the creek channel.

This Project's FDS basin would be located immediately adjacent to Fairfax Creek. It would be built below the existing grade by excavating the site to create a space for storing diverted flows. A diversion structure in Fairfax Creek would have openings to allow normal flows to pass but would detain higher flows, causing them to pond in the channel and spill over a side-weir into the basin. When peak flows have passed, the diverted water would drain from the basin back into



SOURCE: CH2M

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 2-1
Project Location

A.	<u>Flow Diversion and Overflow Structure</u>. Concrete diversion structure with gated opening(s) required to immediately reduce flow passing downstream by partially closing the opening(s) and allowing water to begin filling the basin. The exact dimensions and configuration of the gated opening(s) would be developed during final design to support sediment transport.
B.	<u>Spillway</u>. The 235-foot elevation spillway passes the 1,000-year flood with maximum basin water surface elevation at 236.5 feet.
C.	<u>Gated Opening</u>. Gate closed to reduce Fairfax Creek flows when overbank flooding is imminent in downstream vulnerable areas.
D.	<u>Ungated Opening.</u> Always open for normal creek flows, sediment transport, and fish and wildlife movement.
E.	<u>East Levee</u>. 238-foot elevation levee is 1.5 feet higher than maximum basin water surface elevation.
F.	<u>Side-weir</u>. Fairfax Creek flows into basin over 228-foot elevation weir segment in perimeter road.
G.	<u>Basin Floor</u>. Slopes from 226.0 feet at northwest corner to 223.8 at southwest corner.
H.	<u>Basin Drain</u>. Open 223.8-foot inlet in southeast corner of basin draining to outlet at Fairfax Creek.
I.	<u>Operations and Maintenance Vehicle Access</u>. Existing or improved driveway bridge and diversion structure.
J.	<u>Perimeter Road</u>. 15-foot-wide and 1.5 feet above the maximum water surface elevation.
K.	<u>West Levee</u>. 238-foot fill levee top elevation contains temporary peak volume storage under detention operations.
L.	<u>West Gate</u>. Locked vehicle access gate through fence.
M.	<u>Deer Creek Court Stormwater Drains and Rip Rap Energy Dissipation Structure</u>. Ensures gravity drainage from Deer Creek Ct cul-de-sac under potential maximum basin water surface elevation.
N.	<u>Floodwall/Road Barrier.</u> Floodwall prevent overflow onto roadway.
O.	<u>Perimeter Fence.</u> Security fencing.
P.	<u>Setback – East.</u> 50 feet from toe of levee.
Q.	<u>Setback – West.</u> 50 feet from top of basin cut slope.
R.	<u>Rip-Rap Bank Protection.</u> Vegetated rip-rap and other biotechnical bank erosion protection and stabilization both banks Fairfax Creek for protecting habitat and facilities from hydraulic and sediment transport and deposition dynamics during operations.

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 2-2
Nursery Basin Site Plan

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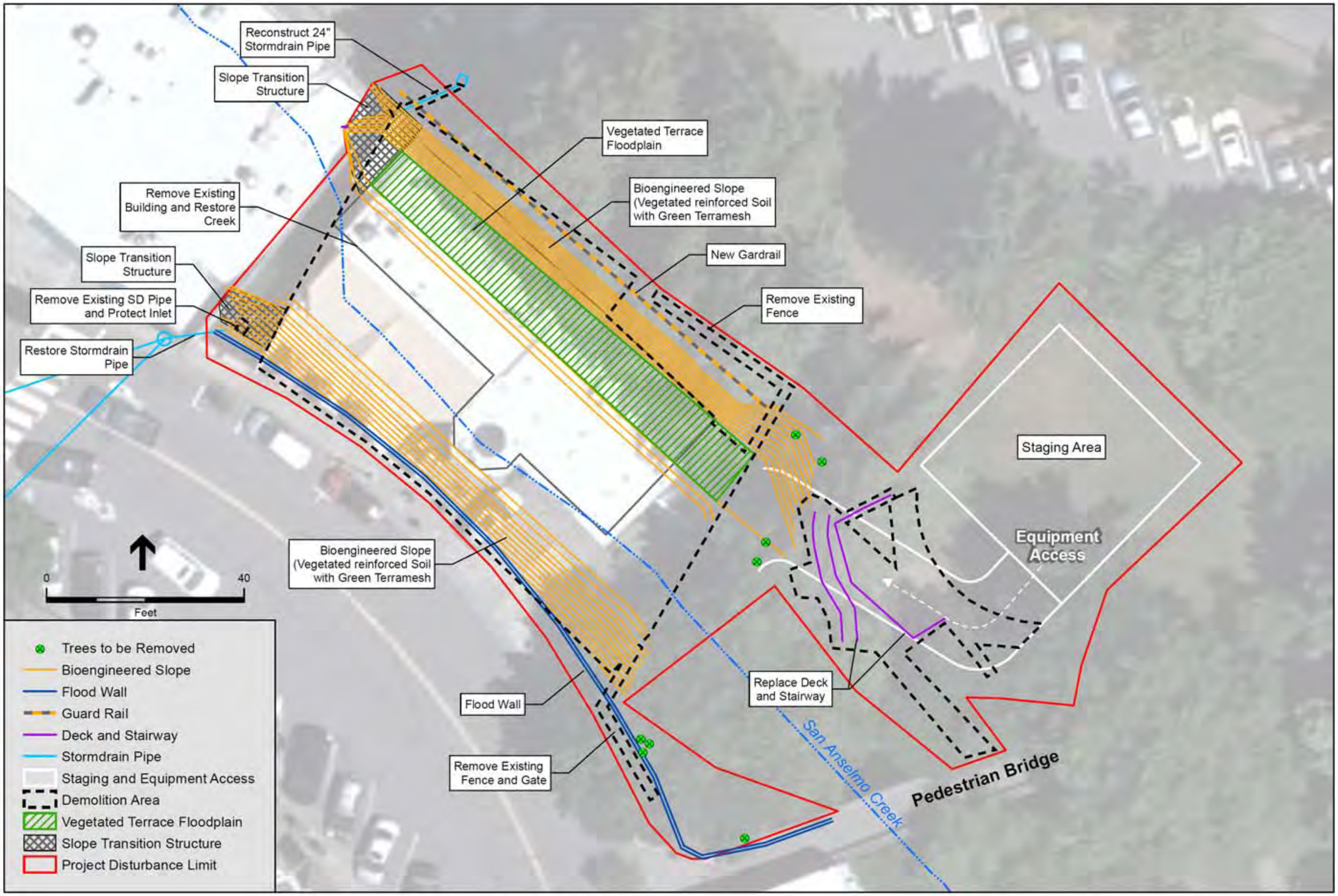

SOURCE: Marin County, 2018

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 2-3

634-636 San Anselmo Avenue (Downtown San Anselmo Site) Plan

Fairfax Creek, downstream of the diversion structure. This temporary diversion and storage would reduce the risk of downstream flooding by taking that water out of the creek system until peak flows had passed.

Creek capacity improvements are typically made by widening and/or deepening certain sections of creeks and/or by modifying or removing bridges, culverts, buildings, or bank protection structures that encroach into the creek. These structures often encroach into the creek, restrict flows, and cause water to back up and overtop creek banks during large flood events. In downtown San Anselmo, there are several of these constrictions; the building at 634-636 San Anselmo Avenue has a deck that extends two feet below the other buildings. That building and its footings and foundations would be removed, and the creek channel would be sloped back and bioengineered using bio-stabilization slope protection methods to restore the creek banks. This would allow flows to pass downstream and thus reduce flooding in downtown San Anselmo.

2.2 Summary of Impacts and Mitigation Measures

Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*, describes in detail the environmental impacts that would result from implementation of the proposed Project. Impacts of a proposed project may be classified as either (1) less than significant (adverse effects that are not substantial according to CEQA); (2) significant (substantial or potentially substantial adverse changes in the environment, for which feasible mitigation measures must be identified to reduce those impacts to less-than-significant levels); or (3) significant and unavoidable (substantial or potentially substantial adverse changes in the environment that cannot feasibly be reduced with mitigation measures to a less-than-significant level). Significant unavoidable adverse impacts, growth-inducing impacts, and significant irreversible environmental changes that would occur with implementation of the proposed Project are discussed below. Growth-inducing and cumulative impacts of the Project are discussed in Chapter 5.

Table 2-1, at the end of this chapter, summarizes the Project's environmental impacts (including cumulative impacts), the level of significance before mitigation, mitigation measures, and the level of significance after mitigation. Please refer to Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*, and Chapter 5, *Growth-Inducing and Cumulative Effects*, for a detailed discussion of these issues.

2.3 Summary of Significant Unavoidable, Growth-Inducing, and Cumulative Impacts

This section summarizes the significant unavoidable adverse impacts, growth-inducing impacts, and cumulative impacts of the Project.

2.3.1 Significant Unavoidable Impacts

State CEQA *Guidelines* Section 15126.2(b) requires that an EIR describe the significant impacts of a proposed project, including those that cannot be fully mitigated. In some cases, no feasible mitigation measures are available to reduce the environmental impacts to a less-than-significant level. In other cases, mitigation measures may be available in connection with the project, but they would not reduce an impact to a less-than-significant level or would substantially alter the basic project characteristics. In both cases, impacts are considered to be significant and unavoidable. This EIR finds that the following significant unavoidable impact would occur if the project were to be implemented:

Hydrology and Water Quality

Impact 4.9-4: Removal of the building at 634-636 San Anselmo Avenue in downtown San Anselmo would lead to small increases in inundation depths and/or small increases in the extent of flooding from San Anselmo Creek in the 25-year event and the 100-year event (Significant), but would also reduce localized flooding by adding more creek capacity upstream and downstream (Beneficial). As noted in Table 2-1, these adverse effects would take place on a small number of parcels, compared to the several hundred on which flooding would decrease. A similar effect would occur upstream of the proposed FDS basin at the former Sunnyside Nursery site adjacent to Fairfax Creek. As explained in Section 4.9, *Hydrology and Water Quality*, of the EIR, this element of the proposed Project would cause sediment deposition in the Fairfax Creek channel, which could cause occasional increases in the extent of flooding on one or two parcels there (Significant).

The Flood Control District has identified a potential mitigation measure to reduce this adverse effect (in both of those locations) to a less-than-significant level, but it would require the cooperation of those private property owners to allow the installation of a flood barrier on their properties. Because this measure cannot be required by the Flood Control District, this impact must be considered significant and unavoidable.

However, in the expected future condition, as discussed in Chapter 5, *Growth-Inducing and Cumulative Impact*s, this significant and unavoidable impact would be avoided in the San Anselmo Creek location by the removal of several other flow-constraining bridges over San Anselmo Creek and associated tributaries. Removal of those bridges would allow flows to pass safely downstream within the creek channel. Because those are separate projects within the responsibility and jurisdictions of other agencies, not the Flood Control District, their implementation cannot be assumed, and the impact remains significant and unavoidable.

2.3.2 Growth-Inducing Impacts

Chapter 5, *Growth-Inducing and Cumulative Impacts*, discusses the growth-inducement potential of the Project. It explains that the Project would not involve any housing construction, road extension, permanent or temporary employment opportunities, or any infrastructure improvements that could directly or indirectly induce growth. The Project would reduce flood risk in existing developed areas and in areas already anticipated for growth in the Marin Countywide Plan. Consequently, implementation of the proposed project would not affect current and/or projected population growth patterns within Marin County as already evaluated and planned for in the Countywide Plan and, therefore, would not have a growth-inducing impact.

2.3.3 Cumulative Impacts

Chapter 5, *Growth-Inducing and Cumulative Impacts*, of this EIR discusses the analysis of cumulative impacts from the Project. Cumulative impacts, as defined in Section 15355 of the State CEQA *Guidelines*, refer to two or more individual effects that, when taken together, are “considerable” or that compound or increase other environmental impacts. Cumulative impacts were analyzed based on a list of past, present, and probable future projects producing related or cumulative impacts. These impacts were analyzed for whether they were “cumulatively considerable” (i.e., whether the incremental effects of this individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency,).

That analysis found that the Project would not cause a new cumulative impact or make a considerable contribution to an existing cumulative impact. That determination was made in some cases because there is no cumulative impact to which the Project could contribute. In other cases, the Project’s impacts, either on their own or after implementation of project-level mitigation measures, would not make a considerable contribution to a cumulative impact.

2.4 Summary of Plan and Policy Consistency

Section 4.10, *Land Use and Planning*, of this EIR evaluates whether the Project would conflict with the Marin Countywide Plan, the Marin County Development Code (Zoning and Subdivision Regulations), the Town of San Anselmo General Plan, or the Town of Fairfax General Plan. That analysis concludes that the Project would not conflict with applicable policies and regulations (see Section 4.10 for details). Appropriate decision makers in the Flood Control District (the CEQA lead agency), Marin County, and the Town of San Anselmo (expected to be a responsible agency under CEQA) will review the Project to make final determinations about the Project’s consistency with all policies.

2.5 Summary of Alternatives to the Project

This EIR examines the following four alternatives to the Project. These alternatives are summarized below, and Chapter 6, *Alternatives* presents a complete description of them. In that chapter, **Figures 6-1** and **6-2** show Alternative 2 and its changes in design or location in relation to the Project. **Figure 6-3** shows Alternative 3 and the bridge structure’s reinforced concrete decks. **Figure 6-4** shows the larger FDS basin associated with Alternative 4.

2.5.1 Alternative 1: No Project Alternative

Inclusion and evaluation of the No Project Alternative in an EIR is required by CEQA This alternative would avoid the adverse environmental impacts of the Project’s construction and operation. In the No Project Alternative, there would be no construction actions taken or changes to the existing flood risk management system or its current operations, maintenance, or management practices. There would be no FDS basin at the former Sunnyside Nursery site to temporarily detain peak stormwater runoff. The building at 634-636 San Anselmo Avenue would remain. The Flood Control District and the Town of San Anselmo's Public Works Department would continue to maintain creek channels, bridges, culverts, and other parts of the existing system as they do now. Because none of the flood risk hazard reduction benefits of the proposed Project would occur under the No Project Alternative, existing flood risk in San Anselmo would persist.

2.5.2 Alternative 2: Morningside Neighborhood/Passive Basin Alternative

The Morningside/Passive Basin Alternative would have a smaller capacity FDS basin without a diversion structure built in Fairfax Creek. Filling of the basin would thus be "passive". This basin design would involve placement of less fill and reduced construction and maintenance actions within the creek channel, as compared to the proposed Project. Also, instead of removing the building at 634-636 San Anselmo Avenue, this alternative would remove or replace two flow-constraining bridges on Sleepy Hollow Creek, a tributary to San Anselmo Creek, in the Morningside Neighborhood. Compared to the proposed Project, this project would decrease many impacts related to aesthetics, biological resources, hydrology and water quality, and some aspects of noise. However, this alternative would have greater impacts than the proposed Project related to daily air quality and greenhouse gas emissions, land use, noise and vibration, and transportation and circulation. Importantly, because there would not be a diversion structure in Fairfax Creek, the proposed Project's significant and unavoidable impact associated with upstream flooding following sediment deposition in the creek channel would be avoided. However, downstream, in the Towns of Fairfax and San Anselmo, it would not reduce existing flood risk as much as the proposed Project would, and it would increase flood risk in some places more than the proposed Project would.

2.5.3 Alternative 3: Raised Building Alternative

The Raised Building Alternative would have the same design for the FDS basin as the proposed Project would, but instead of removing the building at 634-636 San Anselmo Avenue, it would raise it, retain it in place, and remove its foundation from the creek channel. This alternative was developed in response to community interest in preserving rather than removing that building. Because this alternative would preserve and replace the building supports, it would not include the restoration improvements to San Anselmo Creek described in Chapter 3, *Project Description* (i.e., regrading and sloping portions of both banks of the channel with bio-stabilization protection methods and vegetating the slopes with riparian woodland shrubs). This alternative would reduce the Project's impacts related to aesthetics, land use (community character portion), biological resources, geology and soils, and hazardous building materials by retaining the building and diminishing the degree of change. However, the alternative would cause slight increases in impacts related to longer construction periods, including total air quality and greenhouse gas emissions, and transportation and circulation. This alternative would have the same changes to flood risk (both beneficial and adverse) as the proposed Project would.

2.5.4 Alternative 4: Increased Capacity Basin Alternative

The Increased Capacity Basin Alternative would make the same changes to San Anselmo Creek in downtown San Anselmo as the proposed Project (i.e., removing the building at 634-636 San Anselmo Avenue and making other creek capacity and channel improvements), but it would construct a larger capacity FDS basin at the former Sunnyside Nursery site. A pump would be installed to fully drain the deeper basin when needed. Implementation of the Increased Capacity Basin Alternative would remove more area from the 10-year floodplain and would reduce the depth of inundation more than the proposed Project. During the 25-year event, it would reduce the depth of inundation over a larger area in Fairfax and much of downtown San Anselmo than the proposed Project. In the vicinity of the Winship Bridge, it would result in increased inundation depth and extent, as would the proposed Project, but compared to the proposed Project, this increase in inundation could be slightly lessened. During the 100-year event, similar to the proposed Project, this alternative would not substantially reduce the extent of inundation in Fairfax or San Anselmo. This alternative would result in greater impacts than the proposed Project related to air quality and greenhouse gas emissions, biological resources, energy, hydrology and water quality, noise, public services, and transportation and circulation related to construction and operation of the increased capacity basin.

2.5.5 Comparison and Conclusion Regarding Alternatives to the Project

The environmental impacts of the action alternatives vary; as a result, there are trade-offs in the environmental impacts of each, summarized below.

Flood Risk. Reduction in flood risk (extent and inundation depth) in the Fairfax-San Anselmo area is the fundamental purpose and key environmental benefit, in terms of avoided impacts, of the proposed Project. Most of the alternatives provide similar flood risk reduction except for the Morningside/Passive Basin Alternative, due to the reduced capacity provided by the FDS basin in that alternative and because of the different hydrologic effects of shifting the creek capacity improvements into Sleepy Hollow Creek. Also, some of the benefits in reduced flood risk would occur in a portion of the Morningside neighborhood instead of in downtown San Anselmo. As discussed in Section 4.9, Hydrology and Water Quality (Impact 4.9-4), the only significant and unavoidable impact of the proposed Project is that it could increase flood risk in two locations. This impact could be avoided in one of these locations (the San Anselmo area) if removal of the Winship Bridge from San Anselmo Creek (described in Chapter 5) were to be completed prior to removal of 634-636 San Anselmo Avenue. This is expected to happen in time to avoid this potential effect, but that is not certain. That external project would not affect the potential for backwater flooding along Fairfax Creek upstream of the FDS basin site, and so Mitigation Measure 4.9-4 is the only option to reduce this impact to a less-than-significant level.

FDS Basin Elements. Among the FDS basin elements considered, the severity and magnitude of many construction- and operational-phase impacts at and in the vicinity of the FDS basin site would generally be less with the passive basin than with either the proposed Project or the Increased Capacity Basin Alternative because construction of the diversion structure would not occur, resulting in less extensive conversion and disturbance of aquatic and riparian habitat and associated special-status species within Fairfax Creek, as well as less tree removal. The passive basin would also reduce operational impacts associated with the need to periodically remove deposited sediment from behind the diversion structure; this annual removal of deposited material would be a recurring impact to the stream channel, water quality, and aquatic and amphibian wildlife species. The different basin designs are otherwise quite similar in both the proposed Project and the action alternatives with regard to increases in scour/erosion potential and other hydraulic impacts.

Creek Capacity Elements. The severity and magnitude of impacts to the natural (as opposed to human) environment would be somewhat less in the Morningside/Passive Basin Alternative than with either the proposed Project or the Increased Capacity Basin Alternative because the extent of disturbance to stream habitat would be less. However, implementing creek capacity improvements on Sleepy Hollow Creek instead of on San Anselmo Creek at the downtown location would shift impacts to a location surrounded by residences, which are more sensitive to construction-phase disturbance (e.g., noise and vibration, transportation, land use) than commercial uses are. Under the Raised Building Alternative, almost all of the impacts attributable to the Downtown San Anselmo Element of the proposed Project also would occur; consequently, this alternative offers little environmental advantage, though it would have somewhat reduced impacts due to changes in community function and character and visual impacts (both of which would be less than significant in the proposed Project) from retaining the existing building.

Environmentally Superior Alternative. Pursuant to the State CEQA *Guidelines*, this EIR identifies the “Environmentally Superior Alternative”. Based on a comparison of impacts discussed in Chapter 6, *Alternatives*, the EIR finds that – of the alternatives described in Chapter 6, Alternatives – the Morningside/Passive Basin Alternative would be environmentally superior to the proposed Project and the other alternatives because it would eliminate one of the two small areas where the Project would have a significant and unavoidable impact (i.e., the backwater flooding from Fairfax Creek upstream of the project site). Because the Morningside/Passive Basin Alternative is the only alternative that does not include the diversion structure in Fairfax Creek, it is the only alternative that would avoid that impact. Therefore, it is the environmentally superior alternative among those developed for the alternatives analysis in Chapter 6. However, the Morningside/Passive Basin Alternative would also increase flood risk in portions of downtown San Anselmo that would not be adversely affected by the proposed Project, and it would not wholly avoid the significant and unavoidable impact of increased flood risk near the Winship Bridge.

A more environmentally superior alternative could be formed from combining the passive basin component of the Morningside/Passive Basin Alternative with the Downtown San Anselmo Element of the proposed Project. Based on the environmental trade-offs described above, this combined alternative would reduce construction impacts on biological, water quality, and most hydrologic impacts, including the sediment deposition and backwater flooding upstream of the project site on Fairfax Creek, compared to the proposed Project. It would also reduce flood risk compared to existing conditions, although not be as much as the proposed Project. This combination was not one of the initial alternatives because the modeling of all of the combinations of different design elements was not completed when this alternatives analysis began.

2.6 Significant Irreversible Environmental Changes

Construction activities associated with the proposed Project would result in an irretrievable and irreversible commitment of natural resources though direct consumption of fossil fuels and use of materials. However, the energy consumption for construction would not result in long-term depletion of non-renewable energy resources and would not permanently increase reliance on energy resources that are not renewable. Construction activities would not reduce or interrupt existing electrical or natural gas services such that existing supplies would be constrained.

Project operations that would affect irretrievable resources would be limited to annual maintenance activities. Maintenance activities would result in irreversible and irretrievable use of energy and material resources, and conversion of land use from commercial uses to flood management uses.

The use of nonrenewable resources is expected to account for a minimal portion of the region's resources and would not affect the availability of these resources for other needs within the region. Similarly, the conversion of one parcel of land from its former commercial land use to a flood management facility would not affect the availability of commercially zoned parcels in Marin County, Ross Valley as a whole, or in the adjacent Town of Fairfax.

2.7 Areas of Known Controversy

On April 6, 2017, the Flood Control District issued a Notice of Preparation (NOP) of a Draft EIR for the Project pursuant to Section 15082 of the State CEQA *Guidelines* to seek comments from responsible and trustee agencies and the public about the scope of the EIR. The 30-day NOP comment period closed on May 8, 2017. During the comment period, on April 20, 2017, the Flood Control District held a public scoping session (meeting) regarding the Project to solicit agency and public input on the range of environmental effects that should be analyzed in the EIR. Oral comments were received at the scoping meeting, and additional written comments were received at and following the meeting. The topics commented on – and thus the main areas of potential controversy – were these:

1. Increased flood risk downstream of project sites
2. Liquefaction from a potentially-raised water table due to the FDS basin at the Nursery site
3. Loss of business revenue along San Anselmo Avenue due to construction and removal of the building at 634-636 San Anselmo Avenue.
4. Impacts to creek ecosystem and water quality from the project, including both in-stream structures and increased flows causing erosion
5. Opposition to FDS basins due to safety, recreation, and aesthetic concerns

A scoping report containing the NOP and scoping comments received are included in **Appendix A**. The scoping report also identifies the Draft EIR sections that address the scoping issues raised in the comments received.

2.8 Major Conclusions and Issues to be Resolved

The following major conclusions and issues to be resolved are derived from the analysis in the EIR. The major conclusions of the EIR are presented first, followed by the issues to be resolved. The issues are presented to highlight the topics on which the decision-makers may want to focus special attention.

2.8.1 Major EIR Conclusions

The EIR evaluates a total of 62 project-based potential adverse environmental impacts. Of these, 24 are identified as significant impacts. Feasible mitigation measures are available to reduce all but one of the Project's significant project-based effects to a less-than-significant level. The EIR also evaluates cumulative impacts of the Project in combination with other related past, present, and probable future projects, and identifies one significant cumulative impact. The Project's contribution to this impact would not be cumulatively considerable with implementation of mitigation.

Although the Project would result in a net reduction in flooding for the 10-year and 25-year storms, the Project would result in some new flooding downstream of the Project area, north of the Sir Francis Drake Bridge and east of Sir Francis Drake Boulevard, and upstream of the Nursery Basin site, during the 25-year flood event. This impact can be mitigated to less than significant with the installation of flood barriers, and for areas in Ross and San Anselmo, could be avoided in the cumulative scenario. However, because the Flood Control District cannot fully control implementation of the flood barriers (on private property) and because the cumulative scenario bridge replacement projects are within the responsibility and jurisdiction of other agencies, not the Flood Control District, the Project's impact related to flooding remains significant.

2.8.2 Issues to be Resolved

Draft EIR Section 4.9, Hydrology and Water Quality, identified a significant and unavoidable flooding impact on select parcels in unincorporated Marin County (east of the Town of Fairfax), the Town of San Anselmo, and the Town of Ross. Implementation of the passive basin (as evaluated in Alternative 2) would avoid this impact in unincorporated Marin County because the diversion structure would not be included in the basin design. However, the passive basin design would not retain as much water as the proposed Project basin design; therefore, fewer areas downstream would experience reduced flood risk compared with the Project if the passive basin is selected.

Further, in the proposed Project or any alternative to it analyzed in the EIR, there are small areas along San Anselmo Creek in the Town of San Anselmo and the Town of Ross that would have slightly higher peak flood elevations in large flood events (e.g., the 25-year event). While adequate mitigation measures (the flood barriers described in Section 2.8.1) are available to reduce this impact to less-than-significant levels, the Flood Control District cannot enforce those measures on private property owners without their permission.

The Flood Control District's Board of Supervisors will need to consider whether to adopt a statement of overriding considerations, prior to approving the Project, stating the reasons why the benefits of the Project outweigh its significant unavoidable impacts as identified in this EIR and/or adopt feature of one or more of the alternatives that would further reduce this impact.

2.9 Effects Found Not to be Significant

The impact analysis determined that in six of the 14 resource areas, impacts would be either less than significant or have no impact, generally due to the project's required compliance with applicable regulations protecting these resources, incorporation of project-specific control measures, and/or the limited extent that the existing resource would be affected by the project. These resource areas are:

1. Aesthetics and Visual Resources
2. Cultural Resources
3. Geology, Soils, and Seismic Hazard
4. Land Use and Planning
5. Population and Housing
6. Public Services and Utilities

The remaining eight resource area impacts would be mitigated to a less-than-significant level with implementation of identified mitigation measures. The EIR identified significant impacts that could be mitigated to a less-than-significant level with implementation of mitigation measures in the following areas:

1. Air Quality and Greenhouse Gas Emissions
2. Energy, Mineral, Forest, and Agricultural Resources
3. Biological Resources
4. Hazards and Hazardous Materials
5. Hydrology and Water Quality
6. Noise and Vibration
7. Parks and Recreation
8. Transportation and Circulation

Table 2-1 at the end of this chapter includes summary discussions of these impacts and their mitigation measures.

2.10 Other Social and Economic Impacts Found Not to Be Significant

State CEQA *Guidelines* Section 15382 provides that "[a]n economic or social change by itself shall not be considered a significant effect on the environment." However, physical impacts associated with social or economic changes may be considered significant. Pursuant to State CEQA *Guidelines* Section 15382, purely economic or social impacts would not be considered significant impacts of the proposed Project, and are not, therefore, addressed in this EIR. This EIR evaluates all physical impacts that would result from the proposed Project and has not identified any physical impacts associated with substantial social or economic changes. The Flood Control District has an option to purchase the building at 634-636 San Anselmo Avenue from its owner and is committed to providing relocation assistance for the current tenant businesses at that location. The removal of a single commercial building from the downtown San Anselmo area would not be sufficient to cause a significant social or economic change that would lead to a significant environmental effect that was not analyzed in the EIR.

2.11 Mitigation Monitoring and Reporting Program

In conformance with California Resources Code Section 21081.6, a Mitigation Monitoring and Reporting Program has been prepared for the Project, if approved. The purpose of the program would be to ensure compliance with the mitigation measures incorporated into the Project and set forth in this EIR. The Mitigation Monitoring and Reporting Program is presented in **Appendix E**.

TABLE 2-1
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Aesthetics and Visual Resources		
Impact 4.2-1: The Project would not have a substantial adverse effect on a publicly-accessible scenic vista.	LTS	No mitigation required.
Impact 4.2-2: The Project would not substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway.	LTS	No mitigation required.
Impact 4.2-3: The Project would not substantially degrade the existing visual character or quality of the site and its surroundings, including alteration of the built environment or land use patterns.	LTS	No mitigation required.
Impact 4.2-4: The Project would not create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area.	LTS	No mitigation required.
Air Quality and Greenhouse Gas Emissions		
Impact 4.3-1: Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation.	LSM	**Mitigation** Measure **4.3-1: BAAQMD Basic Construction Measures.** To limit dust, criteria pollutants, and precursor emissions associated with construction, the following BAAQMD-recommended Basic Construction Measures shall be implemented and included in all contract specifications for components constructed under the Project: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. 4. All vehicle speeds on unpaved roads shall be limited to 15 mph. 5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. 6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Air Quality and Greenhouse Gas Emissions		
Impact 4.3-1 (cont.)		7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. Post a publicly visible sign with the telephone number and person to contact at the Flood Control District regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.
Impact 4.3-2: Construction of the Project would result in emissions that could conflict with the 2017 Clean Air Plan.	LSM	**Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures** (refer to Impact 4.3-1 above)
Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that would not exceed air quality standards and conflict with the 2017 Clean Air Plan.	NI	No mitigation required.
Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions.	LSM	**Mitigation Measure 4.3-4: Tier 4 Engines for Construction Equipment.** All off-road equipment greater than 25 horsepower that operates for more than 20 total hours over the entire duration of construction activities shall have engines that meet the USEPA or CARB Tier 4 interim or Tier 4 Final off-road emission standards.
Impact 4.3-5: Construction of the Project would not result in objectionable odors.	LTS	No mitigation required.
Impact 4.3-6: Construction and operation of the Project would result in GHG emissions that would not have a significant impact on the environment or conflict with applicable plans and policies in place to reduce GHG emissions.	LTS	No mitigation required.
Energy, Mineral, Forest and Agricultural Resources		
Impact 4.4-1: Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources.	LSM	**Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures** (refer to Impact 4.3-1 above)

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources		
Impact 4.5-1: Project implementation could have substantial adverse effects on special-status aquatic species or habitats.	LSM	**Mitigation Measure 4.5-1a: Seasonal Avoidance of Sensitive Aquatic Species.** In-water construction work, including activities on the banks that are expected to create turbidity or disturb the streambed, shall be conducted within resource agency-approved work windows intended to reduce potential impacts on salmonids (generally limiting work to the period between June 15 and October 15) with resource agency concurrence for the following exceptions: 1. Removal of debris, foundations or other manmade materials from the creek bed may continue year-round, in areas of the stream which are dry and where such activity shall not create turbidity. 2. Tree removal and invasive species removal may take place year-round, providing the area is free of nesting birds and roosting bats as provided under **Mitigation Measure 4.5-4**. 3. Revegetation activities may occur year-round. **Mitigation Measure 4.5-1b: Relocation of Special-Status Fish.** If in-channel work requires dewatering, including for sediment removal maintenance activities, fish shall be captured and relocated downstream of the Project areas to avoid injury and mortality and minimize disturbance. The Flood Control District shall implement the measures below, or whatever more stringent species preservation and avoidance measures are imposed by resource agencies, including NMFS and CDFW, with jurisdiction over aquatic special-status species. 1. The name(s) and credentials of qualified biologist(s) to act as construction monitors shall be submitted to CDFW and NMFS for approval at least 15 days before construction work begins. 2. Prior to and during the initiation of construction activities, qualified fisheries biologist (i.e., approved by CDFW and/or NMFS) shall be present during installation and removal of creek diversion structures. 3. For sites that require flow diversion and exclusion, the work area shall be blocked by placing fine-meshed nets or screens above and below the work area to prevent salmonids from re-entering the work area. To minimize the potential for re-entry, mesh diameter shall not exceed 1/8 inch. The bottom edge of the net or screen shall be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening shall be placed in low velocity areas to minimize fish impingement against the mesh. Screens shall be checked periodically and cleaned of debris to permit free flow of water. 4. Before removal and relocation on individual fish begins, a qualified fisheries biologist shall identify the most appropriate release location(s). In general, release locations should have water temperatures similar to (<3.6°F difference) the capture location and offer ample habitat (e.g., depth, velocity, cover, connectivity) for released fish, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on exclusion nets or screens. 5. The means of capture shall depend on the nature of the work site, and shall be selected by a qualified fisheries biologist as authorized by CDFW and NMFS. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, fish and other aquatic species may be captured by pumping down the pool and then seining or dip netting. Electrofishing, if necessary, shall be conducted only by properly trained personnel holding current permits from CDFW and NMFS and following the most recent NMFS electrofishing guidelines (NMFS, 2000). 6. Initial fish relocation efforts shall be performed several days prior to the scheduled start of construction. Flow diversions and species relocation shall be performed during morning periods. The fisheries biologist shall survey the exclusion screening throughout the diversion effort to verify that no special-status fish, amphibians, or aquatic invertebrates are present. Afternoon pumping activities

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-1 (cont.)		shall be limited and pumping shall be suspended when water temperatures exceed 18 degrees Celsius (64.5° F). Water temperatures shall be measured periodically, and flow diversion and species relocation shall be suspended if temperatures exceed the 18-degree limit under NMFS guidelines. Handling of fish shall be minimized. When handling is necessary, personnel shall wet hands or nets before touching them. 7. Prior to translocation, fish that are collected during surveys shall be temporarily held in cool, aerated, shaded water using a five-gallon container with a lid. Overcrowding in containers shall be avoided; at least two containers shall be used and no more than 25 fish shall be kept in each bucket. Aeration shall be provided with a battery-powered external bubbler. Fish shall be protected from jostling and noise, and shall not be removed from the container until the time of release. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature. Special-status fish shall not be held more than 30 minutes. If water temperature reaches or exceeds 18 degrees Celsius (USFWS 2012), the fish shall be released and relocation operations shall cease. 8. If fish are abundant, capture shall cease periodically to allow release and minimize the time fish spend in holding containers. 9. Fish shall not be anesthetized or measured. However, they shall be visually identified to species level, and year classes shall be estimated and recorded. 10. Reports on fish relocation activities shall be submitted to CDFW and NMFS in within one week. **Mitigation Measure 4.5-1c: Contractor Environmental Awareness Training and Site Protection.** All construction personnel that are working in areas of potential endangered species habitat shall attend an environmental education program delivered by a qualified biologist prior to working on either Project site. The training shall include an explanation as how to best avoid the accidental take of special-status species, including salmonids and other fish species, western pond turtle, California red-legged frog, and listed birds. The training session shall be mandatory for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of maps showing areas where minimization and avoidance measures are being implemented. The program shall include an explanation of appropriate federal and state laws protecting endangered species. The contractor shall provide closed garbage containers for the disposal of all trash items (e.g., wrappers, cans, bottles, food scraps). Work sites shall be cleaned of litter before closure each day, and placed in wildlife-proof garbage receptacles. Construction personnel shall not feed or otherwise attract any wildlife. No pets, excluding service animals, shall be allowed in construction areas.
Impact 4.5-2: Project implementation could have substantial adverse effects on special-status plants.	LSM	**Mitigation Measure 4.5-2: Avoid Impacts to Rare Plants.** A qualified biologist shall conduct a pre-construction survey of each Project site for special-status plant species with the potential to occur within the area of disturbance. The survey shall be floristic in nature and shall follow the procedures outlined in the CDFW Publication *Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Commu*nities (CDFW, 2009). The survey shall be conducted between April and July in conjunction with the blooming seasons of those rare plants with moderate potential to occur in the Project area. If no special-status plants are observed during appropriately timed surveys by a qualified botanist, it is assumed the construction activity will have no impact on special-status plants and no further action is required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-2 (cont.)		If special-status plants are identified within the Project area, the individuals or populations shall be mapped and quantified and reported to the CNDDB, and the project manager shall be notified so that potential impacts to these known occurrences shall be avoided, when feasible. Coordination with CDFW and/or USFWS staff shall be conducted to establish appropriate avoidance and minimization measures if the species is federally or State listed. Avoidance and minimization measures may include: 1. No-disturbance buffers. 2. Work windows for low impact activities that are compatible with the dormant phase of a special-status plant life cycle but that may kill living plants or severely alter their ability to reproduce. 3. Silt fencing or construction fencing to prevent vehicles, equipment, and personnel from accessing the occupied habitat. 4. Erosion control BMPs such as straw wattles made of rice straw, erosion control blankets, or hydroseeding with a native plant seed mix to prevent sedimentation from upslope construction activities. 5. Before the construction activity commences, special-status plant occurrences shall be marked with pin flags in the field, and all maintenance personnel shall be instructed as to the location and extent of the special-status plants or populations and the importance of avoiding impacts to the species and its habitat. 6. If needed a qualified biologist shall be present or on-call during construction activities to provide guidance on avoiding special-status plants, ensure that other avoidance measures (buffers, fencing, etc.) are observed, and to document the total impact of the maintenance activity, particularly if it is greater or less than anticipated. 7. In consultation with, and as authorized by, CDFW or USFWS, a qualified botanist may collect and spread seeds or relocate plants to appropriate locations.
Impact 4.5-3: Project implementation could have substantial adverse effects on special-status amphibians.	LSM	**Mitigation Measure 4.5-3a: Install Wildlife Exclusion Fencing.** The Flood Control District shall implement the measures below, or whatever more stringent California red-legged frogs (CRLF) and western pond turtle (WPT) preservation and avoidance measures are imposed by resource agencies with primary jurisdiction over special-status wildlife species, including USFWS and CDFW. 1. Before ground-disturbing activity occurs, the contractor shall install temporary exclusion/silt barrier fencing around the perimeter of the construction site. Fencing shall be installed to the extent necessary to exclude CRLF from the construction area (in areas with habitat), and minimize impacts to natural habitat. Fencing material shall provide for wildlife exclusion as well as maintenance of water quality. Construction personnel and construction activity shall avoid areas outside the fencing. The need for and exact location of the fencing shall be determined by a qualified biologist, with the goal of protecting sensitive biological habitat and water quality. The fencing shall be checked at regular intervals (e.g., weekly) and maintained until construction is complete at individual work sites. The fence shall contain exit funnels to allow any wildlife within the construction area to leave without human intervention while preventing entry into the construction zone. Exit funnels shall be placed at ground level no more than 100 feet apart along the fence, or as modified by a qualified biologist or as directed by resource agencies with primary jurisdiction over special-status wildlife species. 2. The fencing shall be monitored as prescribed in **Mitigation Measure 4.5-6**.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-3 (cont.)		**Mitigation Measure 4.5-3b: Avoid Impacts to California Red-legged Frog and Western Pond Turtle.** The name(s) and credentials of the qualified biologist(s) to act as construction monitors shall be submitted to the USFWS for approval at least 15 days before construction work begins. Prior to commencing work, an approved biologist shall survey the entire construction footprint for California red-legged frog and other special-status species with potential to be present, such as western pond turtle. At the beginning of each workday that includes initial ground disturbance, including grading, excavation, and vegetation-removal activities, an approved biologist shall conduct on-site monitoring for the presence of these species in the area where ground disturbance or vegetation removal is planned. If required by the USFWS or CDFW, perimeter fences shall be inspected to ensure they do not have any tears or holes, that the bottoms of the fences are still buried, and that no individuals have been trapped in the fence. All excavated or deep-walled holes or trenches greater than 2 feet deep shall be covered at the end of each workday using plywood, steel plates, or similar materials, or escape ramps shall be constructed of earth fill or wooden planks to allow animals to exit. Before such holes are filled, they shall be thoroughly inspected for trapped animals. If a special-status species is present within the exclusion fence area during construction, work shall cease in the vicinity of the animal, and the animal shall be allowed to relocate of its own volition unless relocation is permitted by state and/or federal regulatory agencies. The contractor shall maintain the temporary fencing—both exclusion fencing and protective fencing (if installed)—until all construction activities are completed. No construction activities, parking, or staging shall occur beyond the fenced exclusion areas.
Impact 4.5-4: Project implementation could have substantial adverse effects on nesting birds.	LSM	**Mitigation Measure 4.5-4: Avoid Impacts to Special-status and Nesting Birds, including Raptors and Northern Spotted Owls.** Tree removal activities shall be avoided during the nesting season (February 1 to August 31). Prior to any tree removal or construction in nesting season, a qualified biologist shall conduct a spotted owl and general nesting bird survey in each Project site and areas within 1/2-mile. Any identified spotted owl nesting areas or activity centers shall be flagged and avoided with a buffer of 1/4-mile throughout the active nesting season. Other nesting birds with active nests in the vicinity of the construction area shall be avoided by a buffer of 50 feet, or as determined in coordination with USFWS and CDFW. Construction work may continue outside of the no-work buffer. Northern spotted owl nesting surveys shall be conducted in coordination with Marin County Parks and Point Blue Conservation Science (Point Blue, 2017).
Impact 4.5-5: Project implementation could have substantial adverse effects on Northern spotted owls.	LSM	**Mitigation Measure 4.5-4: Avoid Impacts to Special-status and Nesting Birds, including Raptors and Northern Spotted Owls** (refer to Impact 4.5-4 above)
Impact 4.5-6: Project implementation could have substantial adverse effects on special-status bats.	LSM	**Mitigation Measure 4.5-6: Avoid Impacts to Special-status Bats.** Prior to any construction, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in trees to be removed or pruned and structures to be demolished. If no roosting bats are found, no further action is required. If a bat roost is found, the following measures shall be implemented to avoid impacts on roosting bats. If active maternity roosts are found in trees or structures that shall be removed or demolished as part of construction, tree removal or demolition of that structure shall commence before maternity colonies form (generally before March 1) or after young are flying (generally by July 31). Active maternal roosts shall not be disturbed.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-6 (cont.)		If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist and with approval from CDFW. Removal of the tree or demolition of the structure should occur no sooner than two nights after the initial minor site modification (to alter airflow), under guidance of the qualified bat biologist. The modifications shall alter the bat habitat, causing bats to seek shelter elsewhere after they emerge for the night. On the following day, the tree or structure may be removed, in presence of the bat biologist. If any bat habitat is not removed, departure of bats from the construction area shall be confirmed with a follow-up survey prior to start of construction.
Impact 4.5-7: Project implementation could adversely affect sensitive natural communities.		**Mitigation Measure 4.5-7a: Vegetation Protection for Sensitive Natural Communities.** Prior to start of construction of any Project element, the extent of sensitive natural communities within the work area shall be identified by a qualified botanist experienced in the definition and recognition of these communities. The area of impact in sensitive natural communities shall be minimized by siting construction staging and access areas outside the limits of riparian vegetation (as determined during pre-construction surveys) and by utilizing previously-disturbed areas. Before construction begins, the Project engineer and a qualified biologist shall identify locations for equipment and personnel access and materials staging that will minimize riparian vegetation disturbance. When heavy equipment is required, unintentional soil compaction shall be minimized by using equipment with a greater reach, or using low-pressure equipment. Temporary impacts on sensitive natural communities shall be mitigated by revegetation with native species, as required by **Mitigation Measure 4.5-7b.** **Mitigation Measure 4.5-7b: Habitat Restoration and Monitoring Plan.** The Flood Control District shall prepare a Habitat Restoration and Monitoring Plan for restoration following construction activities at both Project sites. The plan shall describe required salvage and replanting protocols prior to and after construction is complete and shall thereby reduce the long-term amount of losses of these natural communities. This plan shall include, but not be limited to, protocols for replanting of vegetation removed prior to or during construction, and management and monitoring of the plants to ensure replanting success pursuant to Marin County's Countywide Plan, Marin County Code, or Code requirements of the Town of San Anselmo, or by any more stringent requirements included in other permits issued for the Project. The plan shall specify monitoring and performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits from the various resource agencies with regulatory purview over the Project. Revegetated areas shall be monitored for a five-year period to track progress toward performance criteria. Native riparian vegetation within the Project sites shall be salvaged prior to construction and replanted after construction is completed. Areas impacted by construction-related activity shall be replanted or reseeded with native trees, shrubs, and herbaceous perennials and annuals from the watershed under guidance from a qualified biologist. Local plant materials shall be used for revegetation of the disturbed area. The plant materials shall include local cuttings from the local watershed or from adjacent watersheds. This shall ensure that the seeds can be collected during the appropriate season and the container plants shall be of an appropriate size for out-planting. Using local cuttings can reduce the length of this phase. The Habitat Restoration and Monitoring Plan would also address restoration of jurisdictional wetlands and waters. Temporary impacts to wetlands shall be restored onsite with native wetland species under guidance from a qualified biologist. Permanent impacts to jurisdictional wetlands shall be mitigated for by replacement on- or off-site at an equal ratio or whatever more stringent requirements are included in the permits to be issued for the Project. The monitoring plan shall include annual monitoring of restored areas for at least 5 years. The plan shall contain vegetation management protocols, protocols for monitoring replanting success, and an adaptive management plan if success criteria are not being met. The adaptive management plan would include interim thresholds for replanting success and alternative management approaches, such as weed control or additional replanting, to undertake if thresholds are not met.

Table 2-1 (continued)
Summary of Impacts and Mitigation Measures

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-7 (cont.)		**Mitigation Measure 4.5-7c: Avoid Spread of Invasive Species and Pathogens.** All vehicles and equipment entering each Project site shall be clean of noxious weeds. Noxious weeds could spread between sites as well as from outside the Project sites. All construction equipment shall be washed thoroughly to remove all dirt, plant, and other foreign material prior to entering the Project sites. Particular attention shall be shown to the under-carriage and any surface where soil containing exotic seeds may exist. Arrangements shall be made for inspections of each piece of equipment before entering each Project site to ensure all equipment has been properly washed. Equipment found operating on the Project that has not been i.e., properly washed shall be shut down and may be subject to citation. 1. Certified weed-free permanent and temporary erosion control measures shall be implemented to minimize erosion and sedimentation during and after construction. 2. The contractor shall conform to applicable federal, state, and local seed and noxious weed laws. 3. Nursery operations where plants are stored, propagated, or purchased must certify implementation of best management practices to reduce pest and pathogen contamination within their nursery. 4. Disturbed and decompacted areas outside the restoration area shall be revegetated with locally native vegetation. Revegetated areas shall be protected and tended, including watering when needed, until restoration criteria specified by regulatory agency-issued permits is complete. 5. All tree removal and pruning activities shall include measures to avoid the spread of the Sudden Oak Death (SOD) pathogen. Such measures may include, but are not limited to the following: a. As a precaution against spreading the pathogen, clean and disinfect pruning tools after use on confirmed or suspected infested trees or in known infested areas. Sanitize tools before pruning healthy trees or working in pathogen-free areas. Clean chippers and other vehicles of mud, dirt, leaves, organic material, and woody debris before leaving a site known to have SOD and before entering a site with susceptible hosts. b. Inform crews about the arboricultural implications of SOD and sanitation practices when they are working in infested areas. c. Provide crews with sanitation kits containing chlorine bleach, scrub brush, metal scraper, boot brush, and plastic gloves. d. Sanitize shoes, pruning gear, and other equipment before working in an area with susceptible species. e. When possible, work on SOD-infected and susceptible species during the dry season (June-October). When working in wet conditions, keep equipment on paved, graveled, or dry surfaces and avoid mud. Work in disease-free areas before proceeding to infested areas. f. If possible, do not collect soil or plant material (wood, brush, leaves, and litter) from host trees in the quarantine area. Within the quarantine area, host material (e.g., wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic host plants should remain onsite to minimize pathogen spread. g. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a SOD infested site. Scrape, brush, and/or hose off accumulated soil and mud from clothing, gloves, boots, and shoes. Remove mud and plant debris by blowing out or power washing chipper trucks, chippers, bucket trucks, fertilization and soil aeration equipment, cranes, and other vehicles. Restrict the movement of soil and leaf litter under and around infected trees as spores may be found there. h. Tools used in tree removal/pruning may become contaminated and should be disinfected with alcohol or chlorine bleach.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Biological Resources (cont.)		
Impact 4.5-8: Project activities could adversely affect wetlands and other waters.		**See Mitigation Measures 4.5-7a and 4.57b, above.**
Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors.		**See Mitigation Measures 4.5-1a, 4.5-3b, 4.5-4, and 4.5-6, above.**
Impact 4.5-10: Project construction would require tree removal.		**Mitigation Measure 4.5-10: Mitigation for Removal of Heritage or Protected Trees.** During construction, as much understory brush and as many native trees as possible shall be retained, to maintain shade-producing and bank-stabilizing vegetation for the creeks. All trees to remain during construction within the grading area shall be protected and trimmed if necessary to ensure their trunks and/or limbs are not disturbed during construction. To mitigate for tree removal: For each tree to be removed, the Flood Control District shall plant a replacement tree of the same species or a suitable native species substitute, at a rate of one planting per tree removed or such other mitigation ratio requirements included in the LSAA to be obtained from CDFW (for riparian trees) or any applicable County and/or town recommendations (for heritage trees), and ensure that replacement trees are planted within or in the vicinity of the Project sites to the maximum extent practicable, as follows: 1. Trees shall be replaced within the first year after the completion of construction or as soon as possible after construction is completed. 2. Selection of replacement sites and installation of replacement plantings shall be supervised by an arborist or biologist with experience in restoration. Irrigation of tree plantings during the initial establishment period shall be provided as deemed necessary by an arborist or biologist, consistent with the site **Habitat Restoration and Monitoring Plan** (**Mitigation Measure 4.5-7b**).
Cultural Resources		
Impact 4.6-1: The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance.	NI	No mitigation required.
Impact 4.6-2: The Project would not cause a substantial adverse change in the significance of an archaeological resource.	LS	No mitigation required.
Impact 4.6-3: The Project would not disturb human remains, including those interred outside of dedicated cemeteries.	LS	No mitigation required.
Impact 4.6-4: The Project would not cause a substantial adverse change in the significance of a tribal cultural resource.	LS	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Geology, Soils, and Seismic Hazard		
Impact 4.7-1: The Project would not expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides.	LTS	No mitigation required.
Impact 4.7-2: The Project would not result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill.	LTS	No mitigation required.
Impact 4.7-3: The Project would not cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability.	LTS	No mitigation required.
Impact 4.7-4: The Project would not cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures.	LTS	No mitigation required.
Impact 4.7-5: The Project would not cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features.	LTS	No mitigation required.
Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	NI	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Hazards and Hazardous Materials		
Impact 4.8-1: The Project would not create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard.	LTS	No mitigation required.
Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.	LSM	**Mitigation Measure 4.8-2a: Check 700/750 Sir Francis Drake Boulevard investigation status.** Prior to beginning construction activities, the contractor shall check the status of the 700/750 Sir Francis Drake Boulevard investigation available at the SWRCB GeoTracker website at: http://geotracker.waterboards.ca.gov/. Relevant information from the GeoTracker shall be used to inform the Health and Safety Plan and Soil Management Plan, described in subsequent mitigation measures. **Mitigation Measure 4.8-2b: Health and Safety Plan.** The construction contractor(s) shall prepare and implement a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120 to protect construction workers and the public during all excavation and grading activities. The Health and Safety Plan shall include, but is not limited to, the following elements: 1. Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site health and safety plan; 2. A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals based on the most recent reporting of the investigation at 700/750 Sir Francis Drake Boulevard site overseen by the Regional Water Quality Control Board; 3. Specified personal protective equipment and decontamination procedures, if needed; 4. Emergency procedures, including route to the nearest hospital; and 5. Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of unknown discovered or suspected hazardous materials release and notifying the Marin County CUPA (415-473-7085). Mitigation Measure 4.8-2b applies to both the Nursery Basin and the Downtown San Anselmo sites. **Mitigation Measure 4.8-2c: Soil Management Plan.** For the Downtown San Anselmo site, the Flood Control District or its contractor shall develop and implement a Soil Management Plan that includes a materials disposal plan specifying how the construction contractor shall remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan shall identify protocols for training workers to recognize potential soil contamination (such as soil staining, noxious odors, debris or buried storage containers), soil testing and disposal by a qualified

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Hazards and Hazardous Materials (cont.)		
Impact 4.8-2 (cont.)		contractor in the event that contamination is identified, and identification of approved disposal sites (e.g., Redwood Landfill in Novato). Contract specifications shall mandate approval of the Soil Management Plan by the Flood Control District as well as full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of hazardous materials.
Impact 4.8-3: The Project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LTS	No mitigation required.
Impact 4.8-C: Cumulative Impacts	NI	No mitigation required.
Hydrology and Water Quality		
Impact 4.9-1: Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality.	LSM	**Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work.** If dewatering discharge produced during construction of the project elements is not discharged to the sewer system, the construction specifications shall require that the construction contractor(s) implement standard BMPs developed and approved by Marin County for the treatment of sediment-laden water produced during cofferdam dewatering activities. BMPs could include discharging water through filtration media, such as filter bags or a similar filtration device, or allowing the cofferdam dewatering discharge to infiltrate into the soil. If infiltration is used, application of the dewatering discharge shall be conducted at a rate and location that does not allow runoff into San Anselmo or Fairfax Creeks or drainage conveyances, such as storm drains, and does not cause flooding or runoff to adjacent properties. The dewatering discharge shall also be conducted at a rate that does not allow ponding, unless the ponding is a result of implementing BMPs to reduce the velocity of the flow and occurs within constructed containment, such as an excavation or berm with no outlet. The discharge must also be applied at a sufficient distance from building foundations or other areas that could be damaged from ground settling or swelling. Alternatively, if the filtered dewatering effluent is sufficiently clean to comply with applicable federal and state regulation, that water could be reused for construction dust suppression, which would reduce the need for water use for that purpose. Any BMPs developed and implemented shall remove sediment in a manner sufficient to meet the Water Quality Objective for turbidity as specified in the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). Specifically, receiving waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity related to dewatering discharges shall not be greater than 10 percent in areas where natural turbidity is greater than 50 Nephelometric Turbidity Units (NTU), which is the standard unit for measuring turbidity via visibility in water (SWRCB, 2017). At higher turbidity levels, water can become warmer due to the increased light absorption of suspended solids, pathogens can be harbored more easily, and algal blooms can occur. In-stream sediment removal shall follow approved and permitted dewatering practices for wet weather sediment removal during more infrequent flood events in Fairfax Creek. This work shall be timed to take place as flows are receding and only after instream measures to reduce downstream turbidity are in place.
Impact 4.9-2. The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.	LTS	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Hydrology and Water Quality (cont.)		
Impact 4.9-3: The Project could alter existing drainage patterns, potentially causing new erosion or siltation.	LSM	**Mitigation Measure 4.9-3a. Prioritize Nursery Basin Reach for Stream Maintenance.** The SMP imposes limits on the total volume of material allowed to be removed from all of the streams covered by that permit. In order to retain the design capacity of the Nursery Basin and the associated storage within the Fairfax Creek channel behind the diversion structure, the Flood Control District shall prioritize sediment removal at this site over other sites covered by the SMP and shall remove all deposited sediment up to the maximum volume allowed under the existing permit (2,100 cubic yards). If deposited sediment still remains after removing the maximum volume, then this site shall be prioritized in subsequent years to remove the remaining sediment and any newly accumulated material, again up to the maximum allowed. **Mitigation Measure 4.9-3b. Scour Analysis and Protection Measures.** Due to the dependence of erosion and sedimentation patterns on the bed-scale morphology of the new structures, measures to counter scour and sedimentation issues must be based on more advanced project design. To reduce project impacts on erosion and sedimentation, the Flood Control District shall conduct a scour analysis and then develop and implement appropriate scour countermeasures from the analysis into project design and operations. The analysis shall be based on at least 30 percent design and must evaluate the potential for scour and channel bank erosion including specifying the expected depth and lateral extent both upstream and downstream of the project site. The analysis shall recommend foundation designs and scour protection measures that protect structures to depths below potential scour, estimated using standard engineering methods. The Flood Control District shall implement the foundation designs and scour protection measures in final project design. Foundation design and scour protection measures commonly used to protect existing in-channel structures and banks and that could be implemented in this project include but are not limited to: 1. Adding new rock revetment or extending the depth of existing rock revetments 2. Extending the foundations of vertical retaining walls using sheet pile or concrete.
Impact 4.9-4: The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite.	SU	**Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas.** For areas upstream and downstream of the Winship Bridge (between Barber Avenue and the Sir Francis Drake Bridge): If the Winship Bridge Replacement Project is not completed prior to construction of the Project, the Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. The flood barriers shall be designed based on hydraulic modeling demonstrating that the flood barriers would protect existing habitable structures on any properties upstream of the Sir Francis Drake Bridge from new inundation during the 25-year event. For areas immediately upstream of the Nursery Basin site: The Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. For both of those locations: The flood barriers would ensure that existing habitable structures would not be inundated by the 25-year event. Upon confirmation of permission by the property owners, the Flood Control District shall implement this measure, including implementing any measures identified in permits required from the California Department of Fish and Wildlife, Regional Water Quality Control Board, or other regulatory agencies. However, the potentially adversely affected parcels are privately owned, and the Flood Control District cannot necessarily require the installation of flood barriers because the property owner(s) may specifically request that such measures not be implemented. In that case, this Mitigation Measure shall not be implemented and the affected parcels may experience an increased level of flood inundation in a 25-year event or larger.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Hydrology and Water Quality (cont.)		
Impact 4.9-5: The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows.	LTS	No mitigation required.
Impact 4.9-6: The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition.	LTS	No mitigation required.
Impact 4.9-7: The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow.	LTS	No mitigation required.
Land Use and Planning		
Impact 4.10-1: The Project would not physically divide an established community.	NI	No mitigation required.
Impact 4.10-2: The Project would not conflict with local land use plans.	LTS	No mitigation required.
Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or present or planned use of an area.	LTS	No mitigation required.
Noise		
Impact 4.11-1: Project construction would not result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity.	LTS	No mitigation required.
Impact 4.11-2: Project construction would not generate noise that would expose people to noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction.	LTS	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Noise (cont.)		
Impact 4.11-3: Project construction would not expose people to or generate excessive groundborne vibration during construction.	LTS	No mitigation required.
Impact 4.11-4: The Project would not cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations.	LTS	No mitigation required.
4.10.4.5 Cumulative Impacts	LSM	
Population and Housing		
Impact 4.12-1. The Project would not induce substantial population growth.	NI	No mitigation required.
Impact 4.12-2. The Project would not displace substantial numbers of existing housing units or people.	NI	No mitigation required.
Impact 4.12-3. The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan.	NI	No mitigation required.
Public Services and Utilities		
Impact 4.13-1. The Project would not result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools or other public facilities.	LTS	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Public Services and Utilities (cont.)		
Impact 4.13-2. The Project's demand for solid waste disposal would not exceed the permitted capacity of a suitable landfill.	LTS	No mitigation required.
Impact 4.13-3. The Project would comply with federal, state, and local statutes and regulations related to solid waste.	LTS	No mitigation required.
Impact 4.13-4. The Project would not require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects.	LTS	No mitigation required.
Parks and Recreation		
Impact 4.14-1: Construction and operation of the Project would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LTS	No mitigation required.
Impact 4.14-2: Construction and operation of the Project could include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment.	LSM	**Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures** (refer to Impact 4.3-1 above) **Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work** (refer to Impact 4.9-1 above)
Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards.	NI	No mitigation required.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Transportation and Circulation		
Impact 4.15-1: Construction activity associated with the Project could temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), and could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.	LSM	**Mitigation Measure 4.15-1: Traffic Management Plan.** Prior to initiation of construction, the Project contractor(s) shall use a qualified traffic engineer to prepare a TMP. The TMP shall be developed during the design phase on the basis of detailed design plans for the approved Project. The TMP shall be reviewed and approved by the Flood Control District and agencies with jurisdiction over roadways affected by Project construction activities, prior to construction. Once approved, the TMP shall be incorporated into the contract documents specifications. The TMP shall include, but not necessarily be limited to, the elements listed below: 1. Develop truck access routes to minimize impacts on local street circulation. The route selection for movement of heavy equipment and truck traffic shall be coordinated with the Marin County Department of Public Works, Marin County Sheriff's Department, and Police Departments for applicable towns, cities and unincorporated communities. Truck drivers shall be notified of, and required to use, the most direct route between the Project work sites and U.S. 101. 2. As needed to avoid unacceptably adverse impacts on traffic flow, schedule truck trips outside of peak morning and afternoon/evening traffic hours. 3. Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic on-site inspections. 4. Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the *California Manual on Uniform Traffic Control Devices; Part 6: Temporary Traffic Control*); flaggers would be used, when warranted, to control vehicle movements. 5. Implement a public information program to notify interested parties of the impending construction activities using means such as print media, radio, and/or web-based messages and information. 6. Comply with roadside safety protocols to reduce the risk of accidents. 7. Maintain access for emergency vehicles at all times. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways. 8. Store all equipment and materials in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction to traffic. 9. Identify locations for parking by construction workers (within the construction work site or at the designated construction staging areas, or, if needed, at a nearby location with transport provided between the parking location and the worksite). 10. Prior to Project construction, document road conditions for all routes that shall be used by Project-related vehicles. Roads damaged by construction shall be repaired to a structural condition equal to that which existed prior to construction activity. 11. Maintaining pedestrian and bicycle access and circulation during Project construction where safe to do so. If construction activities encroach on bicycle routes or multi-use paths, advance warning signs (e.g., "Bicyclists Allowed Use of Full Lane" and/or "Share the Road") shall be posted that indicate the presence of such users. During construction, an environmental compliance manager shall monitor and complete a construction monitor environmental inspection report checklist to ensure that the contractor implements the TMP measures included in the contract documents. Any noncompliance shall be documented and reported to the Flood Control District to ensure corrective action. A final compliance report shall be prepared post-construction.

TABLE 2-1 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

IMPACT	Significance Determination	Mitigation Measure
Transportation and Circulation (cont.)		
Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles.	LSM	**Mitigation Measure 4.15-1: Traffic Management Plan.** (refer to Impact 4.15-1 above)
Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety.	LSM	**Mitigation Measure 4.15-1: Traffic Management Plan.** (refer to Impact 4.15-1 above)
Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear).	LSM	**Mitigation Measure 4.15-1: Traffic Management Plan.** (refer to Impact 4.15-1 above)

NOTES:
LSM = Less than Significant with Mitigation
LTS = Less than Significant
NI = No Impact
SU = Significant and Unavoidable

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CHAPTER 3

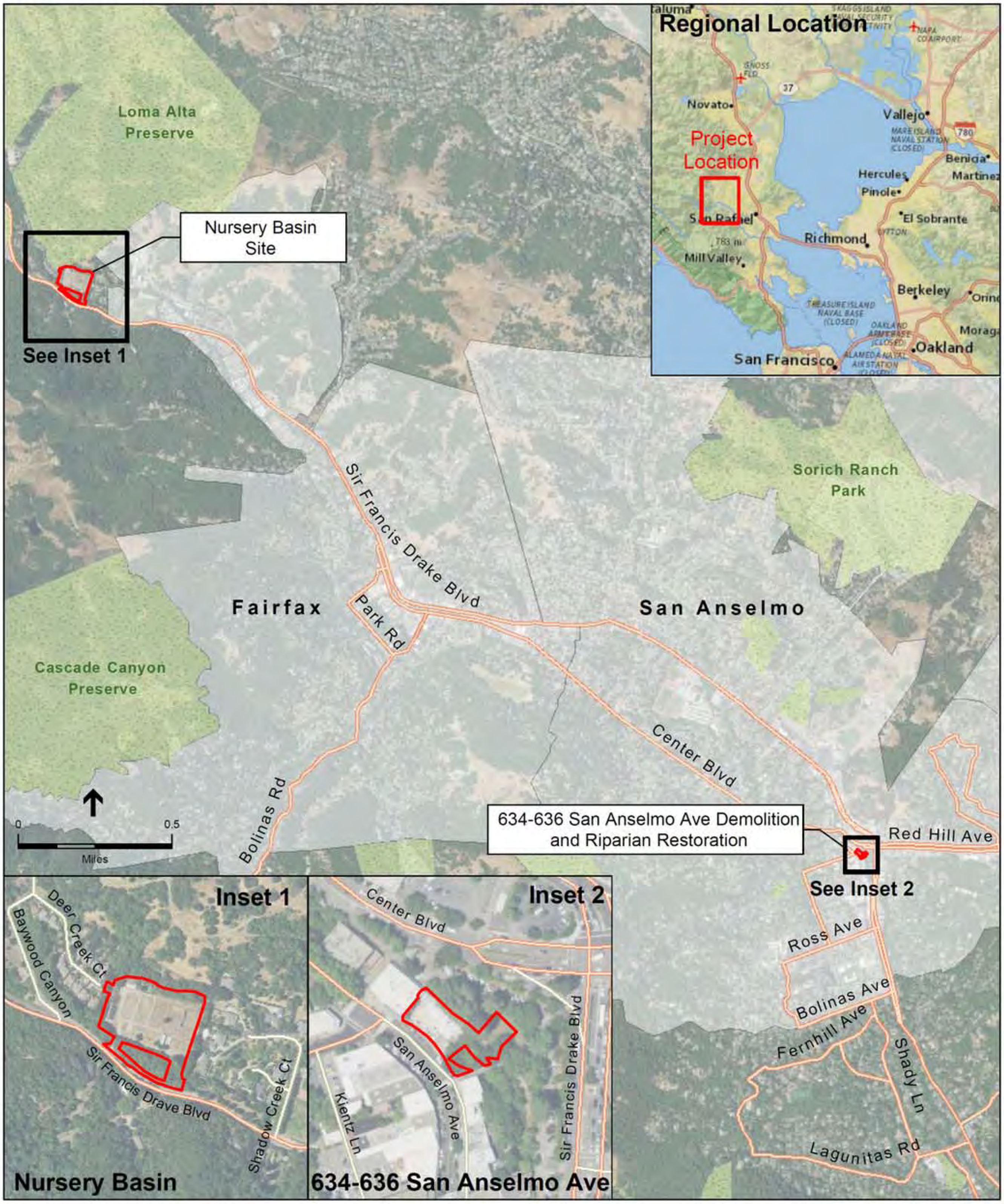
Project Description

The primary goal of the San Anselmo Flood Risk Reduction Project (Project) is to substantially reduce the frequency and severity of flooding within portions of the San Anselmo Creek and Fairfax Creek subwatersheds in Ross Valley. The Marin County Flood Control and Water Conservation District (Flood Control District) would meet this goal by implementing a project that would increase creek capacity by enlarging the San Anselmo Creek channel by removing existing obstructions to flow and reducing peak discharge by attenuating flows through use of a flood diversion and storage (FDS) basin. By implementing this Project, as described in more detail later in this section, the existing flood risk in portions of Ross Valley – including downtown San Anselmo and Fairfax – would be substantially reduced, eliminating flooding in many places and reducing the depth of inundation is many others.

3.1 Project Location

The Project would occur in two locations. The first is at the former site of the Sunnyside Nursery in unincorporated Marin County, adjacent to the western border of the Town of Fairfax in the upper portion of the Fairfax Creek subwatershed. The address is 3000 Sir Francis Drake Boulevard. The second location is at 634-636 San Anselmo Avenue in downtown San Anselmo along San Anselmo Creek in the subwatershed of the same name. Both Fairfax Creek and San Anselmo Creek are part of the larger the Corte Madera Creek Watershed, which is also referred to as the Ross Valley Watershed, or Ross Valley, in central eastern Marin County, California (**Figure 3-1**). Ross Valley is approximately 12 miles north of San Francisco, with Mount Tamalpais to the west, the City of San Rafael to the east and San Pablo Bay and San Francisco Bay to the south. **Figure 3-2** shows the streams, watersheds, and communities in the Project area and its surroundings.

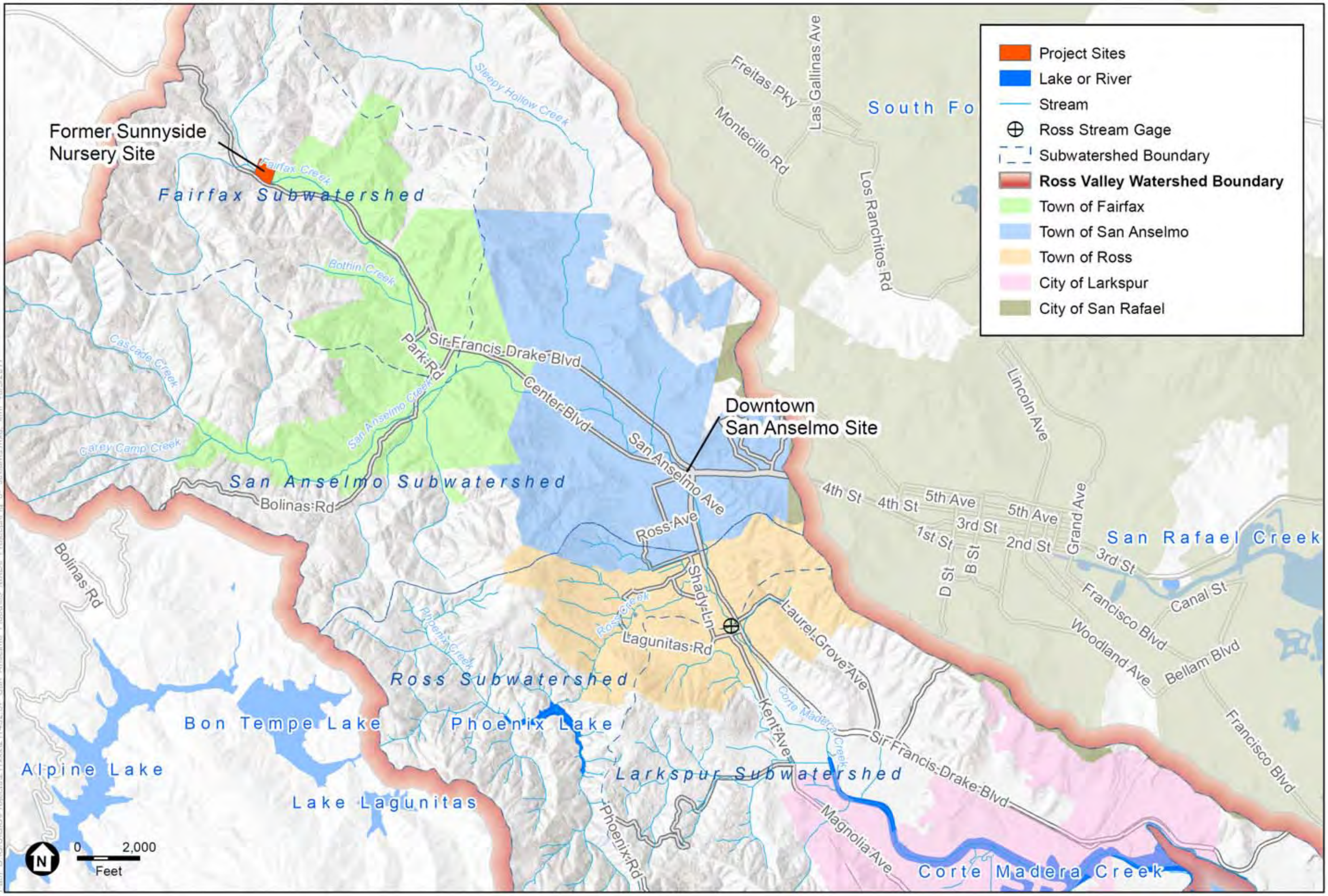
The Ross Valley Watershed contains 42 linear miles of stream channels, and covers approximately 28 square miles. It is characterized by ridges and small stream valleys. Within the watershed are 29 named tributaries and four subwatersheds. This Project involves the Fairfax subwatershed, which is drained by Bothin and Fairfax Creeks and contains the Town of Fairfax, and the San Anselmo subwatershed, which is drained by Deer Park, San Anselmo and Sleepy Hollow Creeks, and includes the Town of San Anselmo and the unincorporated areas of Sleepy Hollow and Oak Manor. Downstream of the Project area, the Ross subwatershed includes the Town of Ross and is drained by Phoenix, Bill Williams and Ross Creeks. The Larkspur subwatershed includes the City of Larkspur, the incorporated areas of Greenbrae and Kentfield, and the Town of Corte Madera, and is drained by Corte Madera Creek and Larkspur Creek.



SOURCE: CH2M

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-1
Project Location



SOURCE: National Hydrography Dataset, Marin County

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-2
Streams, Watersheds, and Communities in the Project Vicinity

ESA

3.1.1 Ross Valley Flood Protection and Watershed Program Summary

The Flood Control District boundary is conterminous with the County of Marin's boundary. The Flood Control District's mission is to reduce the risk of flooding for the protection of life and property by implementing effective, transparent, and responsive planning, design, construction, operation, and maintenance of District-owned facilities such as stormwater pump stations, detention basins, bypass drains, creeks, ditches, and levees. The Flood Control District provides these services to address specific flooding problems in eight zones[1] in Marin County.

The San Anselmo Flood Risk Reduction Project is a flood risk reduction project that is part of a larger, Flood Control District program to reduce flood risks in the Ross Valley. That program is the Ross Valley Flood Protection and Watershed Program ("Ross Valley Program"), which is being planned and analyzed concurrently with the San Anselmo Flood Risk Reduction Project, but at a regional and programmatic level of detail.

Figure 3-3 illustrates the Ross Valley Program's elements, which include a combination of several types of elements that, when implemented, would provide flood risk reduction on a watershed-wide scale. These element types include (1) FDS basins, located in the upper reaches of the watershed to detain peak flows outside of the creek network during flood events; (2) bridge replacements in Fairfax, San Anselmo, and Ross to remove impediments to flows in the creek and reduce localized flooding; (3) creek improvements in the lower end of the watershed to increase capacity and stability in the lower reaches to handle flood flows as they move through the watershed; (4) low-impact development policies, and (5) flood preparedness and educational programs.

To focus implementation efforts, the Flood Control District proposes to develop the Ross Valley Program elements in two phases, as shown on **Figure 3-4**. Each phase would incorporate various Ross Valley Program elements to provide a designated level of flood protection, which are 10- to 25-year flood event protection (Phase 1) and 25- to 100-year flood event protection (Phase 2).

Specific details regarding the exact size, design, location, sequencing, and phasing of Ross Valley Program elements have not been determined yet. Because of this, the Flood Control District is preparing a Program Environmental Impact Report (PEIR) that will analyze the significant environmental effects of implementing Program elements to reduce flooding risk in Ross Valley. The PEIR will evaluate the environmental impacts associated with implementing the Ross Valley Program elements during two implementation phases, analyze alternative strategies to reduce flood risk in the region, and provide program-level mitigation measures to avoid or reduce the significant environmental effects of the Program elements and alternatives. The Flood Control District, its Board of Supervisors, Responsible and Trustee agencies, and the public will use that PEIR and the associated public comment processes to inform decision making and help determine which Ross Valley Program elements should be implemented.

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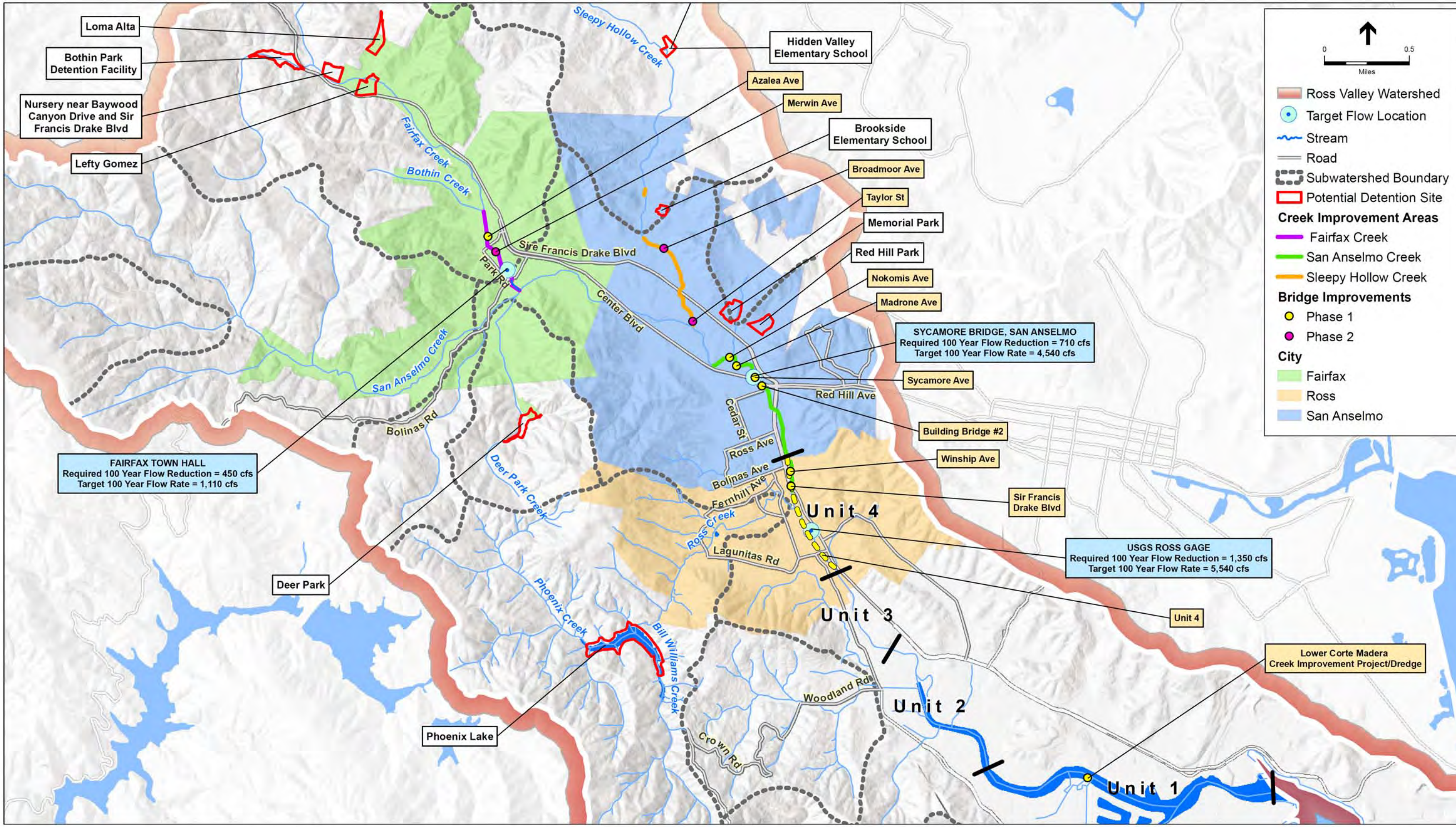
[1] These zones are Zone 1: Novato Area; Zone 3: Mill Valley/Coyote Creek Area; Zone 4: Bel Aire Area (Tiburon); Zone 5: Stinson Beach; Zone 6: San Rafael Meadows; Zone 7: Santa Venetia; Zone 9: Ross Valley; and Zone 10: Inverness. The Ross Valley is sometimes referred to as "Zone 9".



SOURCE: CH2M, 2015

San Anselmo Flood Risk Reduction Project .D211432.07

Figure 3-3
Ross Valley Flood Risk Reduction Program Elements

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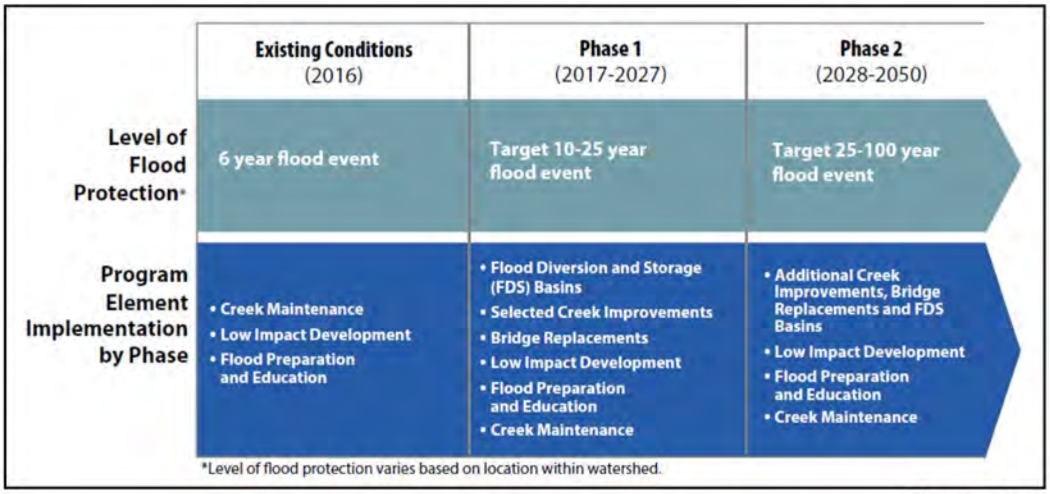


Figure 3-4
Ross Valley Program Implementation Phases

In general, the Flood Control District will not select which Ross Valley Program elements to implement as individual projects within the Program until the Program EIR has received public input and is certified as complying with CEQA by the Flood Control District Board. However, several projects identified as part of the Program are undergoing additional project-level review under CEQA because they have separate funding sources, timelines, or implementing agencies. The San Anselmo Flood Risk Reduction Project is one of these projects and has independent utility because – as is discussed later in this chapter and in much more detail in Section 4.9, Hydrology and Water Quality -- it substantially reduces the existing levels of flood risk in the affected communities. It also supports and is the first step toward reaching the larger goals of the Ross Valley Program, although its benefits would be realized in the Towns of San Anselmo and Fairfax even if the larger Ross Valley Program were not to be implemented. Other Program elements currently undergoing project-level review include the U.S. Army Corps of Engineers' Corte Madera Creek Channel Project – Units 3 and 4, and five bridge replacement projects located on San Anselmo Creek or other tributaries within the limits of the Towns of Fairfax, San Anselmo, and Ross.

For these reasons, and as discussed in Chapter 1, this Project EIR is being prepared separate from and concurrent with the Program EIR. This Project EIR is not being tiered from that Program EIR because the Project is scheduled for earlier implementation.[2] The two EIRs will be coordinated, however, and the Project analyzed in this EIR will be part of the cumulative analysis in the Program EIR. The two EIRs will also use as much of the same hydraulic and hydrologic modeling, information sources, and environmental studies and analyses as are pertinent to both the Ross Valley Program and the Project. As a result, the two EIRs will be consistent and the significant environmental effects of the Project will be included in the analysis of the Program as a whole. In that way, the San Anselmo Flood Risk Reduction Project will support the overall goals of the Ross Valley Program and will begin moving toward the Program's intended flood risk reductions.

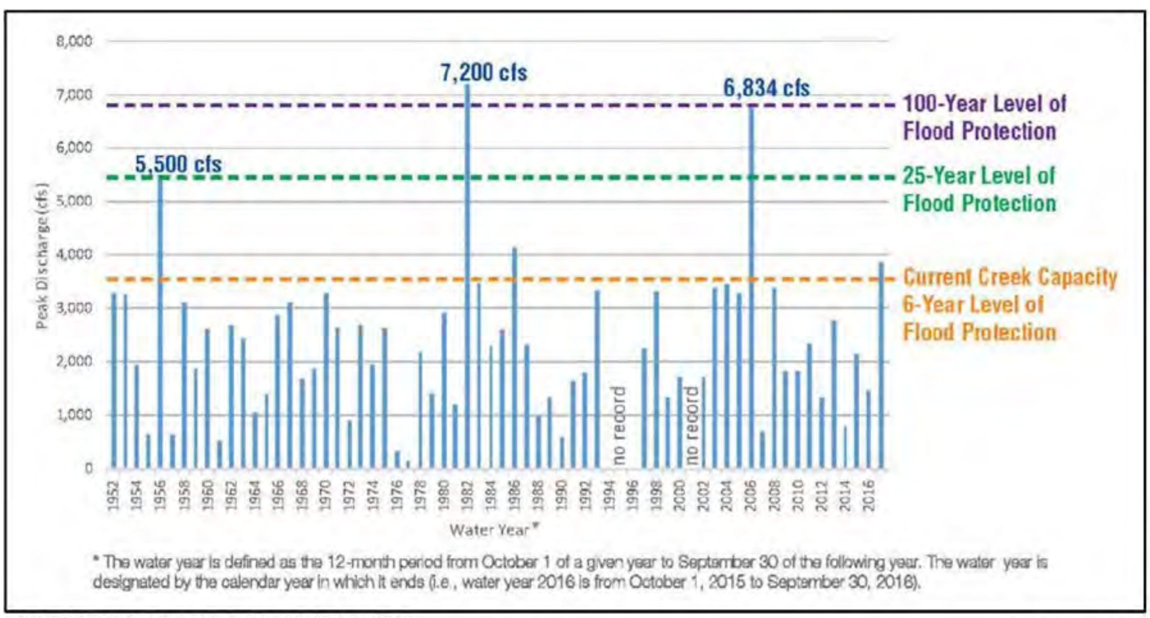
2 "Tiering" under CEQA "refers to the analysis of general matters contained in a broader EIR with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR: and concentrating the later EIR or negative declaration solely on the issues specific to the later project" (CEQA *Guidelines* Section 15152). CEQA encourages agencies to tier environmental analyses as a means to eliminate repetitive discussions of the same issues and focus the later EIR on the actual issues ripe for discussion.

3.2 Project History and Purpose

3.2.1 Flooding History in Ross Valley and the San Anselmo and Fairfax Subwatersheds

During prolonged and heavy storms, soils in the Project area can become saturated, and if rainfall is sufficiently intense, heavy runoff can result in high flows exceeding the capacity of the creeks in places where conveyance is constrained. Flooding occurs when the threshold conveyance capacity of the creek is exceeded and breaching of the creek banks occurs.

Several times in recent history, Ross Valley has been flooded by overflow from Corte Madera Creek and its upstream tributaries, including San Anselmo Creek, Sleepy Hollow Creek, and Fairfax Creek. Prior to establishment in 1951 of the United States Geological Survey (USGS) Streamflow Gage in Ross, flooding was reported as far back as the 1860's and in calendar years 1914, 1925, 1937, 1940, and 1942. Since 1951, flood events have been recorded in calendar years 1951, 1952, 1958, 1967, 1969, 1970, 1982, 1983, 1986, 1993, 2005 and 2017. Of these, the two most severe floods occurred in 1982 and 2005, with peak discharges of approximately 7,200 cubic feet per second (cfs) and 6,800 cfs, respectively; and the percent-annual-chances (i.e., probabilities) of which were approximately 0.6% and 1% (translating to a 100- to 200-year flood event and a 100-year flood event), respectively (**Figure 3-5**). Historical flooding has caused extensive property damage and economic hardship to residents, businesses, and local governments. In the 2005 flood, losses to the public and private sector totaled $94,836,880 in 2006 dollars (Marin County, 2012). Flooding in Ross Valley has also threatened the lives of those living in the floodplain, with at least one recorded death occurring in the 1955 flood. The 1955 flood was an approximate 4% annual-chance flood or a 25-year flood event.



SOURCE: Marin County Flood Control District, 2017

Figure 3-5
Corte Madera Creek Historical Annual Peak Discharges

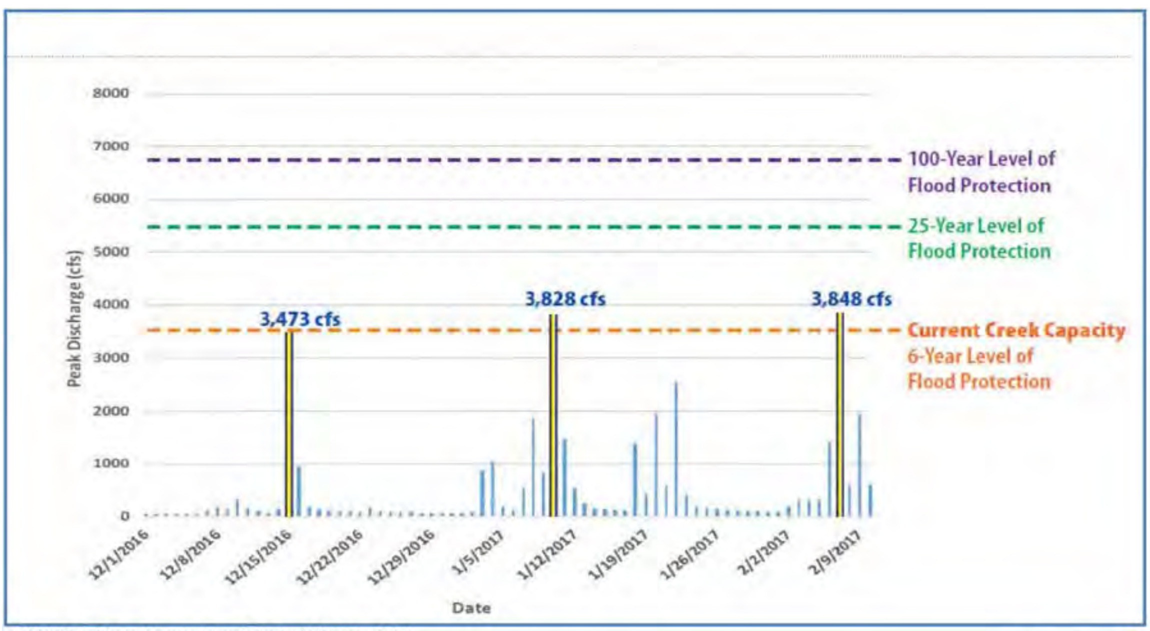
The San Anselmo Historical Society website includes an article on the history of flooding in the area, and begins with the explanation that:

> "San Anselmo Creek actually changed its course during a severe rainstorm long before the town was situated here. The original creek channel ran along Laurel Avenue winding in a southerly direction crossing San Rafael, Tamalpais, Magnolia, Tunstead (at mid-block), and Pine Street, but a debris or log jam in the late 1860s caused the creek to bend to the other side of today's Center Boulevard and carve its present course through our downtown. In 1875, the North Pacific Coast Railroad completed its line through San Anselmo west to Tomales. The railroad built a berm four to five feet above the valley floor on which the tracks west from San Anselmo were laid. The berm, upon which Center Boulevard runs today, narrowed the flood plain and caused the new creek channel to become more deeply incised."

In many of the events listed above, water overflowed the creek bank onto the streets, including San Anselmo Avenue. The resulting damage to property and goods was at times exacerbated by the construction of buildings immediately adjacent to or over the creek. During the 1940 storm, the service station at 634 San Anselmo Avenue was blamed for considerable flooding damage. As the *San Anselmo Herald* reported on February 29, 1940:

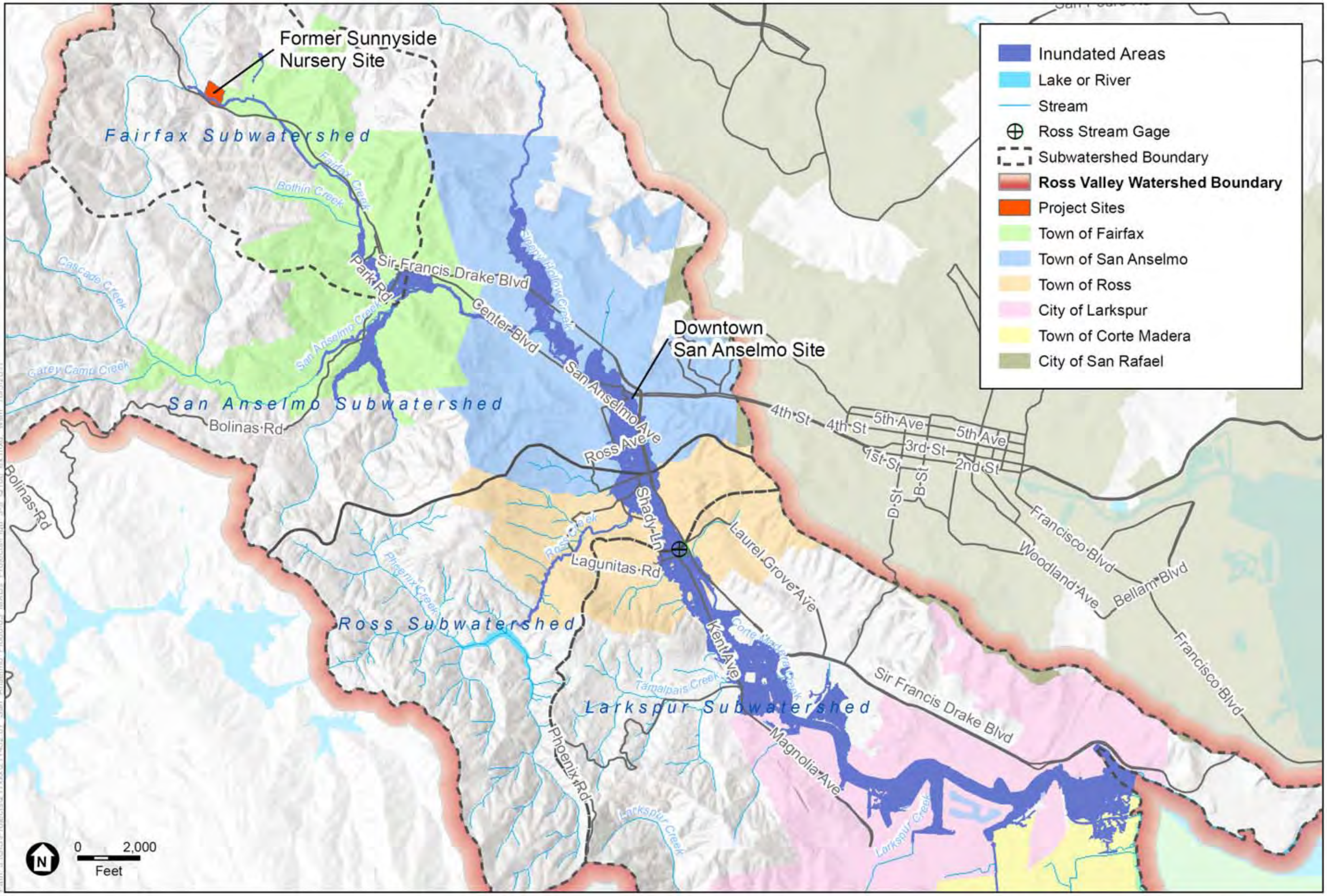
> "Many citizens claim that the oil station on San Anselmo Avenue at Tamalpais was allowed to sink its concrete foundations too low. The station entirely spans the creek."

As **Figure 3-6** illustrates, the large storms of the winter of 2016-2017 were of lesser magnitude (3,000-4,000 cfs) than the events highlighted in Figure 3-5, but flooding still occurred because the current creek capacity is at an approximately 6-year level of flood protection. **Figure 3-7** shows the estimated inundated areas and floodwater flow paths in Ross Valley that occur during a 100-year flood event.



SOURCE: Marin County Flood Control District, 2017

Figure 3-6
Peak Discharges at Ross Creek Gage during the 2016-2017 Winter



SOURCE: Stetson Engineers, 2017; National Hydrography Dataset; Marin County

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-7
Estimated Inundated Areas During the One Percent Annual Chance Exceedance (100-year) Flood Event

3.2.2 Formation of the Flood Control District

Due to this history of severe flooding throughout Marin County, the Flood Control District was created by the California State Legislature through the passage of the Marin County Flood Control and Water Conservation District Act of 1953 (Water Code, Chapter 68 of the Appendix to the Act). The Flood Control District's mission is to reduce the risk of flooding for the protection of life and property while utilizing sustainable practices.

3.2.3 Storm Drainage Fee Fund

In response to the severe flooding that occurred in 2005, voters approved an annual Storm Drainage Fee in 2007 to provide funding for flood protection in Ross Valley. The passage of this ordinance provides funding to meet the following goals (Flood Control District, 2007):

1. Reduce damage due to flooding
2. Offer solutions for homes and businesses
3. Aid homeowners in repairing stream banks
4. Remove bottlenecks that impede water flow
5. Maintain natural creek functions
6. Reduce pollutants entering the San Francisco Bay
7. Incorporate habitat enhancements
8. Improve fish passage

Since the fee's passage, the Flood Control District has utilized these funds to conduct several studies addressing flood reduction in Ross Valley including the *Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley* (CIP) (Stetson, 2011) and the *Ross Valley Flow Reduction Study Report* (CH2M, 2015). These studies utilized a hydrologic and hydraulic model of the Ross Valley Watershed, examined numerous approaches to flood risk management, and ultimately became the framework of the approach being used to develop the Ross Valley Flood Protection and Watershed Program described above. Further details about the utilization of drainage fee funds for the Program and other sources of Program funding are provided in the Flood Control District's annual report available on the Flood Control District website http://marinwatersheds.org/pubs_reports.html#zone_9.

3.2.4 California Department of Water Resources Grant Funding

In addition to the Storm Drainage Fee Fund, the San Anselmo Flood Risk Reduction Project has funding from a California Department of Water Resources (DWR) grant. The funds from that grant were first awarded in 2013 to the Town of San Anselmo based on an application submitted for the Memorial Park Detention Basin Project. Subsequently, following community concerns related to that project, the Town of San Anselmo coordinated with the Flood Control District to reallocate the DWR grant funds to a new project as long as a number of DWR conditions could be met. These requirements include being able to achieve a comparable level of flood risk reduction in a publicly acceptable project while enhancing environmental conditions and recreational opportunities. A new grant agreement has been authorized by the DWR for this Project.

3.3 Project Objectives

3.3.1 Project Objectives

CEQA requires EIRs to include a clearly written statement of objectives that succinctly describes the underlying purpose of the project being evaluated. The objectives serve to guide the development and evaluation of a reasonable range of alternatives to evaluate in the EIR and support the decision making process.

Based on the flood risk reduction needs of San Anselmo and surrounding communities, the goals of the original DWR grant for the project proposed at Memorial Park, and subsequent guidance about reallocating the grant funds to a different project, the Project objectives are as follows:

1. Reduce the risks related to both frequency and severity of flooding.
2. Provide multiple public benefits including environmental enhancements and recreational enhancements.
3. Provide a flood risk reduction project in balance with available and reasonably foreseeable funding.
4. Maintain the quality of adjoining neighborhoods.
5. Ensure basin design meets community needs.
6. Comply with local, state, and federal environmental laws and regulations.
7. Protect the public's health and safety.

In addition, the Flood Control District has committed to engaging the community in designs for flood risk reduction projects, including FDS basins, and providing opportunities for consistent public participation and input at key decision points.

3.4 Project Elements and Design

3.4.1 Project Element Types

The Project includes two elements, an FDS basin at the former Sunnyside Nursery site and creek capacity improvements made by removing a flow-constraining bridge building in downtown San Anselmo. The next two subsections describe those element types and their general purposes and functions, after which the specific elements in the Project are described which are consistent with the same types of elements as described in the Ross Valley Flood Protection and Watershed Program.

3.4.1.1 Flood Diversion and Storage (FDS) Basins

FDS basins provide a means to capture flows during a flood event to prevent flooding in creeks that cannot currently accommodate peak flood flows. In previous communications, FDS basins were referred to as detention basins. However, the terminology has been updated for consistency with Federal Emergency Management Agency (FEMA) uses. FDS basins are located upstream of developed urban areas in order to provide flood water attenuation and limit flooding in downstream creeks and critical reaches. Typically, these facilities are located below existing grade by excavating an area to the desired depth to capture peak storm runoff during large rainfall events from adjacent streams, creeks and tributaries to reduce the potential of flooding downstream.

Many FDS basins are multi-purpose basins that operate as parks or sports fields the majority of the time. However, when there is intense rainfall and the water surface rises in adjacent creeks and streams, some of the storm runoff may be temporarily diverted away from these surface waters and stored in the FDS basin for a limited period of time until the peak flows in the creek subside. This reduces the volume of water in the creeks and lowers the potential for downstream flooding. Filling the FDS basin is triggered by imminent flooding in the critical reaches of streams (i.e., the places where high flows overtop the stream banks and cause flooding), as indicated by streamflow gages. Once the storm has passed and the water surface in the creeks begins to lower, the stored water can be released back into the creek in a controlled manner ensuring no downstream flooding. Measures such as signage and stairs, ramps, or other exit routes are put in place to ensure public safety during the period when the FDS basin is filling and storing water. Once the flood waters have been released, maintenance measures are quickly undertaken to return a multi-purpose FDS basin to its general use. Some FDS basins are single-purpose for temporary water storage only; they operate similarly during flood events but are not actively used for another purpose.

3.4.1.2 Elements that Increase Creek Capacity

Elements that increase creek capacity allow a greater volume of water to flow in-channel, rather than overflowing and flooding adjacent areas. Maximizing the in-channel flood flow capacity is accomplished by widening and/or deepening certain sections of creeks in the watershed, creating and/or restoring functional floodplains, and modifying, removing, or replacing publicly-owned bridges, culverts, buildings, and bank protection structures that encroach into the creek. Structures, such as bridges, that encroach into the creek restrict flow in the creek and cause water to back up and overtop creek banks during large flood events. By enlarging the bridge openings and changing the bridge configurations, the creek channels would have increased flow capacity, which would reduce the risk of upstream flooding. In some situations, typically in the most vulnerable sections of the critical reaches, shallow, top-of-bank floodwalls or landscape levees or berms are needed to prevent overflow.

3.4.2 San Anselmo Flood Risk Reduction Project Elements

The following discussion provides a description of each Project element organized geographically by subwatershed. These elements would reduce flood risk in San Anselmo and Fairfax with limited changes to flood risk in downstream communities, as discussed further in Chapter 4. The locations of the Project elements are shown on **Figure 3-8**. The Project would consist of implementing the FDS basin at the former Nursery site and creek improvements at the Downtown San Anselmo site. The creek channel improvements in San Anselmo are intended to increase flow capacity within the creek channel, and the Nursery site basin is intended to reduce peak instream flows.

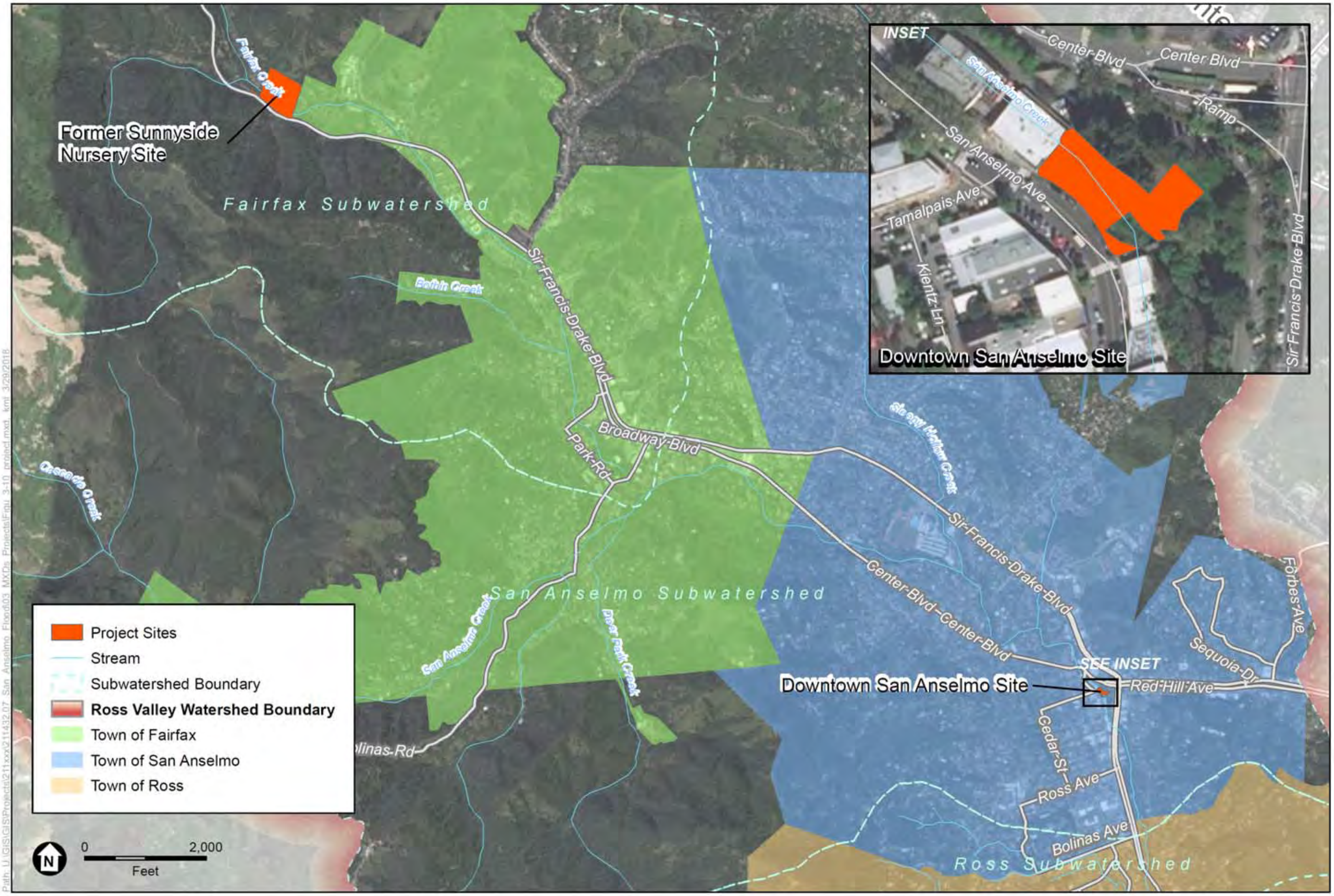
3.4.2.1 Nursery Basin (Fairfax Subwatershed)

The Fairfax subwatershed includes the area upstream of Fairfax Town Hall (Figure 3-2). Fairfax Creek runs through the subwatershed with Bothin Creek as a tributary. Previous studies (FEMA, 2016) have indicated that Fairfax itself is one of several critical reaches in Ross Valley where, during large floods, floodwaters overflow and escape from the creek. To contain 100-year flood flows within the Fairfax Creek channel, these studies indicated that flows should remain below 1,100 cfs. That rate, as measured at the Fairfax Town Hall, is considered a target flow rate for protection against the 100-year flood event. As a first step toward meeting this flow target, the Project would achieve a reduction in flow rate by constructing an FDS basin upstream of Fairfax, at the former Sunnyside Nursery site. Currently, portions of Fairfax are inundated at flood events with greater probability of occurrence than a 10-year event.

The former Sunnyside Nursery is a 7.7-acre site northwest of the Town of Fairfax, along Fairfax Creek near Loma Alta Open Space Preserve.[3] There is potential to configure the site to allow for both a FDS basin and environmental enhancements with native plantings. Because of the site's previous land use, this EIR uses the name "Nursery Basin" for this Project element.

As shown on **Figure 3-9**, the Nursery Basin would be approximately 500 feet long by 350 feet wide, and would generally be excavated up to six feet deep to an elevation of 224 feet NAVD88 (at the southeast corner). The basin's internal slopes are planned to vary between 2 horizontal to 1 vertical (horizontal:vertical; "h:v") and 3 to 1 h:v. An engineered levee approximately 8 feet high, underlain by a shallow seepage cutoff wall installed to an approximate elevation of 217 feet, would be built along the eastern side of the basin to retain stormwater below approximate elevation 238 feet (NAVD88) and to protect the neighboring residences to the east from seepage or other forms of ground failure. The installation of the cutoff wall would involve excavating a 3-foot wide trench from the current elevation of 224 feet down to elevation 217 feet and backfilling with a low permeability soil-bentonite mixture. The levee side slopes on the outboard side would be 3 to 1 h:v. A similar levee is not needed on the northern edge of the basin because of the existing higher ground elevations. A low (1- to 2-foot high) levee would border the basin on the western side. The southern border of the basin abuts Fairfax Creek and its riparian corridor. The west and east levees would transition to an aggregate-surfaced access road along the southern border and an approximate 100-foot wide side-weir that would be constructed of earth fill, heavy geotextile fabric, and rock slope protection. The interior basin slope would be covered by erosion control blankets and native grass.

[3] In September 2016, the Flood Control District purchased the 7.7-acre Sunnyside Nursery plot and held a series of community meetings to discuss the potential FDS basin construction, design and timing with local residents.



SOURCE: CH2M; National Hydrography Dataset; Marin County

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-8
Overview of Project Elements

Elevations at the eastern side of property currently range between 230 feet and 238 feet NAVD88, and the land naturally slopes from higher ground at the northwest corner down to the southeast corner. The proposed design would make use of this existing condition by maintaining the general drainage pattern and adding a culverted exit at the southeast corner that would drain into Fairfax Creek at approximate elevation 224 feet (NAVD88). The basin bottom would slope approximately 0.5%, from northwest to southeast. A channel would be constructed within the basin's interior to carry seasonal flows from the northwest corner to the southeast corner. There would be an outlet structure in the lower southeast corner of the basin to allow gravity drainage of the basin. This structure includes a riser pipe to minimize clogging by debris and a gate to manage outflow from the basin. The structure would be connected to a 36-inch by 200-foot long pipe that would drain into Fairfax Creek downstream of the basin. The outlet pipe would be constructed within the former Sunnyside Nursery site parcel and discharge to Fairfax Creek downstream of the basin.

A 15-foot wide vehicle access/maintenance road would be provided around the basin perimeter at the top of bank or top of levee. This access road would be connected to the north end of the existing bridge crossing Fairfax Creek. The existing bridge would remain in place, though its decking could be replaced or augmented to add load-bearing capacity. A 13-foot tall flow diversion and overflow structure (diversion structure) would be constructed across Fairfax Creek at the southeast corner of the basin, which would also serve as a secondary access ramp to the basin from Sir Francis Drake Boulevard. A designed low point near the center of the diversion structure would act as an overflow to direct peak flows greater than the basin's capacity into Fairfax Creek downstream of the project site. An opening or openings would be installed within the diversion structure (discussed in greater detail below). Six-foot high chain link security fencing and gates would be installed around the perimeter of the basin. Signage and electrical and control wiring structures necessary to operate the flow control gates would be installed. Earthen ditches along the outside of the northern and eastern sides of the basin would direct water draining from the adjacent Marin County Open Space District lands around the basin and into Fairfax Creek.

The basin's appearance would be enhanced using a naturalistic design concept. As the name implies, the naturalistic basin would have less steeply sloped side walls than a typical basin design. The bottom and sides would not be lined with concrete or left as bare earth but would instead be planted with native grasses and plants, and existing trees on the site perimeter would be retained. Trees within the creek would also remain, except as required to construct the new diversion structure and side-weir. A 50-foot setback would be provided from the top of bank to the property line on the western side of the Project area and also from the toe of levee to the property line on the east side of the Project area. The seasonal drainage channel and catch basin/inlet area is expected to develop into a seasonal wetland. The basin bottom and cut slopes would be planted/hydro-seeded to establish a native grassland. Oak-Bay Woodland plantings would be planted along the outer toe of the engineered levee on the east side of the basin and at other selected locations outside the engineered and compacted footprint of the levee to avoid any potential for root penetration through the structure.

A.	**Flow Diversion and Overflow Structure**. Concrete diversion structure with gated opening(s) required to immediately reduce flow passing downstream by partially closing the opening(s) and allowing water to begin filling the basin. The exact dimensions and configuration of the gated opening(s) would be developed during final design to support sediment transport.
B.	**Spillway**. The 235-foot elevation spillway passes the 1,000-year flood with maximum basin water surface elevation at 236.5 feet.
C.	Gated Opening. Gate closed to reduce Fairfax Creek flows when overbank flooding is imminent in downstream vulnerable areas.
D.	Ungated Opening. Always open for normal creek flows, sediment transport, and fish and wildlife movement.
E.	**East Levee**. 238-foot elevation levee is 1.5 feet higher than maximum basin water surface elevation.
F.	**Side-weir**. Fairfax Creek flows into basin over 228-foot elevation weir segment in perimeter road.
G.	**Basin Floor**. Slopes from 226.0 feet at northwest corner to 223.8 at southwest corner.
H.	**Basin Drain**. Open 223.8-foot inlet in southeast corner of basin draining to outlet at Fairfax Creek.
I.	**Operations and Maintenance Vehicle Access**. Existing or improved driveway bridge and diversion structure.
J.	**Perimeter Road**. 15-foot-wide and 1.5 feet above the maximum water surface elevation.
K.	**West Levee**. 238-foot fill levee top elevation contains temporary peak volume storage under detention operations.
L.	**West Gate**. Locked vehicle access gate through fence.
M.	**Deer Creek Court Stormwater Drains and Rip Rap Energy Dissipation Structure**. Ensures gravity drainage from Deer Creek Ct cul-de-sac under potential maximum basin water surface elevation.
N.	**Floodwall/Road Barrier.** Floodwall prevent overflow onto roadway.
O.	**Perimeter Fence.** Security fencing.
P.	**Setback – East.** 50 feet from toe of levee.
Q.	**Setback – West.** 50 feet from top of basin cut slope.
R.	**Rip-Rap Bank Protection.** Vegetated rip-rap and other biotechnical bank erosion protection and stabilization both banks Fairfax Creek for protecting habitat and facilities from hydraulic and sediment transport and deposition dynamics during operations.

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

Figure 3-9
Nursery Basin Site Plan

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An opening or openings designed to pass up to 400 cfs of water would be included in the diversion structure in Fairfax Creek; the likeliest design is an open-bottom design to support natural stream flows and sediment transport. The opening would be set into the current primary channel of Fairfax Creek in such a way that it would be the main channel during normal, low-flow conditions. The outflow from the basin would be through the 36-inch outlet pipe described above. Both the diversion structure opening and the outlet pipe would be gated so that they could be operated by staff from the Flood Control District. More detailed basin operation is described below in Section 3.5.

During high rainfall events, the partial closure of the opening and the diversion structure would sufficiently impede the downstream flows in Fairfax Creek to cause ponding in the Fairfax Creek channel between the floodwall along Sir Francis Drake Boulevard and a lower armored side-weir that would allow water to spill into the basin, filling it.

The Nursery Basin would have a storage capacity of approximately 26 acre-feet of stormwater. Note that this capacity does not include the additional water volume that could be detained in the Fairfax Creek channel, immediately upstream of the diversion structure. An approximately 400-foot long concrete floodwall (no more than 3 feet tall) would be installed along the southern bank of Fairfax Creek channel to prevent flows spilling onto Sir Francis Drake Boulevard. The floodwall would extend along Fairfax Creek between the existing access roads and the one on top of the diversion structure. The Fairfax Creek channel would provide an additional 5.6 acre-feet of stormwater capacity within the creek area, making the total detention capacity 31.6 acre-feet. The top of the floodwall would be at elevation 238 feet NAVD88. Scour protection (such as rock slope protection or similar materials) would be added along the southern bank of the channel between the diversion structure and the existing bridge and upstream of the existing bridge. Scour protection would also be installed within the Fairfax Creek channel from the downstream side of the diversion structure to approximately 10 feet downstream of the outlet pipe. Approximately 300 to 400 feet of new guard rail would also be installed, along the north edge of Sir Francis Drake Boulevard, upstream and downstream of the new floodwall.

3.4.2.2 Downtown San Anselmo Site (San Anselmo Subwatershed)

The San Anselmo subwatershed includes the area upstream of Bolinas Avenue in San Anselmo and downstream of the Fairfax subwatershed as shown on Figure 3-8 San Anselmo Creek runs through the subwatershed with tributaries that include Deer Park, Sleepy Hollow and Sorich Creeks. In downtown San Anselmo, constrictions in the channel of San Anselmo Creek reduce creek capacity and cause local flooding. The Downtown San Anselmo portion of the Project would address that condition. The creek capacity improvements in the Project would include removal of a commercial building over San Anselmo Creek and creek improvements along the channel in the vicinity of that building and the adjacent Creek Park. As part of the proposed building acquisition a relocation plan is being drafted in concert with this EIR to address the tenants that occupy the building. These improvements are described in more detail below.

To reduce flooding of downtown San Anselmo and areas further downstream, the Project would remove a private commercial building at 634-636 San Anselmo Avenue (formerly known as

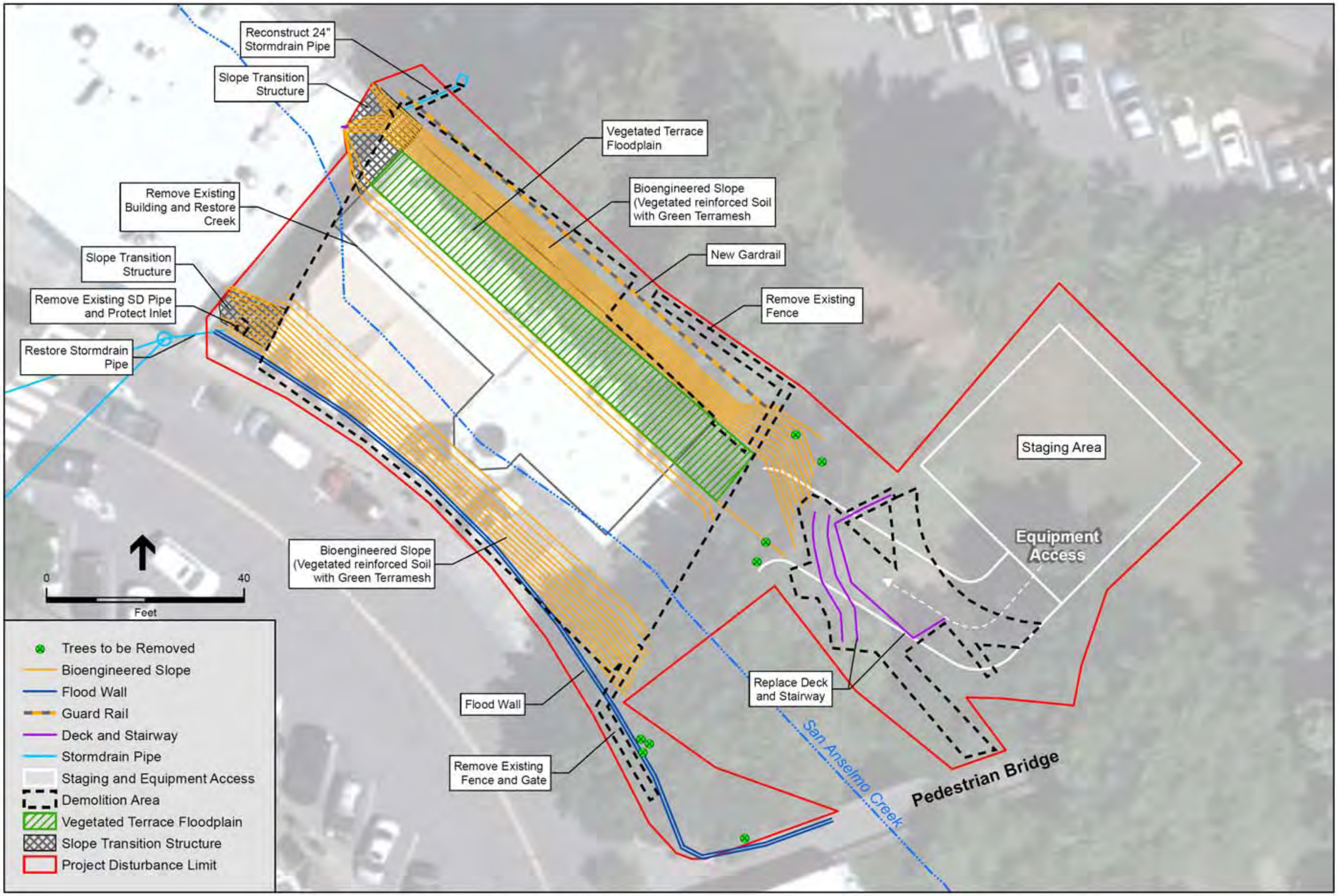
Bridge Building #2 and shown on **Figure 3-10**). This building has concrete footings and other foundation structures in the stream channel as well as a relatively low soffit that extends below the top of the creek bank (the underside of the "bridge" over the creek). This structure is approximately 60 feet long by 90 feet wide. Foundation structures include a smaller box culvert-shaped segment on the north side of the crossing.

SOURCE: ESA

San Anselmo Flood Risk Reduction Project / 211432.07

Figure 3-10
634-636 San Anselmo Avenue

Together, these aspects of that building form a substantial impairment to flows in San Anselmo Creek, and removing them would allow more flood water to remain in the creek channel. As shown on **Figure 3-11**, all structures associated with 634-636 San Anselmo Avenue would be removed. The channel would be sloped back and bioengineered using bio-stabilization slope protection methods to restore the creek banks, as shown in **Figure 3-12**. Along the southern side of the stream, at the top of the stream bank, a new floodwall would be constructed to provide flow containment. The existing concrete sidewalk along the southern side of the stream would be removed and reconstructed.

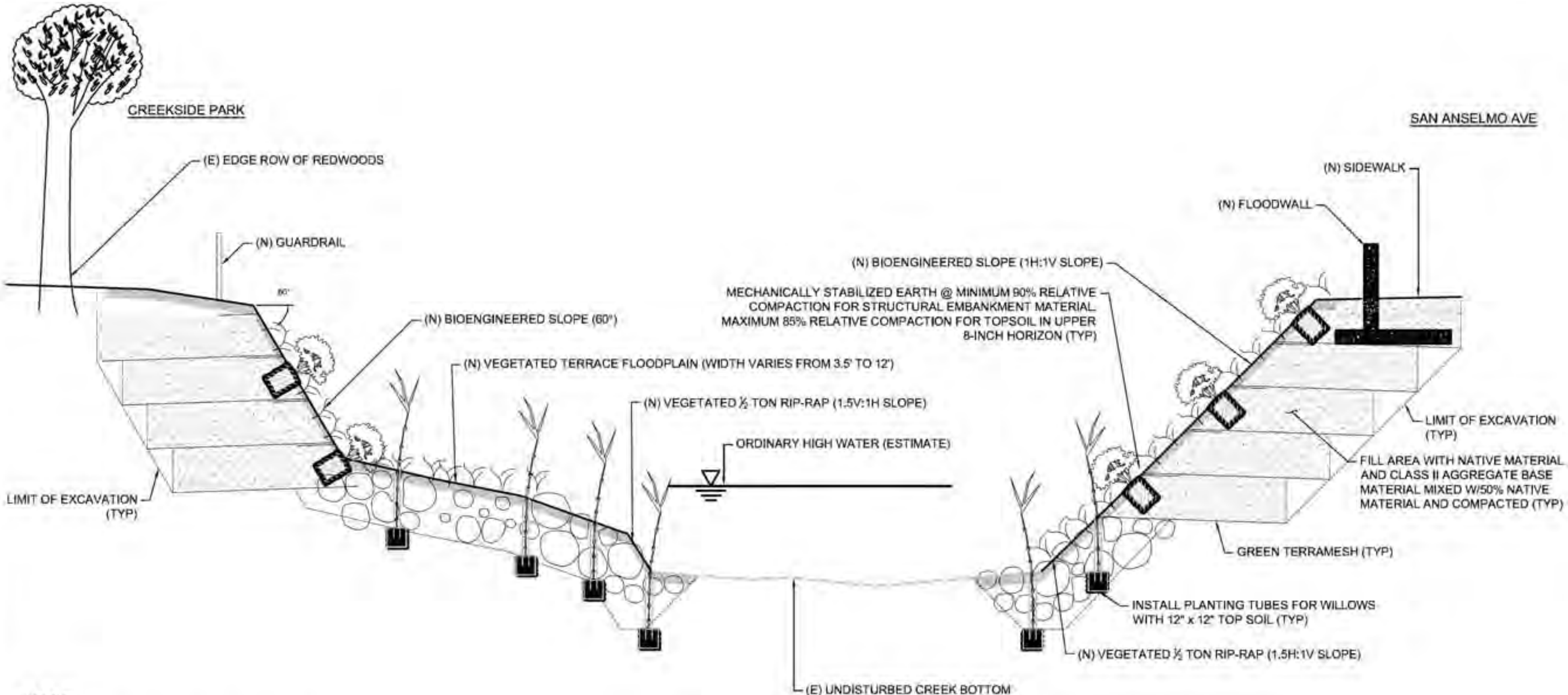


SOURCE: Marin County, 2018

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-11

634-636 San Anselmo Avenue (Downtown San Anselmo Site) Plan



NOTE:
(N) New structures or features
(E) Existing structures or features
(TYP) Typical example of structure or feature
V:H Vertical to horizontal

Not to scale

SOURCE: CH2M Hill, 2018

Figure 3-12
Typical Creek Restoration Cross Section

The stream banks on the northeastern and eastern sides of the creek would be sloped back, regraded or terraced and bioengineered using bio-stabilization slope protection methods to restore the creek banks. The bioengineered slopes would be vegetated reinforced soil slopes planted with riparian woodland shrubs to allow opportunities for future restoration efforts with the Town of San Anselmo's Creek Park, at the Town's discretion.

The wooden observation structure on the north bank, adjacent to Creek Park, would be temporarily removed during construction and then replaced once construction is complete. The existing fence and gate marking the downstream end of 632-636 San Anselmo Avenue would also be demolished. All new slopes would be planted with willow tubes and native shrubs. Two existing storm drain outfalls, one at each side of the creek upstream of the demolition footprint, would be reconstructed with new rock slope protection outfalls. A new reinforced concrete floodwall would be constructed along the south side of the creek, adjacent to the street. A new concrete sidewalk would abut the outside of the floodwall along the street. A new pedestrian guardrail, approximately 100 feet long, would be constructed along the north top of bank. Eight trees or stumps in the Downtown San Anselmo area would be removed during construction.

3.4.2.3 Benefits of Project Implementation

Preliminary modeling indicates that implementing the above elements would reduce the frequency of flooding in Ross Valley, and reduce the severity of flooding by reducing the total area of inundation in the San Anselmo and Fairfax subwatersheds. **Figures 3-13a**, **3-13b**, and **3-13c** show the Project's change in inundation depth during the 10-year event, illustrating the modeled change in depth and extent in three general areas of the watershed. These areas were chosen to capture the complete effects of the project on existing flood patterns, and range from downtown Fairfax at the upstream end to lower downtown San Anselmo and Ross at the downstream end. As shown, the Project would generally reduce inundation depths and extent in the watershed. The greatest reduction would occur during the 10-year event; the Project would result in relatively smaller reductions during the larger and less frequent events (such as the 25-year event shown in **Figures 3-14a**, **3-14b**, and **3-14c** and the 100-year event shown in **Figures 3-15a**, **3-15b**, and **3-15c**).

Table 3-1 presents a summary of the modeled number of parcels that would be removed from the inundation areas, that would see a reduction in inundation depths, or that would see an increase in inundation depths (including being newly added to the flood zone). These modeled results are shown for the 10-, 25-, and 100-year events. These results and other relevant model results are presented in more detail in Section 4.9, Hydrology and Water Quality, but they are previewed here as an overview of the relative beneficial effects and potentially adverse effects of Project implementation. These results indicate that many more parcels would receive benefits related to flood risk reduction than the very small number that would experience increased flood risk.

TABLE 3-1
MODELED PROJECT OUTCOMES ON PARCELS AFFECTED BY FLOODING

Flood Risk Change by Number of Parcels	10-year event	25-year event	100-year event
Removed from Inundated Area	300	20	10
Decreased Inundation Depth	230	615	470
Added to Inundated Area or Increase in Depth	*0*	*20*	*20*
Total with Reduced Flood Risk	**530**	**635**	**480**
Total with Increased Flood Risk	***0***	***20***	***20***

SOURCE: Stetson Engineers, San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018; Stetson Engineers, Water Depth Change point GIS data for D30, D31, D33, December 12, 2017

3.5 Construction, Operation, and Maintenance

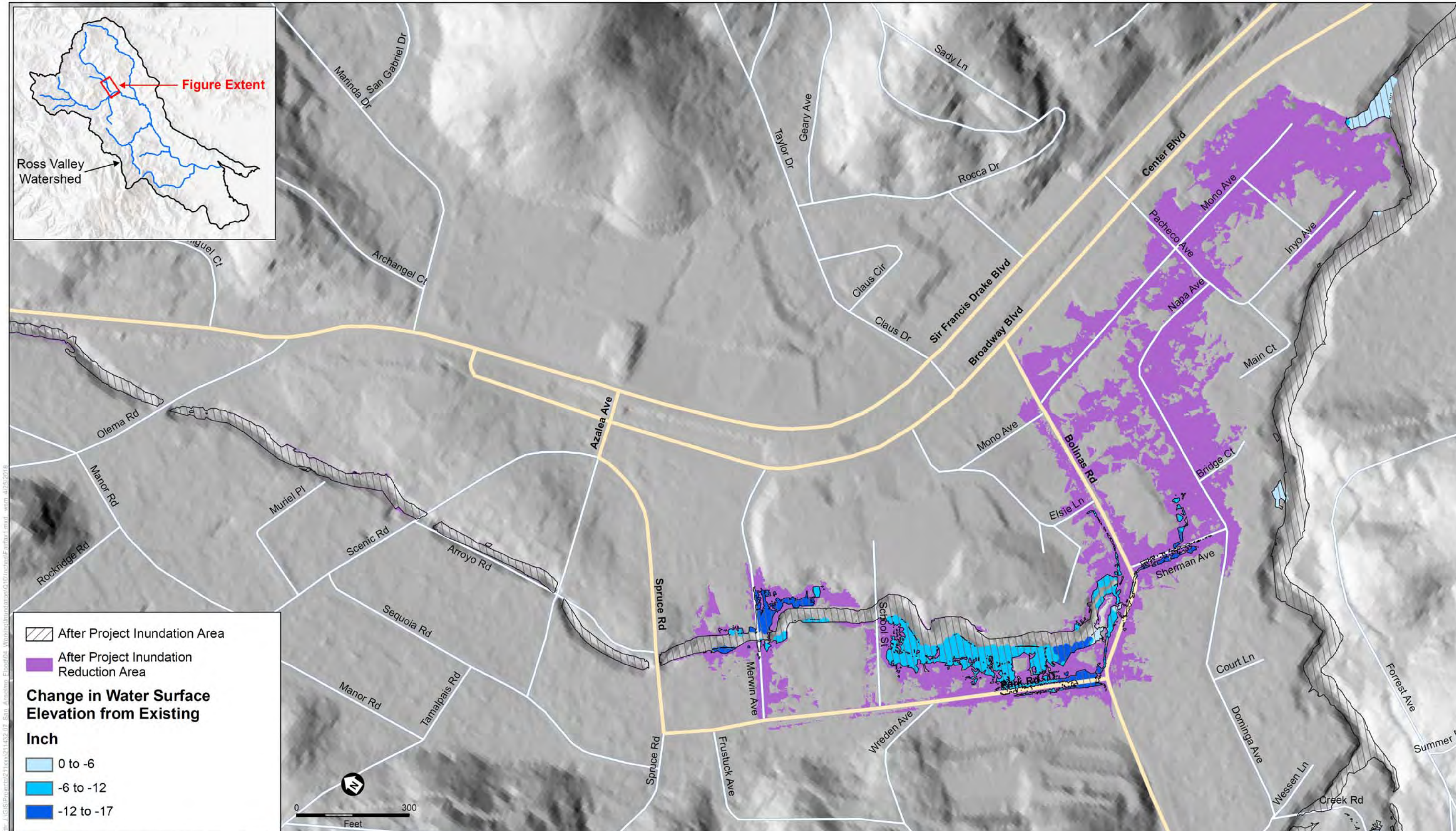
3.5.1 Project Construction

Project elements would result in some level of alteration of existing physical conditions within or adjacent to stream channels. These alterations would result in the temporary disturbance, permanent loss, or permanent enhancement of various resources. Construction activities at the Nursery Basin site would disturb approximately 5.5 acres, though the parcel boundary itself encloses 7.7 acres. The staging would occur within that area. Construction activities at the downtown San Anselmo site would disturb approximately 0.3-acres, including the staging area at Creek Park.

3.5.1.1 Equipment

Equipment usage would depend on the individual needs of each element type, as well as the discretion of individual contractors. The following presents a list of equipment types that would be likely to be used during implementation of the Project.

1. Pavement saw
2. Jackhammer
3. Grader
4. Excavator
5. Compactor
6. Bulldozer/backhoe/loader
7. Flatbed trucks
8. Drill rig Cyclone filter
9. Pump rig
10. Welding rig
11. Forklift
12. Manlift
13. Jumping jacks
14. Scraper
15. Concrete pumper
16. Water pump and treatment skid
17. Vacuum truck
18. Sand shaker
19. Crane
20. Boom truck
21. Water truck
22. Generators and air compressors
23. Concrete trucks
24. Baker tanks
25. Dump trucks
26. Bottom dump truck/trailer
27. Pickup truck
28. Hydroseeder



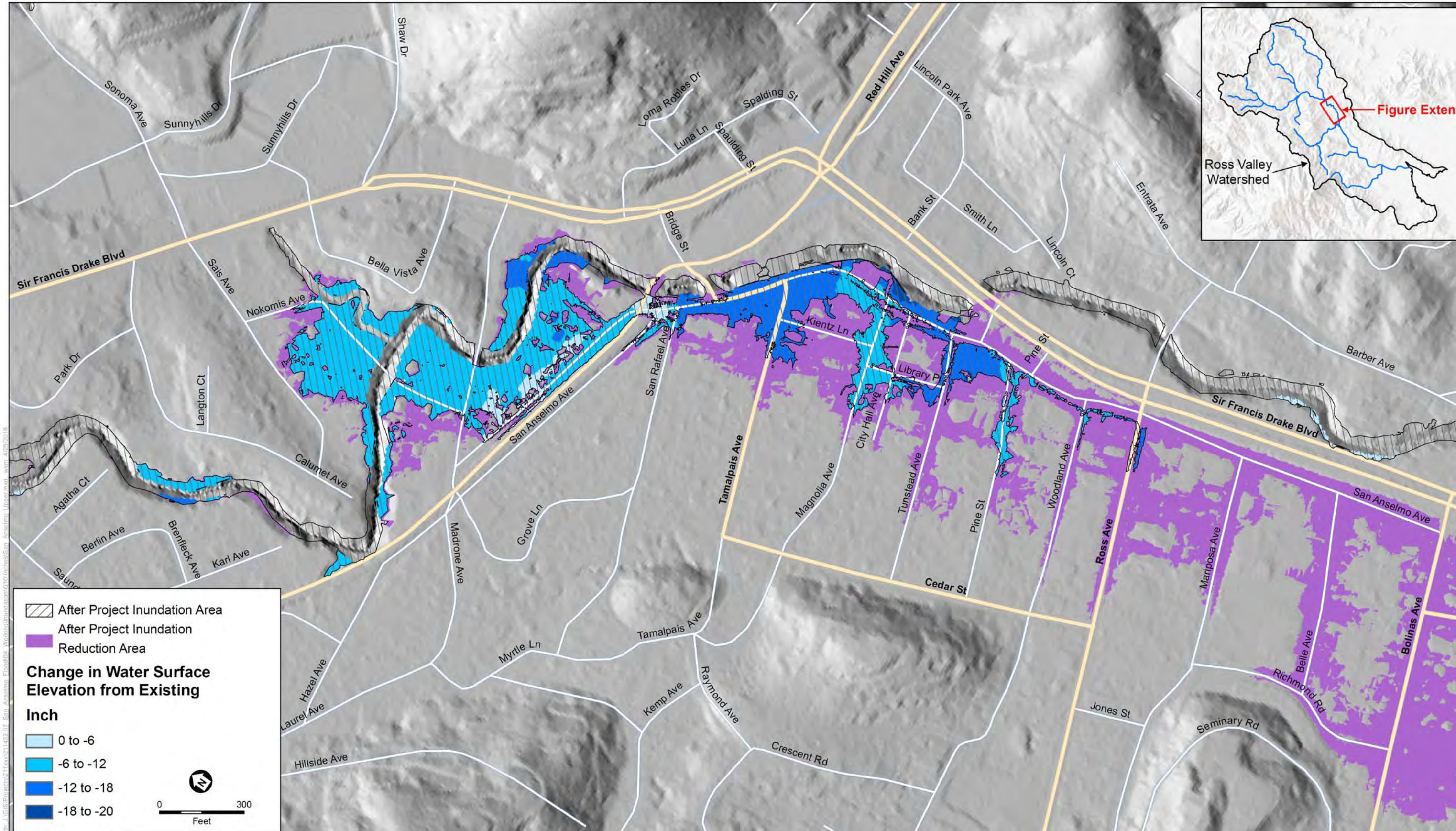
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-13a
Water Surface Elevation Change With Project
10 - Year Flood Event: Fairfax Area



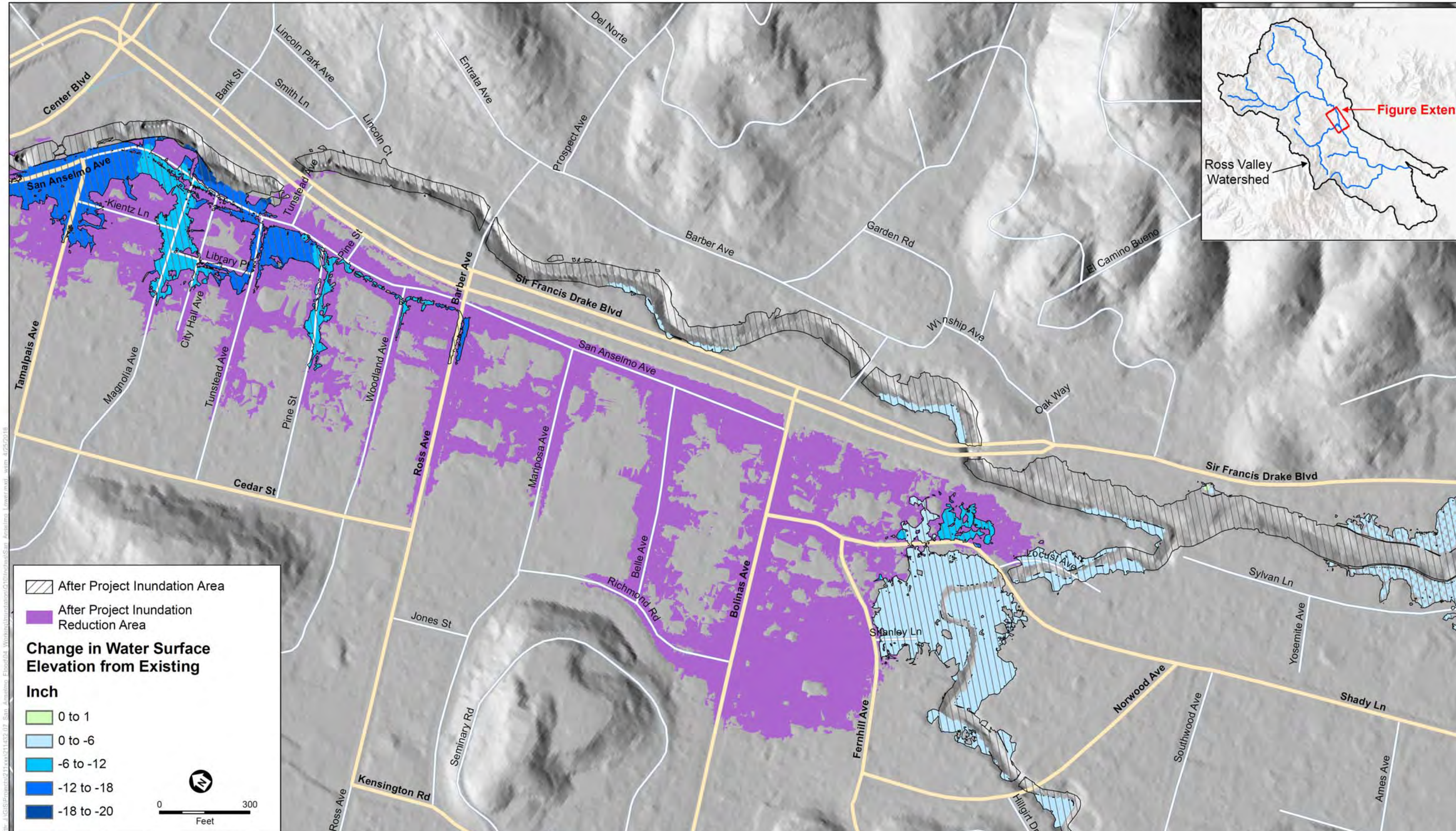
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-13b
Water Surface Elevation Change With Project
10 - Year Flood Event: Upper San Anselmo



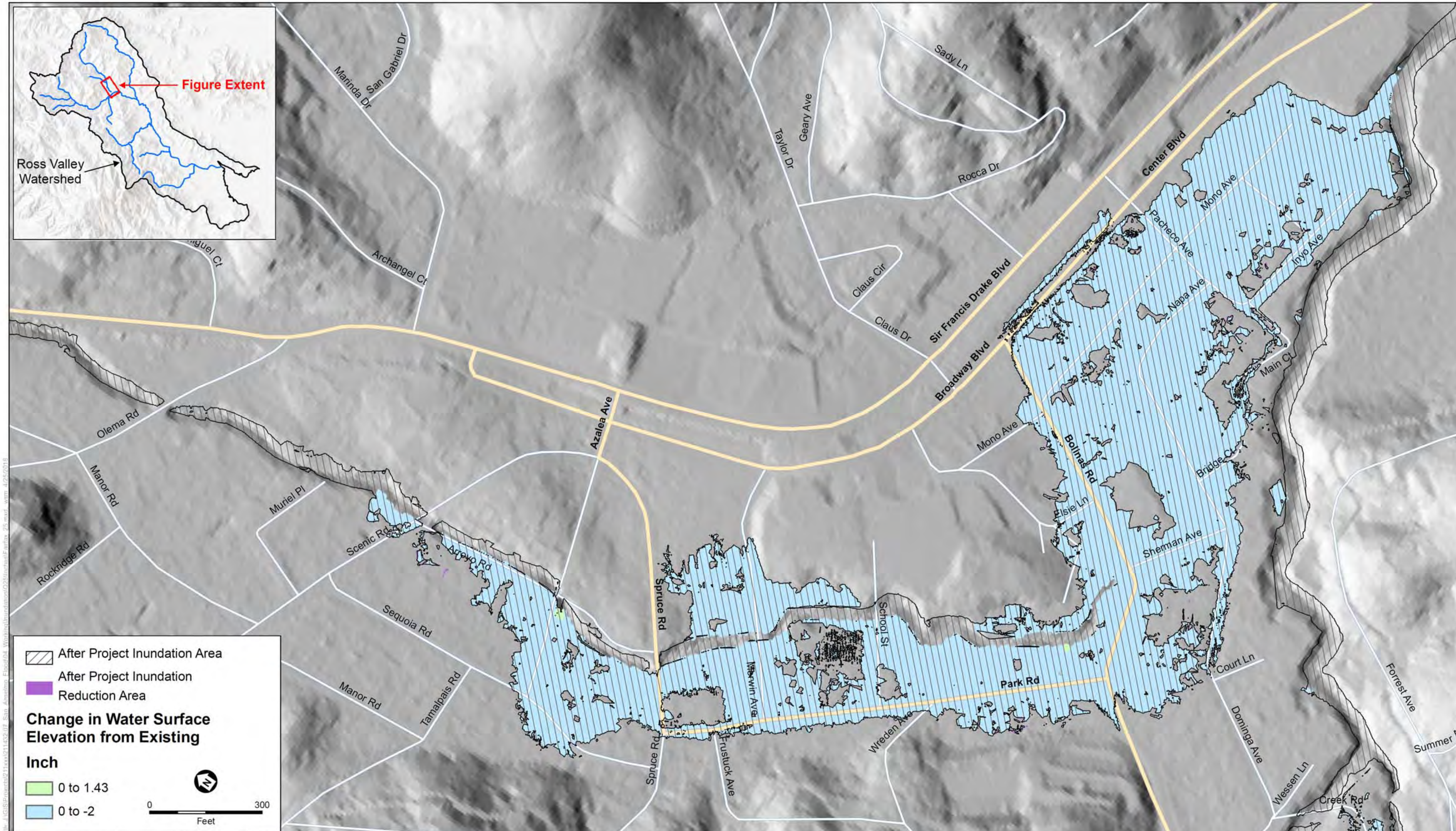
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-13c
Water Surface Elevation Change With Project
10 - Year Flood Event: Lower San Anselmo



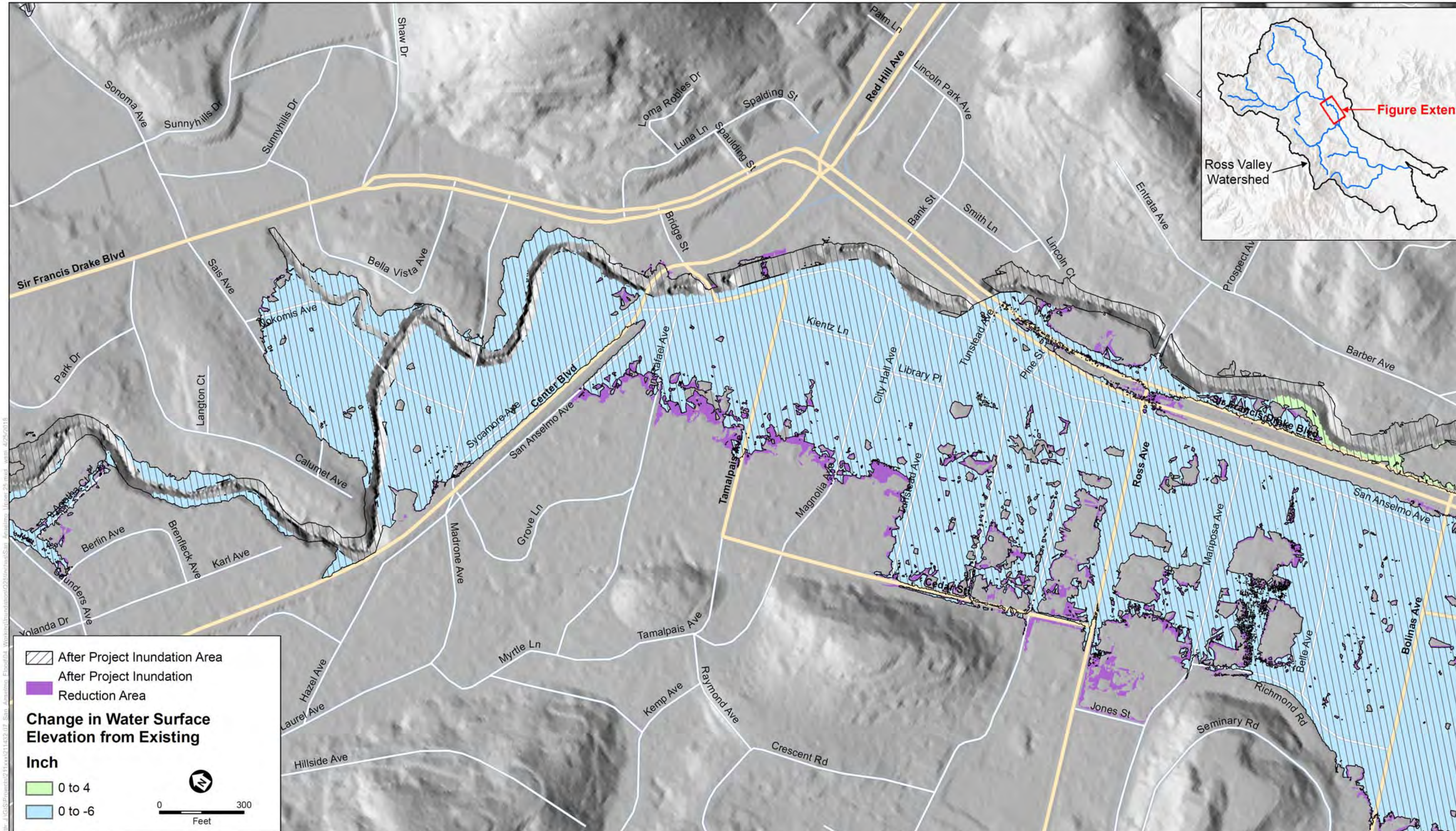
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-14a
Water Surface Elevation Change With Project
25 - Year Flood Event: Fairfax Area



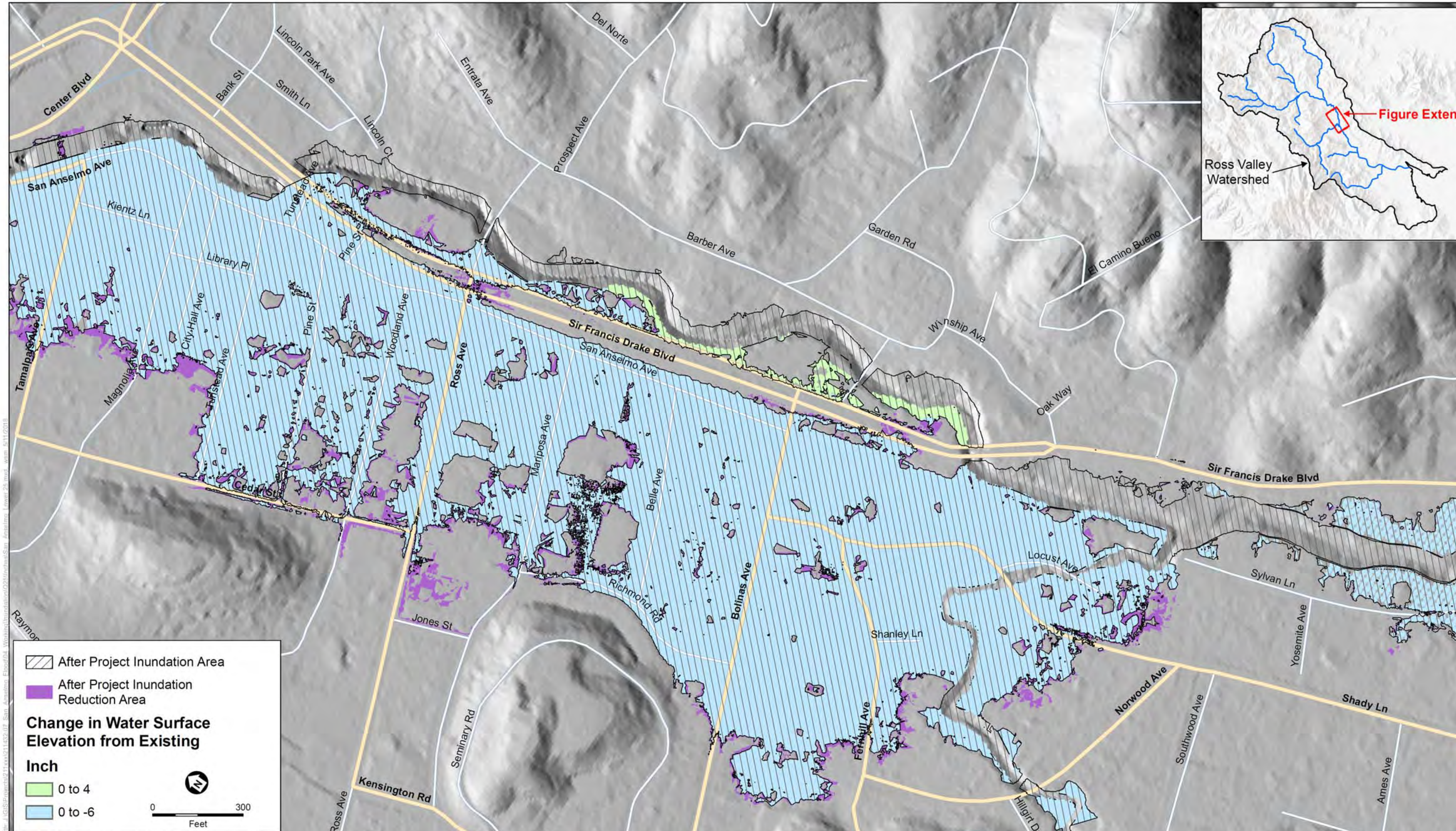
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-14b
Water Surface Elevation Change With Project
25 - Year Flood Event: Upper San Anselmo



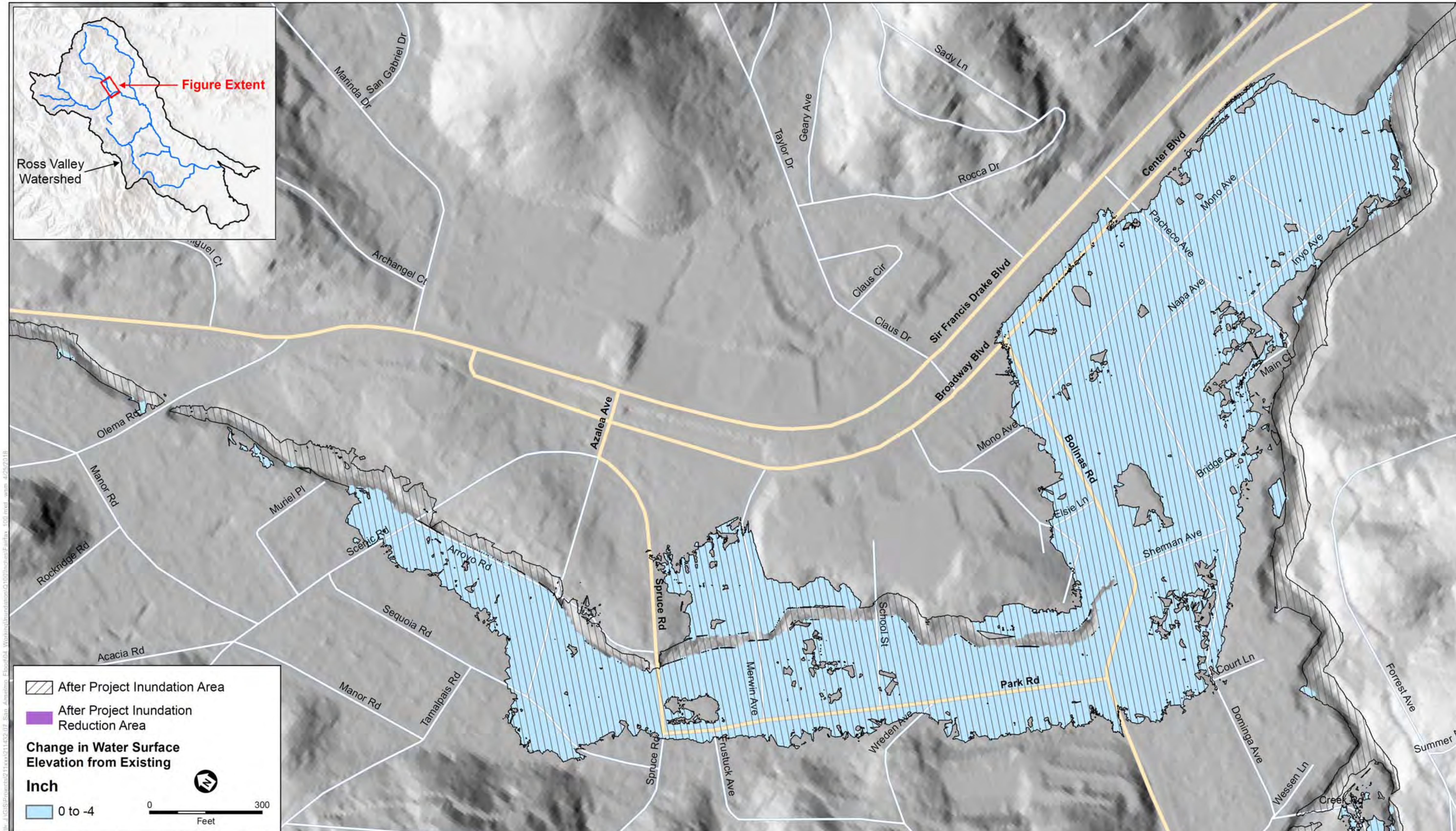
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-14c
Water Surface Elevation Change With Project
25 - Year Flood Event: Lower San Anselmo



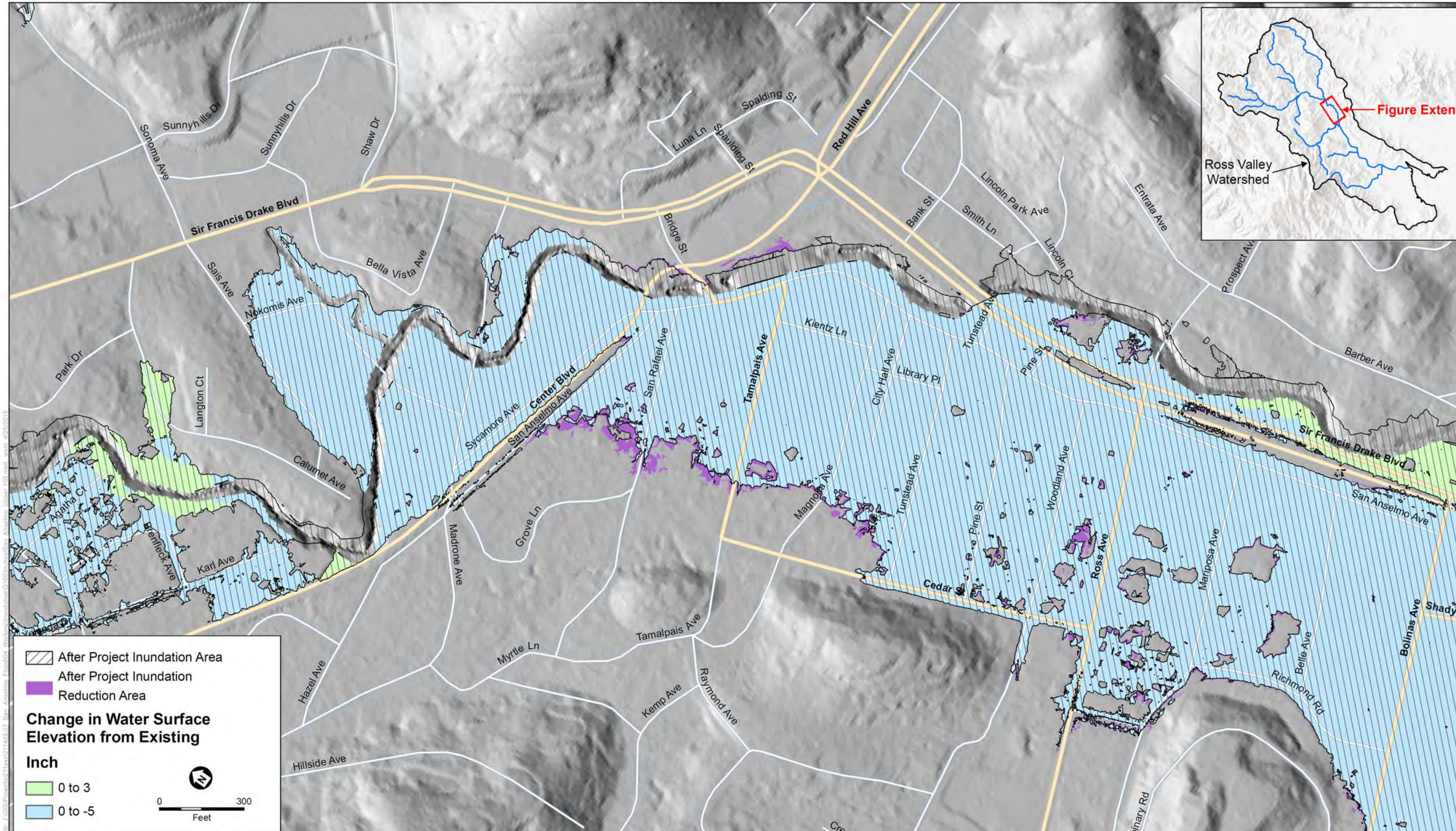
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-15a
Water Surface Elevation Change With Project
100 - Year Flood Event: Fairfax Area



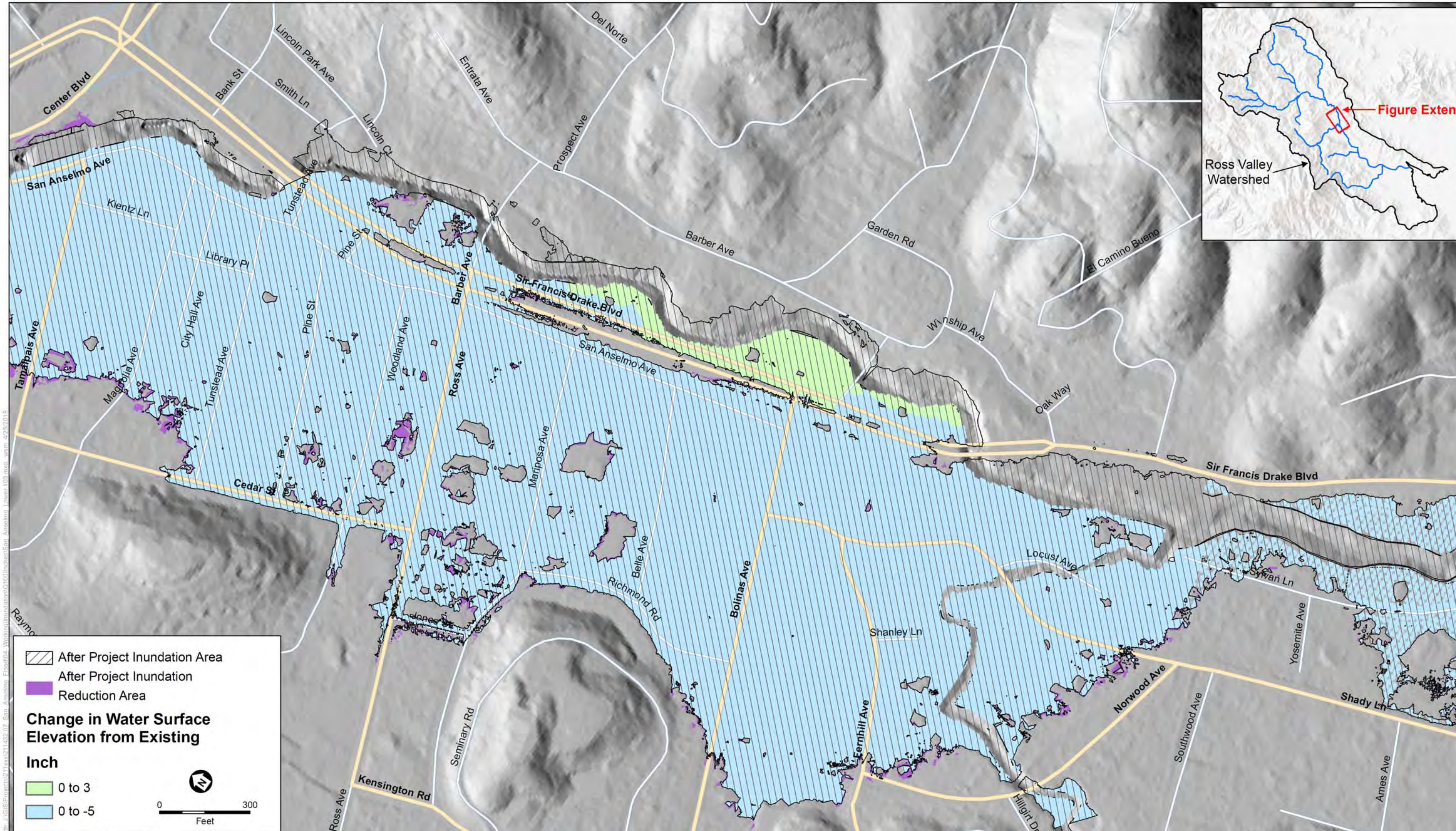
SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-15b
Water Surface Elevation Change With Project
100 - Year Flood Event: Upper San Anselmo



SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 3-15c
Water Surface Elevation Change With Project
100 - Year Flood Event: Lower San Anselmo

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3.5.1.2 Construction Crews/Durations of Individual Project Elements and Construction Site Access

General construction timeframes and crew size estimated for Project implementation are shown in **Table 3-2**. Construction is expected to occur concurrently at the two project sites in 2020. Construction activities would occur on weekdays between the hours of 7:00 a.m. and 7:00 p.m. at the Downtown San Anselmo site and 8:00 a.m. and 5:00 p.m. at the Nursery Basin site. No nighttime construction activities would occur as part of the Project.

At the Nursery Basin, construction staging would occur within the project area. The Nursery Basin site would be accessed from Sir Francis Drake Boulevard using the existing bridge. At the downtown San Anselmo site, construction staging would occur on the northern side of the creek within Creek Park, between the pedestrian bridge and the parking area. Site access would be afforded from the staging area. Construction equipment would be delivered to the staging area via the Creekside Park parking area.

TABLE 3-2
ANTICIPATED CONSTRUCTION DURATION, BY PROJECT ELEMENT[a]

Project Element	Estimated Maximum Construction Duration (months)	Estimated Maximum Construction Crew Size (Individuals)
Flood Diversion and Storage (FDS) Basin at the Former Sunnyside Nursery Site	8	20-30
Downtown San Anselmo (634-636 San Anselmo Avenue Building removal and other creek improvements)	4	20-30

NOTE:
[a] Time periods and crew numbers are estimates based on the highest numbers provided pursuant to Project element at current stage of design.

3.5.1.3 Hauling of Demolition Debris, Excavated Soil, and Construction Equipment and Materials

A total of approximately 2,940 vehicle loads would be associated with the Project. Building demolition and total project earthwork would generate approximately 29,100 cubic yards of demolition debris and soil requiring off-site transport.[4] As summarized in **Table 3-3**, a maximum of 154 truckloads per day would be needed to haul demolition debris and soil to appropriate sites for disposal or recycling, assuming construction hauling occurs concurrently at both Project locations (construction sequence and schedule is discussed below). The soil that is excavated from the Nursery Basin site (approximately 28,000 cubic yards) may be beneficially reused in an appropriate project or may be hauled to Redwood Landfill, located north of Novato, for disposal. After demolition and excavation, materials would be delivered to the project sites using dump trucks and flatbed trucks. Approximately 350 vehicle loads would deliver rip rap and bioengineered slope materials to the downtown San Anselmo Site. Another 300 vehicles loads

[4] Assuming 14.5 cubic yards of material per truck load.

would deliver rip rap to the Nursery Basin site. Other vehicles associated with construction activity, such as service trucks and porta-potty trucks, would account for about 270 vehicle loads.

TABLE 3-3
PROJECT ELEMENT VEHICLE LOAD ESTIMATES

Project Element	Total Truck Loads
Flood Diversion and Storage (FDS) Basin at the Former Sunnyside Nursery Site	2,482 (maximum of 146 truckloads per day for 19 days during excavation and hauling)
Downtown San Anselmo (634-636 San Anselmo Avenue Building removal and other creek improvements)	460 (maximum of 8 truckloads per day for 9 days during demolition)
Total	2,942 (maximum of 154 trucks per day assuming construction activity overlaps)

SOURCE: CH2M Equipment and Work Durations, March 9, 2018

3.5.2 Implementation Sequence and Schedule

As described in Section 3.4, the Project elements essentially provide two different approaches to reducing flood risk: increasing creek capacity by removing impediments to creek flow and reducing peak flood flows by detaining such flows with an FDS basin. The sequencing of development of these elements must be considered carefully to avoid inadvertently increasing flood risk downstream of individual elements. For example, removing flow constraints that are causing localized flooding in downtown San Anselmo without first increasing upstream flow storage or increasing downstream creek capacity could simply transfer flooding downstream. For that reason, it is generally considered best practice when constructing flood improvements in a watershed to do the following:

1. If feasible, start downstream and move upstream, thereby increasing capacity at the lower reaches to be able to receive increased flows from upstream.

2. Build FDS basin capacity before removing or reducing flow constrictions that would release previously bottlenecked flows downstream.

In this case, however, because both Project elements would be constructed in the same season, effectively adding upstream storage capacity and reducing the peak downstream flows at the same time such that subsequent increases in flow capacity could be implemented without passing peak flows farther downstream than San Anselmo.

Anticipated project construction sequences are summarized below. **Table 3-4** presents detailed construction steps.

TABLE 3-4
PROJECT CONSTRUCTION ACTIVITIES AND SEQUENCING

Construction Activity	Description For Nursery Basin	Description for Building Removal and Site Restoration (in Downtown San Anselmo Section)
Mobilization	Contractor gathers and transports equipment and personnel to the site; a construction office/staging area is established. Construction signage is installed on Sir Francis Drake Boulevard. Survey markers are installed to define work areas.	Contractor gathers and transports equipment and personnel to the site; a construction office and staging area is established. Contractor installs construction area signs on San Anselmo Avenue, re-stripes San Anselmo Avenue, narrow lanes (shift traffic to north-bound side of San Anselmo Avenue), closes sidewalk and installs a temporary safety barrier (often called a Jersey barrier or a k-rail) along north-bound side. Contractor installs construction fencing/access gates as required, Contractor sets up staging area.
Erosion Control Measures	Contractor installs orange plastic fencing and temporary fencing around the site to protect existing trees to remain and creek habitat and for site security and public safety. Contractor installs temporary erosion control best management practice elements to prevent stormwater erosion until vegetation and/or permanent slope protection is installed.	Contractor installs orange plastic fencing and temporary fencing erosion control measures around the site to protect adjacent properties, existing trees to remain and creek habitat and for site security and public safety. Contractor installs temporary erosion control best management practice elements to prevent stormwater erosion until vegetation and/or permanent slope protection is installed.
Stream Diversion	See “Creek Earthwork” line item below.	Contractor diverts stream flows into a culvert or side of the channel to facilitate construction activities; cofferdams and temporary pumps may be employed.
Demolition	Contractor demolishes all existing man-made structures on site and hauls them off site to a dump or recycling center.	Contractor demolishes the existing wood frame building and underlying concrete bridge structures on site and hauls them off site to a dump or recycling center.
Clearing and Grubbing	Contractor removes trees, shrubs and grass/topsoil as necessary, within construction footprint. This material is loaded into trucks and hauled offsite to a dump or recycling/compost center. Topsoil would be stockpiled onsite for replacement after grading is complete.	Contractor removes trees, shrubs and grass/topsoil as necessary, within construction footprint. This material is loaded into trucks and hauled offsite to a dump or recycling/compost center. Topsoil would be stockpiled in the construction staging area for replacement after grading is complete.
Basin Earthwork	Contractor excavates existing soil material to basin geometry; builds seepage cutoff wall under eastern side of basin by excavating a trench, adding a soil-bentonite mixture, compacting it, and then replacing and compacting the removed fill; excavated material or imported soil is used to construct eastern levee; seasonal stream is excavated at bottom of basin; excess soil material is loaded into trucks and hauled offsite for disposal at an approved disposal or beneficial reuse site. Excavation would be performed to allow continued access to the basin.	Not Applicable
Creek Earthwork	The creek earthwork would be related to construction of the diversion structure, installation of the basin outlet pipes and structure, and bank stabilization along the side-weir and outfall locations. Excavation, backfill, and compaction would be required to achieve required elevations and soil subgrade preparation for installation of rock rip rap for bank protection and pipe outfalls.	Contractor excavates, grades, and compacts the existing creek bank material to create stable soil subgrade for the bioengineered slope stabilization system. Slope transition structure installed at upstream end of site. Terraced flood plain graded. Bioengineered slope installed.
Storm Drain Piping	Contractor relocates/extends the existing storm drain pipe from Trestle Glen residential development into the northwest corner of the basin and installs a secondary pipe along the north and east boundaries of the basin into Fairfax Creek downstream of the proposed diversion and overflow structure; pipe trench is excavated, pipe placed and backfilled. Control gate and diversion structure is installed; it includes two openings penetrating the diversion structure across the creek: one is smaller and ungated and the other is a larger with a gate control. Erosion protection is placed in the creek at upstream and downstream faces of control structure; floodwall is constructed. Installation of rock rip rap for bank protection on the side-weir would also be constructed.	Two storm drains removed and reconstructed at upstream end of site.

TABLE 3-4 (CONTINUED)
PROJECT CONSTRUCTION ACTIVITIES AND SEQUENCING

Construction Activity	Description For Nursery Basin	Description for Building Removal and Site Restoration (in Downtown San Anselmo Section)
Access Roads/ Ramps	Contractor finish grades all access roads and ramps installs geotextile fabric and erosion protection on south basin top of bank and installs aggregate surfacing on roads/ramps.	Not Applicable
Floodwall	Contractor constructs the reinforced concrete floodwall along southern creek bank.	Contractor constructs the reinforced concrete floodwall along southern creek bank
Rock Slope Construction	Rock slope protection installed along southern bank of Fairfax Creek between the bridge and the diversion structure and within Fairfax Creek from the diversion structure to 10 feet downstream of the outlet pipe.	Contractor installs new ½-ton rock slope protection at storm drain outfalls.
Topsoil Placement and Planting	Once finished final grading, contractor places topsoil on finished grades and slopes and installs Oak-Bay plantings adjacent to the west levee outer toe and hydro-seeds basin bottom and banks and levee side slopes.	Contractor places topsoil and installs willow plantings on vegetated terrace and hydro-seeds banks.
Miscellaneous Work	Contractor installs permanent fencing at basin perimeter, metal beam guardrail along Sir Francis Drake Boulevard and permanent signage. Control gate is tested and all appurtenances completed.	Contractor constructs new sidewalk, walkway and guardrails along San Anselmo Avenue. Deck and stairway in Creek Park are replaced.
Demobilization/ Cleanup	Contractor removes construction trailer and all equipment and supplies from site; final cleanup completed.	Contractor removes construction trailer and all equipment and supplies from site; Creek Park staging area restored to original grade and appearance; final cleanup completed.

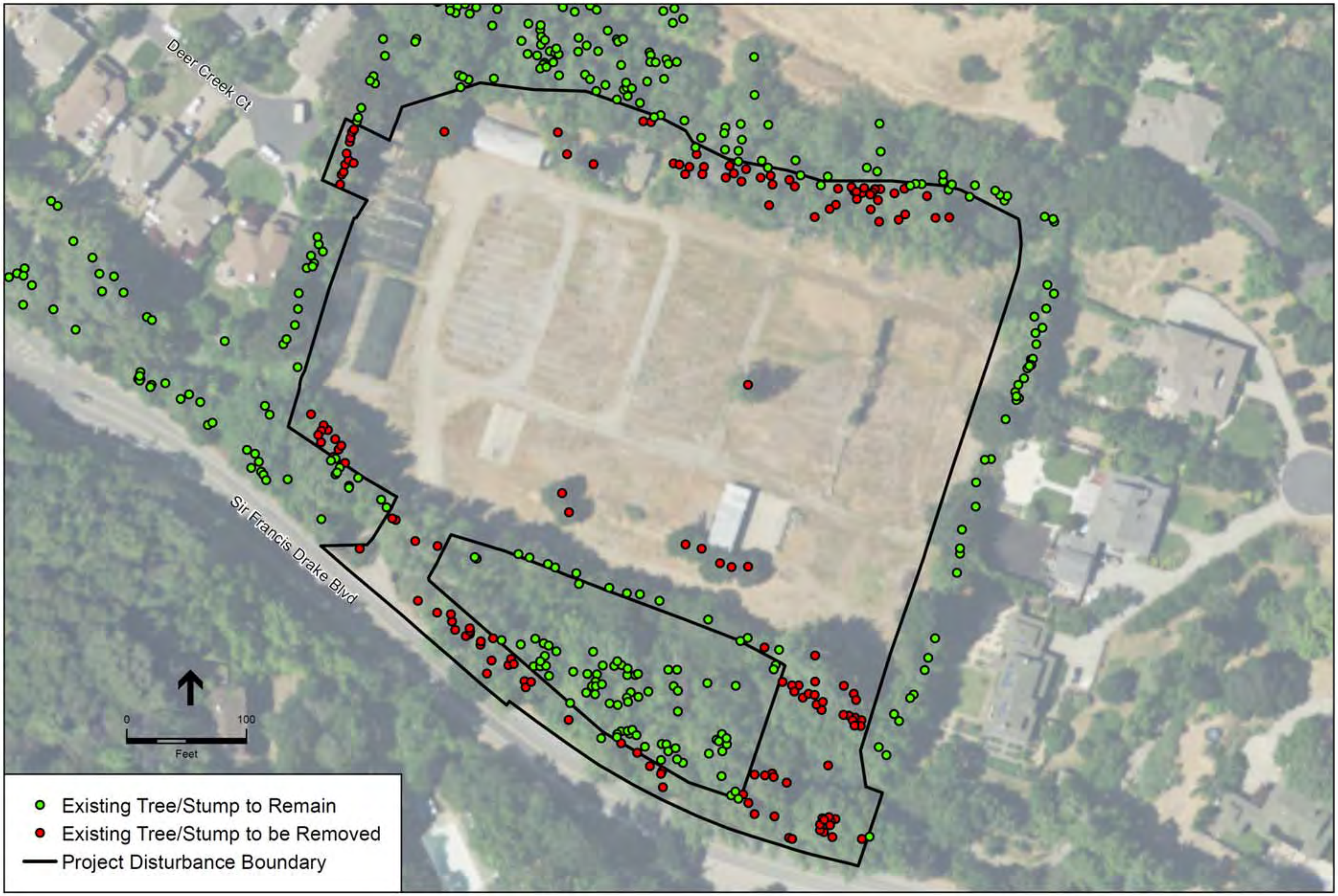
3.5.2.1 Nursery Basin Site

Upon initiation of construction activities at the Nursery Basin site, a field office would be placed onsite and construction area controls (signs, fencing) and erosion control measures would be installed on and around the site. Buildings, structures, and select vegetation would be removed from the site. **Figure 3-16** illustrates trees to be removed at the site. Existing utilities would be identified and safely removed. A water well on the site would be capped and abandoned. Fencing would also be removed. After topsoil is removed and stored, excavation and grading of the basin would proceed, including over-excavation at the side-weir and diversion structure. New structures would then be placed or constructed, including the seepage wall, catch basins, drainage piping, and the pre-cast openings of the diversion structure. Concrete would be poured for the side-weir footings and the floodwall; once these are complete, the remainders of the diversion structure and side-weir would be constructed and scour protection would be installed in multiple locations along Fairfax Creek. Final grading of the basin would follow. After topsoil is replaced in the basin, planting and hydroseeding of the basin would occur. A chain link fence would be installed around the perimeter of the basin, and all construction equipment and materials would be removed.

3.5.2.2 Downtown San Anselmo Site

Upon initiation of construction activities at the Nursery Basin site, a field office would be placed onsite and construction area controls (signs, fencing) and erosion control measures would be installed on and around the site (including delineation of the construction staging area at Creek Park). A temporary creek diversion system, consisting of culverts or other means of directing flows to one side of the creek at a time or out of the work area entirely, along with cofferdams and temporary pumps, would be installed. The building at 634-636 San Anselmo Avenue and the existing Creek Park deck would be demolished. Concrete structures would also be demolished. Select vegetation would be removed from the site, and topsoil stripped and moved to the construction staging area. Slope transition structures would be installed on either bank of the upstream end of the site. The flood plain terrace would be graded, and a floodwall installed along San Anselmo Avenue. After reconstructing two existing storm drains through the slope transition structures, the creek banks would be graded and bioengineered slope would be installed on both banks. Topsoil would be replaced on the finished slopes, and plantings and a guard rail would be installed and all construction materials would be removed. The Creek Park deck and stairway would be reconstructed and the construction staging area restored to its pre-construction condition.

As described in Chapter 1 and in Section 3.1, the Project would support and assist in achieving the goals of the Ross Valley Flood Protection and Watershed Program and will be analyzed as a cumulative project in the Program EIR as well as at a project-level in this Project EIR. Although not analyzed at a project-level in the Program EIR, this Project is one element of the overall Program. Accordingly, the San Anselmo Flood Risk Reduction Project's implementation has been carefully sequenced to avoid increasing flood risk anywhere in the Ross Valley. The Ross Valley Program is planned to be implemented in two phases. Phase One primarily consists of the



SOURCE: CH2M, 2018

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-16
Trees to be Removed at Former Sunnyside Nursery Site

FDS basins, bridge replacements and selected elements in the creeks to increase capacity.[5] To minimize the potential to increase flooding downstream, the ideal sequencing of Phase One Program elements would be to begin with development of the FDS basins in each of the subwatersheds to reduce peak flows. Early implementation of the Nursery Basin would fit with that general plan.

Similarly, implementation of the downtown San Anselmo portion of the Project would increase local flow conveyance capacity and direct more water downstream. Depending on the timing of implementation of other portions of the Ross Valley Program and other cumulative projects, particularly if cumulative projects are completed prior to completion of FDS basins, earlier Project elements may need to include and implement mitigation measures to reduce or avoid the possibility of increasing downstream flooding. These measures could include baffles, inflatable dams, or temporary floodwalls placed in the downtown San Anselmo area to keep the channel in its current, constrained condition and thus retain flows until additional projects (which may include FDS basins and/or additional downstream creek improvements) could be implemented to reduce that downstream flood risk.

This same general strategy applies to both the Project’s own actions and those of the proposed bridge removal/replacements projects, described above. Because the bridge replacements would also reduce bottlenecks in the system, similar mitigation measures to reduce the effects of the combined effect of the Project and the bridge replacements could be necessary. These effects are discussed in Chapter 5, *Growth-Inducement and Cumulative Effects*.

3.5.3 Project Operation and Maintenance

The operations and maintenance of the Project would be different for the two major elements, which are discussed in the following sections.

3.5.3.1 Nursery Basin

Detailed characteristics of the Nursery Basin are included above in Section 3.4. The general operation of the FDS basin would occur as follows.

During most of the year, the only water entering the basin would be incidental rainfall into the basin itself, storm water flows from the adjacent Trestle Glen neighborhood (Deer Creek Court) that would flow through the storm drain system into the basin, and emergent groundwater. Together, these inflows would result in a seasonal wetland channel running diagonally through the basin. Water would passively drain from the basin to Fairfax Creek through the 36-inch riser outlet pipe, which would be open. The rest of the basin bottom and side slopes would be planted to establish native and non-invasive grassland. In Fairfax Creek, water would flow through an opening or openings installed in the creek.

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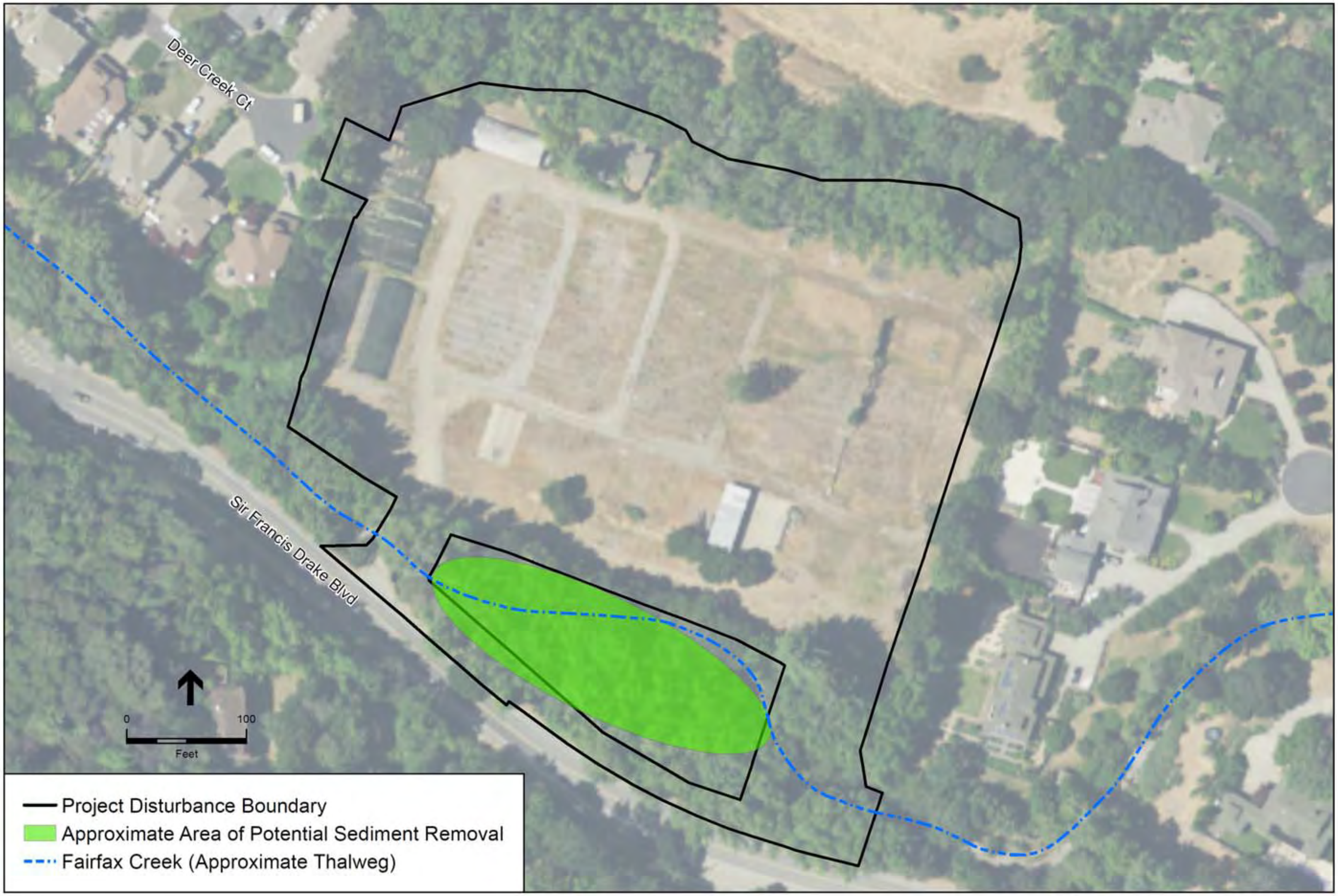
5 Phase Two of the Ross Valley Watershed Flood Protection and Watershed Program would implement additional creek improvements, bridge replacements, FDS basins, low impact development, flood preparation and education, and creek maintenance between 2028 and 2050, after implementation of Phase One, to achieve a 25-100 year levels of flood protection.

During wet weather events, when incipient flooding is observed downstream at the Fairfax Creek stream gage and/or the Ross stream gage, the opening in Fairfax Creek would be partially closed and creek flows would rise and spill into the basin over the armored side-weir (elevation 228 feet NAVD88) along the south side of the basin. The basin inflow would cross the aggregate-surfaced side-weir and flow down the slope into the basin. Approximately 26 acre-feet of water would be stored in the basin (plus the additional 5.6 acre-feet of storage in Fairfax Creek behind the diversion structure and closed opening). Once high flows have passed, water collected in the Nursery Basin would exit the basin through the gated 36-inch riser outlet pipe. It would take about eight hours for that pipe to fully drain the basin. In the event that basin capacity is reached (i.e., when water reaches an elevation of 235 feet NAVD) and creek flows continue to increase, water from the combined basin and creek channel would flow over the designed low point in the diversion structure (the overflow) and downstream into Fairfax Creek. Both the opening in Fairfax Creek and the outflow pipe from the basin would be gated so that they could be operated by staff from the Flood Control District. The opening within the diversion structure would not be opened until after peak flows have passed and the basin itself has emptied.

When the basin is full, the storm drain pipe on Deer Creek Court would back up if it were not fully closed at its downstream end. To ensure adequate drainage during wet weather events when the FDS basin is in use, the project includes a flap gate at the end of the Deer Creek Court storm drain pipe that would close, preventing this backflow. It also includes a secondary Deer Creek Court storm drain pipe consisting of a 24-inch storm drain pipe from the inlet structure at Deer Creek Court around the northern and eastern edges of the basin to discharge into Fairfax Creek at a location downstream of the diversion structure.

Sediment may be removed at least annually from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel, as shown in **Figure 3-17**. One routine, annual sediment removal would occur in the dry season to reduce effects on water quality and aquatic species. The amount of sediment removed in that routine maintenance action would vary depending on storm events and sediment moving into the creek each year. During especially wet years, a second sediment removal action may be necessary. This second removal could occur between large winter storms to restore detention capacity. The depth of sediment removal would be feathered in the upstream and downstream edges of the area to match the existing channel gradient. The removal would be done using a bulldozer in the creek and an excavator working from the maintenance access road, top of the diversion structure, or top of the side-weir, as needed to reach the deposited material. The bulldozer would access Fairfax Creek channel from the side-weir. Up to 1,600 cubic yards of sediment may be removed from Fairfax Creek per sediment removal event. Removed sediment would be hauled to a site within Marin County for beneficial reuse pursuant to the Flood Control District's Stream Maintenance Program or to Redwood Landfill. Approximately 290 cubic yards, requiring 33 truckloads, would be generated each day during sediment removal; about one week would be required to remove 1,600 cubic yards of sediment.



SOURCE: CH2M, 2018

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 3-17
Sediment to be Removed from Fairfax Creek

The Flood Control District would also conduct other maintenance at the Nursery Basin. Ongoing work would include routine activities such as:

1. perimeter and access road maintenance, including grading and weed control, removing accumulated debris from the drainage ditch and storm drain along the northern side of the basin, monitoring bank erosion near the existing access bridge, and inspections of the roadway across the diversion structure
2. inspection of security fencing and repair of vandalism
3. the gated opening closure mechanism, closure and storm drain inlet controls, and electrical services
4. invasive vegetation removal on basin side slopes
5. monitoring of setback areas for invasive vegetation and subsequent vegetation removal
6. The Fairfax Creek riparian corridor along and upstream of the Nursery Basin would be inspected routinely for tree hazards or large woody debris that could block the openings, diversion structure overflow, or side-weir during operations. The Flood Control District would remove such hazards.

Periodically, the Flood Control District would also

1. Inspect the levees for settlement and burrowing animals
2. Inspect the diversion structure surface for settlement, stability, and maintenance of proper overflow dimensions
3. Inspect the side-weir surface and structure for settlement, stability, and maintenance of proper weir elevation and dimensions
4. Inspect the basin drain inlet to remove any debris and ensure proper working conditions of mechanisms for opening/closing the inlet
5. Inspect the basin side slopes for settlement

Prior to the rainy season, the opening or openings would be inspected to ensure closure mechanism is not vandalized or blocked by debris and to ensure it is not blocked by debris and maintains design suitable for fish passage and basin operations.

As needed, the District would address other security issues at the Basin as reported by neighboring landowners, police and fire departments, and Marin County Open Space District.

Other maintenance activities would only be needed after use of the basin. After the basin has been filled and emptied, the District would remove foreign materials and excessive woody debris, and sediments if deemed excessive or passing threshold for hydraulic performance or if in conflict with vegetation restoration. The District would also remove any foreign debris from the natural channel through the basin, and monitor the new channel through the basin for sedimentation and bank erosion.

Within Fairfax Creek, bank erosion protection and sediment deposition would be monitored annually, as well as after precipitation events.

3.5.3.2 Downtown San Anselmo Portion

The operation and maintenance of the downtown San Anselmo portion of the Project would be similar to what the Flood Control District, Marin County Department of Public Works, and the Town of San Anselmo already do for the stream channels and banks, buildings, bridges, culverts, and other aspects of their management responsibilities. Typical activities include management of invasive vegetation that may have adverse flooding impacts, catch floating debris, or increase erosion; removal of litter or debris; regular inspection and as-needed repair of flood walls, retaining walls, or other structures; and replanting, tree-trimming, or other vegetation management actions, as described in the Flood Control District's Stream Maintenance Program. The improved stream channel and banks proposed by the Project may actually require less of these types of actions than are currently necessary. The access openings in the new reinforced concrete floodwall would be constructed as floodgates, so these openings could be closed during periods of high-flow in the creek.

3.6 Next Steps in the Project Review Process

The project review and approval process is described in full in Chapter 1. For convenience, however, the next steps in the process are summarized in the bullet list below.

1. This Draft EIR will be circulated for a 45-day public review and comment period.
2. The Flood Control District Board will hold a public hearing during the public comment period on the Draft EIR at which time public agencies and members of the public may provide oral and written comment on the adequacy of the Draft EIR.
3. The Final EIR, consisting of all comments received on the Draft EIR together with responses to those comments and any changes to the EIR text will be circulated for two weeks.
4. The Flood Control District Board will hold a public hearing, at which time it will consider whether the Final EIR complies with CEQA, and – if so – decide whether to certify the Final EIR.
5. Certification of the EIR neither requires nor ensures approval of the project. Following certification, the Board may decide to approve the project with mitigation measures specified in the Final EIR incorporated as conditions of approval; to disapprove the project; or to approve an alternative to the project that has been evaluated in the Final EIR.

3.7 Distinction between Review of Environmental Issues and Project Merits

Often during review of an EIR, the public raises issues that relate to the attributes or wisdom of the project or issues such as the project's community benefits or community consequences (referred to here as "Project merits"), rather than the scope or substance of the environmental analyses in the EIR. Lead Agency review of environmental issues and project merits are both important in the decision of what action to take on a project, and both are considered in the decision-making process for a project. However, a Lead Agency in its CEQA review is required only to address environmental issues that are raised. Certifying an EIR (i.e., finding that it was completed in compliance with CEQA) and taking action on the project are procedurally distinct processes and result in separate decisions made by the Lead Agency. Nonetheless, the EIR must be certified by the Lead Agency before the Lead Agency can take approval actions on the project.

3.8 References

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CHAPTER 4

Environmental Setting, Impacts, and Mitigation Measures

4.1 Introduction

4.1.1 Scope of Analysis

This chapter contains an analysis of the environmental topics identified by Marin County's scoping process for the EIR (Notice of Preparation and Scoping Meeting) described in Chapter 1, *Introduction*. Environmental topics addressed in this chapter include:

Chapter 4 Sections	
4.1 Introduction	4.8 Hazards and Hazardous Materials
4.2 Aesthetics and Visual Resources	4.9 Hydrology and Water Quality
4.3 Air Quality and Greenhouse Gas Emissions	4.10 Land Use and Planning
4.4 Energy, Mineral, Forest and Agricultural Resources	4.11 Noise
4.5 Biological Resources	4.12 Population and Housing
4.6 Cultural Resources	4.13 Public Services and Utilities
4.7 Geology, Seismicity, Soils, and Paleontological Resources	4.14 Parks and Recreation
	4.15 Transportation and Circulation

Sections 4.2 through 4.15 of this chapter describe existing environmental conditions as they relate to each specific topic, identify potential significant adverse environmental effects (significant impacts) from implementing the Project, and present mitigation measures to avoid or substantially lessen significant impacts to a less-than-significant level. Growth-inducing and cumulative impacts are discussed in Chapter 5, *Growth-Inducing and Cumulative Effects.* In Chapter 6, *Alternatives*, alternatives to the Project are described and analyzed, and their impacts compared to those of the Project.

Each section of Chapter 4 is organized as follows, based on the requirements of the California Environmental Quality Act (CEQA):

1. **Setting.** This subsection describes the existing physical environmental conditions in the Project area with respect to each resource topic, at an appropriate level of detail to allow the reader to understand the impact analysis.

2. **Regulatory Setting.** This subsection describes the relevant laws and regulations that apply to protecting the environmental resources within the project area, and the governmental agencies responsible for enforcing those laws and regulations. While the Project is not within the limits of the Town of Fairfax, it is adjacent to the Town; for this reason, Town of Fairfax policies and goals are presented for informational purposes.

3. **Impacts.** This subsection evaluates the potential for the Project to result in adverse effects on the physical environment described in the setting. Each impact analysis section lists significance criteria for evaluating environmental impacts, and the Approach to Analysis explains how the significance criteria are applied in evaluating the project impacts. The conclusion of each impact analysis is expressed in terms of the impact significance under CEQA, which is discussed further in Section 4.1.2 below. Compliance with applicable federal, state, and local laws and regulations by the project applicant is assumed in this analysis. Local, state, and federal agencies would be expected to continue to enforce applicable requirements to the extent that they do so now. Note that compliance with regulations is a condition of certification of the EIR and permit approvals.

4. **Mitigation Measures.** Each impact subsection identifies mitigation measures for all of the impacts considered significant, consistent with CEQA Guidelines Section 15126.4, which states that an environmental impact report (EIR) "shall describe feasible measures which could minimize significant adverse impacts…" In this EIR, mitigation measures are identified (where feasible) for all of the significant impacts and residual effects after mitigation are noted. If additional impacts could result from implementation of a mitigation measure, those impacts are identified, consistent with CEQA Guidelines Section 15126.4.[1]

4.1.1.1 Scoping Comments

Scoping comments were received on the following topics: CEQA process; Project Description; aesthetics and visual resources; biological resources; cultural resources; geology, seismicity, soils, and paleontological resources; hazards and hazardous materials; hydrology and water quality; land use and planning; noise; population and housing; public services and utilities; growth-inducing and cumulative effects; and alternatives. The full details of comments submitted for these topics is available in Appendix A of this document. No comments related to air quality and greenhouse gas emissions; energy, mineral, forest, and agricultural resources; parks and recreation; or transportation and circulation were received.

4.1.2 Significance Criteria and Determinations

Standards used to evaluate the magnitude of impacts are listed in the "significance criteria" subsections for each topic analyzed. Under CEQA, a significant effect is defined as a substantial or potential substantial adverse change in any of the environment – namely, in any of the "physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance." The State *CEQA Guidelines* direct that the significance of an impact be determined on the basis of facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts. The

[1] CEQA Guidelines Section 15126.4 states that "if a mitigation measure would cause one or more significant effects in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed."

significance criteria were derived from the following main sources: the State CEQA *Guidelines* Appendix G; Marin County Environmental Impact Review Guidelines Appendix N *Criteria for Significance* and Appendix K, Initial Study Checklist Form; environmental documents prepared recently on other projects in Marin County; and the professional standards and practices of the technical analysts who conducted the EIR evaluations.

Each section of Chapter 4 presents, before the discussion of impacts, the significance criteria used to analyze each resource topic. The categories used to designate impact significance are as follows:

1. **No Impact.** An impact issue is considered not applicable (no impact) if there is no potential for impacts or the environmental resource does not occur within the project area or the area of potential effect. For example, there would be no impacts related to grading if there is no grading proposed at a particular project site.

2. **Less than Significant.** This determination applies if there is a potential for some limited impact but not a substantial, adverse effect that qualifies under the significance criteria as a significant impact. No mitigation is required for impacts determined to be less than significant.

3. **Less than Significant with Mitigation.** This determination applies if there is a potential for the project to result in an adverse effect that would or could meet or exceed the significance criteria, but feasible mitigation is available that would reduce the impact to a less-than-significant level. An impact described as “potentially” significant indicates there is a potential for this impact to occur, but there is not enough project information or site-specific information to determine definitively whether or not it qualifies under the significance criteria as significant. Impacts identified as “potentially significant” are treated the same as significant impacts in this EIR.

4. **Significant and Unavoidable.** This determination applies if the project would result in an adverse effect that would or could meet or exceed the significance criteria and for which there is no feasible mitigation available.

5. **Significant and Unavoidable with Mitigation.** This determination applies if the project would result in an adverse effect that would or could meet or exceed the significance criteria and there is feasible mitigation available to lessen the severity of the impact, but either the residual effect after implementation of the measure would remain significant or there is some uncertainty as to the effectiveness of the mitigation measure.

4.1.3 Approach to Cumulative Impact Analysis

4.1.3.1 CEQA Provisions Regarding Cumulative Impacts

Cumulative impacts, as defined in Section 15355 of the State CEQA *Guidelines*, refer to two or more individual effects that, when taken together, are “considerable” or that compound or increase other environmental impacts. A cumulative impact from several projects is the change in the environment that would result from the incremental impact of each project when added to those of other closely related past, present, or probable future projects. State CEQA *Guidelines* Section 15130 of the provides the following pertinent guidance for cumulative impact analysis:

1. An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).

2. An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR.

3. A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.

4. The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.

5. The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than on attributes of the other projects that do not contribute to the cumulative impact.

CEQA Guidelines Section 15130(b)(1) provides two approaches to a cumulative impact analysis. The analysis can be based (a) on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document. This cumulative impact analysis considers the effects of the project together with those of other past, present, or probable future projects proposed by the Marin County Flood Control and Water Conservation District or others. Please see Chapter 5, *Growth-Inducing and Cumulative Effects*, and Section 5.3, *Cumulative Impacts*, for a more detailed description of the approach to cumulative impact analysis found in this EIR.

4.2 Aesthetics and Visual Resources

This section describes the existing aesthetic conditions and visual resources in and around the San Anselmo Flood Risk Reduction Project (Project) area and evaluates the potential for Project implementation to result in significant impacts from losses or degradation of views[1] or scenic vistas,[2] degradation of scenic quality and character, or from adding new sources of light or glare. The analysis is based on available background information, plus policies and regulations, collected from each municipality with jurisdiction in the Project area. Potential impacts are discussed and evaluated, with appropriate mitigation measures identified where necessary.

4.2.1 Setting

4.2.1.1 Regional Setting

The Project area is in central Marin County, which is part of the larger San Francisco Bay Area (Bay Area). The San Francisco Bay region is in the Coast Ranges Physiographic Province, which spans 400 miles in California from Humboldt County to Santa Barbara County. The Bay Area is characterized as having a Mediterranean climate, with Coast Redwood forest and chaparral and woodlands. The Bay Area is highly developed; however, substantial tracts of open space contribute to the visual character of the region.

Marin County has a unique visual environment with a diversity of landscape that includes views of open space, ocean vistas and beaches, San Francisco Bay shoreline, hills and ridgelines, agricultural lands, stands of forests, and other natural features. The majority of this undeveloped land is found in the northern and western areas of the county. Nearly half of the county's land is protected by park or open space status. With the largest amount of public land in the nine-county Bay Area, Marin County's park and open space make up 30 percent of its land base, while water area and watershed lands comprise another 20 percent. In the southern portion of the county, long-distance views are often dominated by Mount Tamalpais.

Urban development in Marin County is essentially concentrated along the U.S. Highway 101 corridor in the eastern third of the county from Novato in the north, San Rafael in the central portion, and Sausalito/Marin City in the south, punctuated by the Golden Gate Bridge at its southern tip. Aside from the larger cities of San Rafael and Novato, urban development in Marin County is centered on well-established villages and towns in the many valleys on the northern and eastern flanks of Mount Tamalpais. While the visual character of the larger cities is influenced by commercial, industrial, and urban/suburban housing developments, these smaller villages have traditionally strived to maintain compact and "small town" feel that blends with the surrounding natural and agricultural landscapes. Most of these smaller municipalities have adopted land use controls which encourage residential development near town centers, which lends to walkable neighborhoods maintaining a pedestrian-scale community. As noted below, each Marin County municipality or unincorporated community in the Project area has a particular visual character maintained by its own building design requirements, or the County's

1 A view is the field of vision at a particular location.
2 A scenic vista is a broad visual sweep covering a large area, as designated in City, Town, or County General Plans.

requirements in unincorporated areas. County and local ordinances have also protected nearby ridgeline and scenic vistas.

4.2.1.2 Project Setting

The Project is in the Ross Valley Watershed, which is drained by Corte Madera Creek, San Anselmo Creek, Fairfax Creek, and their tributaries. Municipalities which comprise the Project area and have jurisdiction over aesthetics and visual resources are the Town of San Anselmo and the Town of Fairfax, as well as Marin County in unincorporated areas. The Project is not within the limits of the Town of Fairfax, but it is within Fairfax's General Plan's sphere of influence (SOI), as discussed below.

Visual Character

This discussion of the Project area's visual character is presented by municipality based on information presented in the General Plans of each, then concludes with a composite discussion of the Project area as a whole. This acknowledges that the visual character and quality of the Project area transcends municipal boundaries.

San Anselmo

The Town of San Anselmo is between the Towns of Ross and Fairfax and framed by generally continuous ridgelines to the north and south. The Southern Heights Ridge on the north and east physically and visually separates the Town from San Rafael, while the facing flank of Mount Tamalpais forms the visually-defining ridge on the south and west. Much of the land area on the Mount Tamalpais ridgeline is preserved in open space, including Bald Hill (proposed open space) and the Marin Municipal Water District (MMWD) watershed lands. These ridgelines are also protected as Marin County Open Space lands. In addition, there are identified ridgelines within the Town's boundaries, including Camino de Herrera, Indian Rock, Red Hill, and Sunny Hills. The Town's development pattern is similar to that of the other Ross Valley communities, with development on the valley floor and residential development extending up the adjacent hillsides. The Town's General Plan identifies Sir Francis Drake Boulevard, Red Hill Avenue, and Center Boulevard as scenic highways within the town limits (San Anselmo, 2016). The city's Creek Park is opposite San Anselmo Creek from, and in direct view of, the building at 634-636 San Anselmo Avenue, which would be removed as part of this Project. Additionally, the Pedestrian Bridge, which provides access to Creek Park from San Anselmo Avenue, is immediately downstream and in view of this building.

Fairfax

The Town of Fairfax's Map of Visual Resources, Figure OS-1 in its General Plan Open Space Element (2010), identifies a number of Visually Significant Areas, ridgelines and ridgeline corridors, scenic highways, views and viewpoints (referred to as "views and vista points" in the Town of Fairfax's General Plan), and gateways throughout the Town and within its General Plan SOI. These resources are identified along Fairfax and Bothin Creeks. Sir Francis Drake Boulevard, which run parallel to Fairfax Creek, and Bolinas Road, which runs along ridgelines in the southern part of the Town, are designated as scenic highways. These roads also have designated visual gateways at the town limits and as Bolinas Road transitions from the downtown area up to its ridgeline route. The Map of Visual Resources places multiple visually significant areas in the downtown corridor and at the headwaters of Fairfax Creek. Finally, multiple designated views are identified at the intersection of Sir Francis Drake Boulevard and Bolinas Road, as well as at Sir Francis Drake Boulevard's west gateway on the Town's west border.

Unincorporated Marin County

The remainder of the Project area is unincorporated Marin County. These unincorporated areas either border San Anselmo and Fairfax or are pockets within and between them. The community of Sleepy Hollow is within the county's unincorporated area, as noted above. In general, these areas share the same visual and aesthetic characteristics as the neighboring municipalities. Situated between the City of Larkspur and Town of Ross, Kentfield shares a similar development pattern with commercial and residential on the valley floor, framed by County-designated ridgelines on the north and south. Although in unincorporated Marin County, the community of Sleepy Hollow is within the San Anselmo's sphere of influence and urban service area. It shares many similar large-scale visual characteristics as less densely developed areas of the Town and is framed by the same ridgelines.

Project Area Composite

At a visual macroscale, Mount Tamalpais and Bald Hill (also known as Mount Baldy) form the southern visual boundary of the Project area, while the Southern Heights Ridge separating San Anselmo and Fairfax from San Rafael forms the northern boundary. This physiography forms an enclosed viewshed. Middle- and background views are dominated by these ridgelines. While the northern ridgeline is moderately developed as single-family neighborhoods, the southern ridgeline on Mount Tamalpais and Bald Hill is predominantly undeveloped. This is largely due to the fact that these areas are designated "greenbelt lands," as referred to in the Marin Countywide Plan (Marin County, 2007). These greenbelt lands generally consist of Ridge and Upland Greenbelt, Stream Conservation Areas, and Inland-Rural Corridor Land, as defined in the Countywide Plan. These areas are also overlapped by Marin County Open Space District and MMWD watershed lands.

Throughout the watershed and irrespective of municipal boundaries, the urban development in the Ross Valley Watershed follows Sir Francis Drake Boulevard, which roughly parallels San Anselmo and Fairfax Creeks. Proceeding west on Sir Francis Drake Boulevard in San Anselmo, the visual character is that of tree-lined streets in both commercial and residential areas. The residential areas are primarily single-family dwellings. Views along Sir Francis Drake Boulevard, parallel streets (i.e., San Anselmo Avenue, Center Boulevard, Lansdale Avenue) and the creeks retain a small downtown visual character with tree-lined streets and single-family neighborhoods just beyond the commercial core. The views presented on **Figure 4.2-1** are representative views of downtown commercial and neighborhood residential areas typically found in San Anselmo. Foreground views from streets and viewpoints in the San Anselmo portion of the Project area are dominated by this commercial and residential development. In Fairfax, at the western extent of the Project area at the upper end of the valley, the visual character remains consistent with that of San Anselmo. However, this development thins out quickly, giving way to residential neighborhoods following tributary

View looking north on San Anselmo Avenue in downtown San Anselmo. This is a representative view of the downtown commercial area that a pedestrian or motorist would see.

View looking northeast on Mountain View Drive in San Anselmo. This is a representative view of the residential neighborhoods in the Project area.

SOURCE: ESA

San Anselmo Flood Risk Reduction Project/ 211432.07

Figure 4.2-1
Typical Neighborhood Views in the Ross Valley

streams and hillside topography. These areas are, in turn, adjacent to open space on the flank of Mount Tamalpais.

Trees lining the streets and creeks further limit views to approximately 0 to 0.5 mile beyond the foreground. Views from most publicly-accessible viewpoints are limited to the foreground for these reasons. Where there are breaks in the trees and lines of buildings, middle-ground views of the surrounding ridgelines may be available.

Scenic Vistas

The ridgelines encompassing the Project area provide ample opportunity for scenic vistas from publicly accessible viewpoints into the valley. Multiple single-family residential neighborhoods and recreational spaces (i.e., Loma Alta Open Space Preserve) are along the northern ridge along the extent of the valley. Views from these points include the development on the valley floor along Corte Madera, San Anselmo, and Fairfax Creeks and the undeveloped open spaces on the opposing southern ridge. As noted above, Mount Tamalpais dominates these views. There is considerably less development, fewer trails, and less publicly accessible open space along the southern ridge compared to the northern ridge. Views of the valley floor and northern ridgeline are likely available from select viewpoints on trails within the MMWD lands.

Though the development on the valley floor is visually obvious from the viewpoints on both ridges, the visual texture is softened by the relatively even cover of street trees and open space throughout the valley. This allows the visual appearance of the valley floor to gradually transition and blend in with the undeveloped ridgelines with no sharp or abrupt visual contrast. The appearance from viewpoints is visually consistent and lacking sharp visual contrast.

While some Ross Valley municipalities, such as Fairfax, have designated viewpoints (referred to in the Fairfax General Plan as "vista points"), many do not have views of the Project areas. The Town of Fairfax General Plan has designated specific views and vista points in its Open Space Element. These include viewpoints with views overlooking the valleys and directed toward opposing ridgelines from Sir Francis Drake Boulevard in the northern portion of the Town above Fairfax Creek near Lefty Gomez Field and then further west from an unmarked overlook at the Woodacre (unincorporated) town limit. There are also designated views and viewpoints along Bolinas Road in the southern portion of the Town. Finally, the General Plan has designated views and viewpoints from the valley floor and downtown area looking toward the ridgelines rising to the south.

The General Plans of San Anselmo and Marin County do not identify specific viewpoints, although they provide policies addressing the protection of scenic vistas. However, the Old Railroad Grade Fire Road Trail in the Loma Alta Open Space Preserve in unincorporated Marin County (adjacent to the Town of Fairfax) provides elevated views in the area of the former Sunnyside Nursery site.

There are no designated views or viewpoints in the portions of Ross Valley that are in the vicinity of the Project locations. Broad, publicly-accessible scenic vistas from the valley floor are limited due to intervening development and street trees, which draws the eye downward to street level or blocks middle- or background views.

Scenic Resources

See *Visual Character*, above, for a discussion of designated scenic resources within the Project area by municipality. The San Anselmo General Plan identifies Sir Francis Drake Boulevard, Red Hill Avenue, and Center Boulevard as scenic highways within the town limits (San Anselmo, 2016). The Fairfax General Plan also designates Sir Francis Drake Boulevard as a scenic highway within its sphere of influence (SOI). The Downtown San Anselmo site is adjacent to Creek Park (much of which is in the Project's construction boundary as it would be used for staging) and the pedestrian bridge in downtown San Anselmo. In summary, many of the scenic resources in the Project area are associated with designated open space, preserved lands, and parks, primarily associated with Mount Tamalpais. Many of these lands are also designated scenic by the Towns of San Anselmo and Fairfax. There are no officially designated State scenic highways in Marin County. Likewise, the County has not designated any roadways in the Project area as scenic.

4.2.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.2.2.1 Federal Regulations

There are no federal plans, policies, regulations, or laws related to aesthetics or visual resources applicable to the Project.

4.2.2.2 State Regulations

Title 24 Outdoor Lighting Standards – Nighttime Sky

The California legislature passed a bill in 2001 requiring the California Energy Commission to adopt energy efficiency standards for outdoor lighting for both the public and private sectors. The California Energy Commission adopted changes to Title 24, parts 1 and 6, Building Energy Efficiency Standards, which included changes to the requirements for outdoor lighting for residential and non-residential development. The standards regulate lighting characteristics, such as maximum power and brightness, shielding, and sensor controls to turn lighting on and off, which could affect nighttime views (CEC, 2015).

4.2.2.3 Regional and Local Regulations

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan are relevant to the Project. Multiple Implementation Programs support each of these policies; they are described fully in the Plan.

Biological Resources

Goal BIO-4: Riparian Conservation.

***Policy BIO-4.7: Protect Riparian Vegetation*.** Retain riparian vegetation for stabilization of streambanks and floodplains, moderating water temperatures, trapping and filtering sediments and other water pollutants, providing wildlife habitat, and aesthetic reasons.

Implementation Policy BIO-4.f, Identify Potential Impacts to Riparian Systems. At the time of a development application, evaluate potential impacts on riparian vegetation and aquatic habitat, and incorporate measures to protect riparian systems into the project design and construction. Retain and minimize disturbance to woody and herbaceous riparian vegetation in Stream Conservation Areas and adjacent areas. (Tree growth may be cleared from the stream channel where removal is essential to protect against property damage or prevent safety hazards.)

Community Design

Goal DES-4: Protection of Scenic Resources. Minimize visual impacts of development and preserve vistas of important natural features.

***Policy DES-4.1: Preserve Visual Quality*.** Protect scenic quality and views of the natural environment — including ridgelines and upland greenbelts, hillsides, water, and trees — from adverse impacts related to development.

Implementing Program DES-4.a, Protect Key Public Views. Work with community groups to identify, map, and protect important view corridors. Establish design standards for development in these areas as part of the design review requirements and individual community plans (see DES-3.b).

Implementing Program DES-4.b, Minimize Visual Impacts of Public Facilities. Amend applicable codes and procedures to require appropriate placement, design, setbacks, and native landscaping of public facilities (including soundwalls, medians, retaining walls, power lines, and water tanks) to reduce visual impacts, and encourage local agencies to adopt similar standards.

Implementing Program DES-4.c, Regulate Mass and Scale. Ensure that the mass and scale of new structures respect environmental site constraints and character of the surrounding neighborhood (see Program DES-3.b), are compatible with ridge protection policies (see Program DES- 4.e), and avoid tree-cutting (especially on wooded hillsides) and grading wherever possible. Community plans should consider regulations concerning home size.

Goal DES-5: Attractive and Functional Streets and Parking Areas. Design automobile use areas to fit the character of the community, and comfortably accommodate travel by pedestrians and bicyclists, while still meeting health, safety, and emergency access needs.

***Policy DES-5.1: Achieve Streetscape Compatibility*.** Ensure that roadways, parking areas, and pedestrian and bike movement are functionally and aesthetically appropriate to the areas they serve.

Town of San Anselmo Municipal Code

The Town of San Anselmo Municipal Code Chapter 18, *Excavation, Grading, and Erosion Control*, establishes controls on excavation, grading, and fill within the Town. The controls are established for reasons of safety, erosion control, sound soil engineering practice, aesthetics, environmental protection, and water quality protection. Notwithstanding any of the provisions of this chapter, no permit to excavate, grade or fill shall be granted, where the application shows the excavation, grade or fill to involve the movement of more than one hundred (100) cubic yards of material, unless and until approval of the application is given by action of the Planning Commission of the Town. Prior to approval, the Planning Commission must make findings, including finding that the visual and scenic enjoyment of the area by others will not be unreasonably adversely affected by the project (Section 9-18.08).

Town of San Anselmo General Plan

The following objectives and policies relevant to aesthetics and visual resources are in the Town of San Anselmo's General Plan, portions of which have been updated since its initial implementation in 1988.

Open Space

Objective 7: To protect and preserve those areas of unique natural and visual resources within the planning area.

Policy 7.3**:** To preserve as open space land of aesthetic or recreational value.

Policy 7.4**:** Encourage open space corridors along easements and streams and provide public access where appropriate for bicycling, walking, and equestrians.

Objective 10: To regulate the design of residential units, roads, and public facilities in hillside and ridge areas in order to protect and maintain the existing visual image and character of these lands.

Conservation

Goal 7: Protect the scenic value of San Anselmo by reasonably regulating signs, bill-boards, unsightly uses, and the placement of utilities.

Town of Fairfax

The following goals, objectives, and policies relevant to aesthetics and visual resources are in the Town of Fairfax's 2010 General Plan. More detailed programs support each of these policies; they are described fully in the corresponding elements of the General Plan.

Land Use

Goal LU-1: Preserve scenic and natural resources.

Objective LU-1.1**:** Limit development to preserve and enhance the community's unique natural and scenic resources.

Policy LU-1.1.1: New development outside of the town's boundary shall be limited and of a scale that preserves the significant scenic and natural resources and rural character of the areas adjacent to the Town.

Open Space

Goal OS-3: Preserve the sensory qualities of open space for recreational, cultural, educational, and spiritual experiences.

***Objective OS-3.2*:** Preserve the visual appeal of the natural landscape in the Fairfax Planning Area.

Policy OS-3.2.3: Prevent development from blocking or impairing existing views of Visually Significant Areas.

Conservation

Goal CON-5: Soils and vegetation.

***Objective CON-5.2*:** Protect and maintain high quality vegetation communities within the Fairfax Planning Area.

Policy CON-5.2.1: Maintain and restore native vegetation where appropriate for habitat value, aesthetics, reference habitat, and riparian cover.

4.2.3 Impacts and Mitigation Measures

4.2.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact on aesthetics and visual resources if it would:

a) Have a substantial adverse effect on a scenic vista;

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;

c) Substantially degrade the existing visual character or quality of the site and its surroundings (including abrupt transitions in land use or visual disharmony with adjacent land uses) or conflict with adopted aesthetic or visual policies or standards;

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

4.2.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in the visual character or other aesthetic impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section.

Impacts to visual quality are generally assessed by estimating the amount of visual change introduced by Project elements, the degree to which visual changes may be visible to surrounding viewer groups, and the general sensitivity of viewer groups to landscape alterations. Visual changes are usually measured by three factors, described below:

- **Visual contrast** would be significant if it is strong as a result of regraded landforms, alteration or elimination of ridgelines, and changes introduced by a Project element that result in landscape colors, textures, and scale of visual elements that are inconsistent with Project surroundings.

- **View obstruction** would be considered significant if the Project component would obstruct foreground (0 to 0.5 mile) or middle-ground (0.5 to 3 miles) views of the "viewed area" seen from sensitive viewpoints. The viewed area is the area of landscape within the field of vision. The sensitive viewpoint is that from which a view of notable visual quality may be observed.

- **Degraded visual quality** would be considered significant if a Project element severely alters or displaces specific scenic resources composed of striking landform features, aesthetic water bodies, mature stands of native/cultural trees (e.g., historic hedgerows), or historic structures.

Visual impacts would be considered to be significant overall if any one of the three measures of significance is identified. Considering the limited duration of construction (less than the 12-month rule of thumb that many entities use as a threshold for aesthetic impacts from construction) and the relative lack of visibility of the Nursery Basin site, the Flood Control District has determined that temporary visual or aesthetic changes due solely to active construction activities and/or equipment or materials are not considered significant.

Two field reconnaissance surveys of the Project sites were conducted to inform this analysis. The first occurred on June 19, 2017, and the second was made on January 20, 2018.

4.2.3.3 Impacts and Mitigation Measures

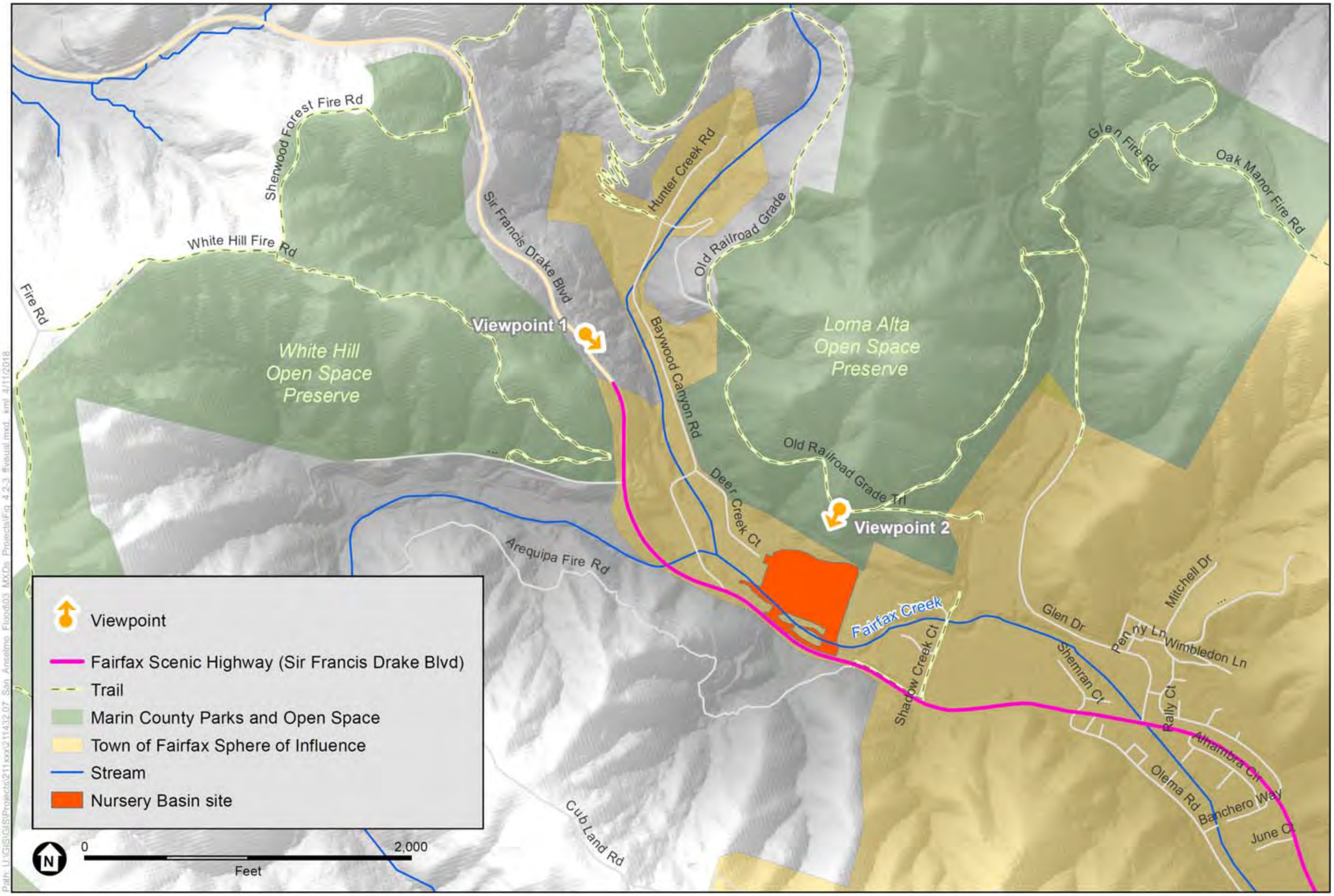
Impact 4.2-1: The Project would not have a substantial adverse effect on a publicly-accessible scenic vista. (*Less than Significant*)

Construction

Former Sunnyside Nursery Site Flood Diversion and Storage Basin

Construction of the Nursery Basin would involve vegetation removal, grading and other earthwork, concrete work, and related construction activities on most of the 7.7-acre site. The current visual character of the site includes remnants of the demolition of buildings on site and untended fields.

When seen from Viewpoints 1 and 2 (illustrated on **Figure 4.2-2**, below), the Nursery Basin site is not readily apparent. The Nursery Basin site, just west of the Town of Fairfax, is situated within the scenic vista from publicly-accessible viewpoints designated in the Town's General Plan along Sir Francis Drake Boulevard. During a field reconnaissance conducted on June 19, 2017, mature intervening vegetation along the roadway was found to obscure views from these designated viewpoints. A viewer would need to step off and beyond the well-established paved surface and into untended vegetation to have a clear view of the site. The view from Viewpoint 1 on Sir Francis Drake Boulevard is shown on **Figure 4.2-3**.



SOURCE: Marin County; National Hydrography Dataset

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 4.2-2
Map of Designated Scenic Roads and Viewpoints

ESA

Roadside vegetation obscuring distant views at Viewpoint 1 on Sir Francis Drake Boulevard west of the Town of Fairfax.

View from Viewpoint 1 looking southeast toward the former Sunnyside Nursery site. This view is obscured by the grassy vegetation and trees in the visual foreground; the site is not visible.

SOURCE: ESA

Figure 4.2-3
View Toward Former Sunnyside Nursery Site

When seen from Viewpoint 2 (illustrated on Figure 4.2-2), the Nursery Basin site would be within the middle-ground viewshed (0.5 to 3 miles) from the Old Railroad Grade Trail (Old White Hill Grade on some maps) to the north in the Loma Alta Open Space Preserve. As shown on **Figure 4.2-4**, the views of the site from this trail are very limited; to see it, one would have to leave the trail and step up onto the small rise at the southern edge of the trail. From this viewpoint, the site's surroundings would remain primarily wooded, although construction equipment could be barely visible from some viewpoints (primarily from off-trail locations). When considered with the broader scenic vista, the wooded surroundings would remain visually dominant. While the construction activity would be visible, the wooded surroundings would soften the appearance such that these activities would not detract from the scenic character or quality of the area. Also as noted above, construction activities would be temporary (several months at each site). Considering the current visual condition of this site, the presence of temporary construction activities would not change the site's visual character or quality in a substantial way. As noted above, temporary visual or aesthetic changes due solely to active construction activities and/or equipment or materials are not considered significant. Based on intervening vegetation and topographic features at viewpoints on Sir Francis Drake Boulevard and the limited area within the view from Loma Alta Open Space District, the impact of Nursery Basin construction on publicly-accessible scenic vistas would be less than significant.

Downtown San Anselmo

The creek capacity improvements and building removal in downtown San Anselmo would be limited in physical scale, when observed within the context of the broader, distant scenic vistas. When viewed from distant publicly-accessible viewpoints, the construction work involved with these activities would not be visually obvious. When seen from a distance, this site would be concealed in the visual blend of development and street trees. As noted above, temporary visual or aesthetic changes due solely to active construction activities and/or equipment or materials are not considered significant. The construction of these elements would have a less-than-significant impact on publicly-accessible scenic vistas.

Operation

All Project Elements

Upon completion of construction, disturbed areas at both Project sites would be cleaned, stabilized, and landscaped in accordance with the design plans. This may include replanting trees or other vegetation removed during construction, in accordance with applicable local heritage tree ordinances, the California Department of Fish and Wildlife's Lake and Streambed Alteration Agreement (as it regards riparian vegetation, including trees), or other permits issued for the Project. The Nursery Basin site would be revegetated with native and non-invasive grasses and oak bay woodland plantings. It is expected that when viewed from trails in the Loma Alta Open Space Preserve the Project would not be visually apparent, due to intervening vegetation or as a result of visually blending in with the wooded surroundings, as noted in the construction analysis above. Therefore, the change in visual context would not be expected to have a negative effect on the visual quality or character of the publicly-accessible scenic vista.

This photo shows the largest portion of the former Sunnyside Nursery site that is visible from Viewpoint 2 on the Old Railroad Grade Trail (yellow arrow); however, it was taken from a small rise that is off-trail, as shown in the photo below.

To obtain the view shown in the top photo, one must step off the trail onto the edge of the steep slope shown in the bottom photo.

SOURCE: ESA

Figure 4.2-4
View Toward Former Sunnyside Nursery Site from Old Railroad Grade Trail

After removal of the building at 634-636 San Anselmo Avenue and restoration of the creek in downtown San Anselmo, Project "operation" activities would be limited to creek maintenance activities, such as debris removal, replanting, and weed control. These activities would be temporary, limited in physical scale, concealed in the visual blend of development and street trees, and would not be visually obvious from distant viewpoints. The rebuilt sidewalk and pedestrian guardrail would be slight improvements to the current visual condition of the building's surroundings.

From distant viewpoints, the restored, post-construction appearance would be similar to its present condition. No change in the visual texture of the valley floor or opposing ridgelines would be evident. Any change in the visual quality and character of the Ross Valley, when viewed from publicly-accessible viewpoints, would not be noticeable. Therefore, the lasting visual impact of the completed Project elements on publicly-accessible scenic vistas would be less than significant.

Mitigation: None required.

Impact 4.2-2: The Project would not substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway. (*Less than Significant*)

As noted in the Setting discussion, the Towns of Fairfax and San Anselmo have designated scenic roadways and corridors within the Project area. These include:

- Fairfax: Sir Francis Drake Boulevard, Bolinas Road
- San Anselmo: Sir Francis Drake Boulevard, Red Hill Avenue, Center Boulevard

There are no Caltrans-designated scenic highways in Marin County. Likewise, the County has not designated any roadways in the Project area as scenic.

Construction

All Project Elements

The former Sunnyside Nursery site is situated in unincorporated Marin County, but within the Fairfax General Plan SOI limits along Sir Francis Drake Boulevard. Sir Francis Drake Boulevard is designated by the Town as a scenic roadway in this area. While access to this site directly from Sir Francis Drake Boulevard is physically possible, the site is not open to the public, and the access road from Sir Francis Drake Boulevard is gated. There are no publicly-accessible viewpoints such as turn outs or parking areas along this stretch of roadway which would offer sustained views of the site.

Although the design plans for the proposed Nursery Basin are intended to minimize tree removal, numerous trees and understory vegetation would necessarily be removed from the Project footprint (shown on Figure 3-9 in Chapter 3) adjacent to Sir Francis Drake Boulevard between the roadway and interior of the site. The vegetation removal would be needed to accommodate the diversion structure, side-weir, bank protection features, and the proposed floodwall. Removal of the trees would create limited views of some Project elements, including the diversion structure and the top of the floodwall at elevation 238 feet NAVD88. At the eastern end of the Project site, the flood wall would extend 2 to 3 feet above the top of the Sir Francis Drake roadway, which ranges from elevation 235 feet NAVD88 at the eastern end to elevation 240 feet at the western end. The tree removal would also allow a limited view into the interior of the site itself. However, the rest of the Project site would continue to be screened by the trees that would be preserved between the proposed floodwall and the basin (i.e., riparian canopy associated with the creek). Views from vehicles traveling on the roadway would be fleeting and momentary. Considering the above factors, the visual impact of this element would be less than significant.

The Downtown San Anselmo element is in close proximity to the three Town-designated scenic roadways identified above. Vegetation removal and building demolition would be visible from an approximately 850-foot section of Center Boulevard from its intersection with San Anselmo and Sycamore avenues to the west and with Sir Francis Drake Boulevard and Red Hill Road on the east. These activities would be most evident to passing viewers in vehicles waiting at traffic signals. Otherwise, the view of the site from vehicles would be fleeting and momentary. As noted above, temporary visual or aesthetic changes due solely to active construction activities and/or equipment or materials are not considered significant. The visual impact of this Project element from a designated scenic highway would be less than significant.

Operation

All Project Elements

Upon completion of construction, disturbed areas at all Project sites would be cleaned, stabilized, and landscaped per design plans. This may include replanting trees or other vegetation removed during construction, as required by the various environmental permits.

As noted above, most of the Nursery Basin site is not clearly visible from Sir Francis Drake Boulevard, a designated scenic highway. The site's interior would be revegetated with native grasses and its perimeter with oak bay woodland plantings. It is expected that the condition viewed from this designated scenic highway would not be readily visually apparent due to intervening vegetation across much of the southern boundary and the visual consistency of the replanting and landscaping on the site. The limited and fleeting views of the diversion structure, flood wall, and interior of the site would be as described above. Therefore, the change in visual context would not be expected to have a negative effect on the visual quality or character of the view from Sir Francis Drake Boulevard.

For the Downtown San Anselmo element, the Project in its "operational" phase would include restored channel bottoms, native plantings on the terraced floodplain, and installation of retaining walls and sidewalk areas at top-of-bank. While passing motorists on Center Boulevard would typically not have the opportunity to notice the improvements, bicyclists and pedestrians would have the opportunity for longer viewing experiences along this stretch of designated scenic highway. With maturation of the restoration plantings along the creek and in Creek Park, the visual character of the site, as viewed from Center Boulevard and other roads, would return to the current park-like setting. This would not be a significant adverse alteration of the area's visual character or quality viewed from the designated scenic highway. The permanent change in visual character and quality attributable to the creek capacity improvement elements would therefore be less than significant.

Mitigation: None required.

Impact 4.2-3: The Project would neither substantially degrade the existing visual character or quality of the Project sites and their surroundings, including alteration of the built environment or land use patterns, nor conflict with adopted aesthetic or visual policies or standards. (*Less than Significant*)

The visual character of the valley floor is that of well-established small town centers surrounded primarily by single-family residential neighborhoods. This primarily residential development pattern is also found on the lower slopes of the hillsides and ridges that visually define the Project area. Most of this development is visually softened by the proliferation of street trees throughout San Anselmo and Fairfax. Additionally, Fairfax and San Anselmo Creeks are primarily lined with mature riparian vegetation, although various types of bank revetment or flood walls may be seen. San Anselmo Creek flowing through downtown San Anselmo is also bounded or bridged by commercial buildings. As these visual elements are well-established, the visual quality of the areas surrounding the Project components is considered moderate. A review of the adopted policies or standards in Section 4.2.2, *Regulatory Setting* indicates that the Project would not conflict with any of those policies or standards.

Construction

Nursery Basin

The existing visual elements at the former Sunnyside Nursery site include one residential building, remnants of the former nursery operational buildings, and untended fields. In their unused state, they give the site a low visual quality. However, the site is visually screened from immediately surrounding areas by intervening vegetation or topography. During construction, the diversion structure and floodwall would be partially and briefly visible from passing vehicles on Sir Francis Drake Boulevard. As noted above, the visual and aesthetic aspects of construction actions are considered less than significant. While the construction of the floodwall and side-weir would remove some of the intervening vegetation, the remaining vegetation would continue to screen views of the site during the wet season. Given the preservation of much of the intervening vegetation on the roadway side of Fairfax Creek, Project construction would not substantially alter the visual character and moderate visual quality of the area surrounding the Nursery Basin; therefore, the impact would be less than significant.

Downtown San Anselmo

The Downtown San Anselmo element would remove the building at 634-636 San Anselmo Avenue, remove vegetation and debris from the creek channel, and regrade and stabilize the channel. All of this work would be visually evident from adjacent or nearby streets, trails, neighborhoods, and commercial establishments (e.g., restaurants). As noted above, these existing visual elements provide a well-established visual character and give the area a moderate visual quality. The presence of equipment, workers, debris, etc., would provide a temporarily sharp contrast to the visual environment in the downtown area.

However, as noted above in the Approach to Analysis discussion, the temporary construction activities would not be considered significant visual or aesthetic impacts. The demolition of the structure at 634-636 San Anselmo Avenue and restoration of that site would be completed within a short time span (i.e., four to six months) to minimize the disruption to the surrounding downtown area to the greatest extent possible. Given the temporary nature of these construction activities, it is anticipated that they would not substantially change the existing visual character of the surrounding area. Although there would be a temporary visual change, the visual quality would remain moderate and the impact, therefore, would be less than significant.

Operation

Former Sunnyside Nursery Site Flood Diversion and Storage Basin

After construction of the Nursery Basin is completed, exposed areas would be revegetated with native ground cover and plantings tolerant of periodic inundation and would blend in with the surrounding existing riparian and forest vegetation. This site would still be screened from publicly-accessible viewpoints by existing intervening mature vegetation and topography as well as the revegetation efforts. Therefore, there would be no change in the visual aspects of the land use patterns. The change in visual context of the Nursery Basin site would not have a negative effect on the visual quality or character of the site. Based on the Project's revegetation and restoration commitments, the potential permanent visual impact attributable to the Nursery Basin would be less than significant.

Downtown San Anselmo

Upon completion of construction, disturbed areas at Project sites would be stabilized, replanted, or restored. For the Downtown San Anselmo element, this would include restoration of the channel, native plantings on the terraced floodplain, installation of retaining walls, and patio/sidewalk areas at top-of-bank. While passing motorists would typically not have the opportunity to notice the improvements from area roadways, bicyclists and pedestrians would have the opportunity for longer viewing experiences. The site would be restored in a manner that would not detract from the visual character of downtown San Anselmo. The appearance and visual lines remaining in the area's streetscape, as well as the land use patterns in the area, would not be substantially altered. In fact, this site would provide a visual linkage across San Anselmo Creek to Creek Park. This would not be considered a significant adverse alteration of the area's visual character or quality. The permanent change in visual character and quality attributable to the creek capacity improvement elements would be considered less than significant.

Mitigation: None required.

Impact 4.2-4: The Project would not create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area. (*Less than Significant*)

Daytime sources of glare in the Project area include reflections from light-colored surfaces, windows, and vehicles. The primary sources of night-time (i.e., after dusk, before dawn) light and glare in the vicinity including street and parking lot lighting, vehicular headlights, commercial signage, security lighting, and external lighting in residential areas. Shading in the Project area is primarily provided by vegetation (e.g., street trees, riparian vegetation) and buildings. Potential receptors sensitive to daytime glare, night-time light trespass and glare, and shadow in the Project area include residences, parks, and other places of public congregation.

Construction

All Project Elements

The primary source of light or glare during construction associated with Project elements would be from vehicles and equipment (e.g., windshields, welding). The materials anticipated to be used during construction, such as cement or rip-rap, would not be expected to produce reflective glare. Glare from construction equipment and vehicles would be intermittent and fleeting depending on sky conditions and equipment use and movement. Because these activities would primarily occur during the typical work day (i.e., 8:00 a.m. to 6:00 p.m., Monday through Friday), the number of receptors affected is anticipated to be low.

No night-time work is anticipated, thus, no receptors would be exposed to nighttime lighting. The Project would comply with Marin County Code, or Fairfax or San Anselmo code requirements, for construction hours (see Section 4.11 *Noise* for the specific codes). Though special situations may arise where construction might extend into the evening, the proper permits would be obtained for the construction. Additionally, although construction of these components would occur concurrently, they are distant enough from one another that they would not have an additive lighting effect if nighttime construction were to occur. Any work would be short-term and thus any impact associated with the work would be less than significant.

By complying with County or Town codes related to construction hours, the Project would not adversely affect day or nighttime views in the area. Therefore, this impact would be less than significant.

Operation

All Project Elements

Given the nature of the Project elements, they would not be expected to inherently generate light, glare, or shadow beyond the extent that currently exists in the Project area. The Downtown San Anselmo element involves the clearing of flow impediments within the channel of San Anselmo Creek (including building demolition) and the restoration or stabilization of these areas with natural and visually inert materials. Current Project design does not include the replacement or installation of street lighting. If street lighting is included as a future part of the Project, the lighting fixtures would be required to comply with Title 24 lighting standards, as explained in

Section 4.2.2, *Regulatory Setting* of this analysis. Therefore, it is expected that any lighting fixtures would include shades or other shielding devices in accordance with Title 24 to direct light downward to street level and not into the night sky. There are no elements associated with the Downtown San Anselmo site that would produce light trespass, reflective glare, or shadow in areas that would affect human habitation beyond that which currently exists.

Likewise, the Nursery Basin site would be revegetated and reserved solely for flood control use (i.e., with no human habitation or other use). Therefore, it would not be equipped with lighting.

None of the Project elements are anticipated to include structures that would cast shadow in areas where none currently exists. Rather, the structure removal associated with the Downtown San Anselmo element would increase the amount of natural light in the immediate area.

Based on this analysis, operation of the Project elements would create a less-than-significant impact due to light, glare, or shadow.

Mitigation: None required.

4.2.4 References – Aesthetics and Visual Resources

California Energy Commission, *2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings*, Title 24, Part 6, and Associated Administrative Regulations in Part 1, June 2015.

Fairfax, Town of, *Town of Fairfax General Plan, Open Space Element,* Figure OS-1, December 1, 2010. Available online http://www.town-of-fairfax.org/html/general_plan.html. Accessed on June 17, 2017.

Marin, County of, *Marin Countywide Plan*, Adopted November 6, 2007. Available online http://www.marincounty.org/depts/cd/divisions/planning/2007-marin-countywide-plan/plans-and-documents. Accessed on June 17, 2017.

San Anselmo, Town of, *Town of San Anselmo General Plan*, last amended November 3, 2015. Available online http://www.townofsananselmo.org/index.aspx?NID=79. Accessed on June 17, 2017.

4.3 Air Quality and Greenhouse Gas Emissions

This section describes and evaluates issues related to air quality and greenhouse gas (GHG) emissions in the context of the proposed San Anselmo Flood Risk Reduction Project (Project). The section provides an introduction to criteria air pollutants, toxic air contaminants (TACs), and GHG emissions; the physical and regulatory setting, including pertinent regulations at the federal, state, and local levels; the criteria used for determining the significance of environmental impacts; and potential impacts and appropriate mitigation measures associated with the construction, implementation, and operation of the Project.

4.3.1 Background

4.3.1.1 Air Quality

Criteria Air Pollutants

The U.S. Environmental Protection Agency (USEPA) has identified criteria air pollutants that are a threat to public health and welfare. These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet specific public health and welfare criteria (see Section 4.3.3, Regulatory Setting, below). Below are descriptions of criteria pollutants identified by USEPA.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and that can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NO_X). ROG and NO_X are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately 3 hours.

Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of ROG and NO_X under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds like ozone.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is an air quality pollutant of concern because it acts as a respiratory irritant. NO_2 is a major component of the group of gaseous nitrogen compounds commonly referred to as NO_X. A precursor to ozone formation, NO_X is produced by fuel combustion in motor vehicles, industrial stationary sources (such as refineries, power plants, and chemical manufacturing facilities), ships, aircraft, and rail transit. Typically, NO_X emitted from fuel combustion is in the form of nitric oxide (NO) and NO_2, with the vast majority (95 percent) of the

NO_X emissions being comprised of NO. NO is converted to NO_2 in the atmosphere when it reacts with ozone or undergoes photochemical reactions.

Carbon Monoxide

Carbon monoxide (CO) is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter when periods of light winds combine with the formation of ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Particulate Matter

Particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) represent fractions of particulate matter that can be inhaled into air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. According to a study prepared by the California Air Resources Board (CARB), exposure to ambient $PM_{2.5}$, particularly diesel particulate matter (DPM), can be associated with approximately 14,000 to 24,000 premature annual deaths statewide (CARB, 2009a). Particulate matter also can damage materials and reduce visibility.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, acidic gas with a strong odor. It is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. SO_2 has the potential to damage materials and can cause health effects at high concentrations. It can irritate lung tissue and increase the risk of acute and chronic respiratory disease (BAAQMD, 2017a). Pollutant trends suggest that the San Francisco Bay Area Air Basin (SFBAAB) currently meets and will continue to meet the federal and State standards for SO_2 for the foreseeable future.

In 2010, the USEPA implemented a new 1-hour SO_2 standard, which is presented in Table 4.3-4. The USEPA initially designated the SFBAAB as an attainment area for SO_2. Similar to the new Federal standard for NO_2, the USEPA established requirements for a new monitoring network to measure SO_2 concentrations beginning in January 2013 (USEPA, 2010). No additional SO_2 monitors are required for the Bay Area because the SFBAAB has never been designated as non-attainment for SO_2 and no State implementation plans or maintenance plans have been prepared for SO_2 (BAAQMD, 2014).

Lead

Leaded gasoline (phased out in the United States beginning in 1973), paint (on older houses, cars), smelters (metal refineries), and manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has a range of adverse neurotoxic health effects, which put children at special risk. Some lead-containing chemicals cause cancer in animals. Lead levels in the air have decreased substantially since leaded gasoline was eliminated.

Ambient lead concentrations are only monitored on an as-warranted, site-specific basis in California. On October 15, 2008, the USEPA strengthened the national ambient air quality standard for lead by lowering it from 1.50 $\mu g/m^3$ to 0.15 $\mu g/m^3$ on a rolling 3-month average. The USEPA revised the monitoring requirements for lead in December 2010.[1] These requirements focus on airports and large urban areas resulting in an increase in 76 monitors nationally. Lead monitoring stations in the Bay Area are located at Palo Alto Airport, Reid-Hillview Airport (San Jose), and San Carlos Airport. Non-airport locations for lead monitoring are in Redwood City and San Jose.

4.3.1.2 Toxic Air Contaminants

TACs are airborne substances that are capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer-causing) adverse human health effects (i.e., injury or illness). TACs include both organic and inorganic chemical substances. They may be emitted from a variety of common sources including gasoline stations, automobiles, dry cleaners, industrial operations, and painting operations. The current California list of TACs includes approximately 200 compounds, including DPM emissions from diesel-fueled engines, which was identified as a TAC by CARB in 1998 (CARB, 2011).

4.3.1.3 Greenhouse Gases and Climate Change

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation and storms. Historical records indicate that global climate changes have occurred in the past due to natural phenomena; however, current data increasingly indicate that the current global conditions differ from past climate changes in rate and magnitude. Global climate change attributable to anthropogenic (human) GHG emissions is currently one of the most important and widely debated scientific, economic and political issues in the United States and the world. The extent to which increased concentrations of GHGs have caused or will cause climate change and the appropriate actions to limit and/or respond to climate change are the subject of significant and rapidly evolving regulatory efforts at the federal and state levels of government.

The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, there remain significant scientific uncertainties in, for example, predictions of local effects of climate change, occurrence, frequency, and magnitude of extreme weather events,

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1 USEPA *Fact Sheet Revisions to Lead Ambient Air Quality Monitoring Requirements*. Available online at http://www3.epa.gov/airquality/lead/pdfs/Leadmonitoring_FS.pdf. Accessed January 19, 2016.

effects of aerosols, changes in clouds, shifts in the intensity and distribution of precipitation, and changes in oceanic circulation. Due to the complexity of the Earth's climate system and inability to accurately model it, the uncertainty surrounding climate change may never be completely eliminated. Nonetheless, the IPCC's *Fifth Assessment Report, Summary for Policy Makers* states that, "it is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forces together" (IPCC 2014). A report from the National Academy of Sciences concluded that 97 to 98 percent of the climate researchers most actively publishing in the field support the tenets of the IPCC in that climate change is very likely caused by human (i.e., anthropogenic) activity (Anderegg et. al 2010).

Some of the effects of global warming in California are likely to include loss of snowpack, reduced water availability, declining crop yields, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, more drought years, increased erosion of California's coastlines and sea water intrusion into the Sacramento and San Joaquin Deltas and associated levee systems, and increased pest infestation (CARB, 2009b; USEPA 2016; California Environmental Protection Agency 2006). Globally, climate change has the potential to adversely affect numerous environmental resources through potential, though uncertain, impacts related to future air temperatures and precipitation patterns. According to the International Panel on Climate Change (IPCC), the projected effects of global warming on weather and climate are likely to vary regionally, but are expected to include the following direct effects (IPCC, 2013):

1. Warmer and/or fewer cold days and nights over most land areas;
2. Warmer and/or more frequent hot days and nights over most land areas;
3. Warm spells/heat waves. Frequency and/or duration increases over most land areas;
4. Heavy precipitation events. Increase in the frequency, intensity, and/or amount of heavy precipitation;
5. Increase in intensity and/or duration of drought;
6. Increase in intense tropical cyclone activity; and
7. Increased incidence and/or magnitude of extreme high sea level.

Also, there are many secondary effects projected to result from climate change, including global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity. While the possible outcomes and the feedback mechanisms involved are not fully understood and much research remains to be done, the potential for substantial environmental, social, and economic consequences over the long term may be great.

GHG emissions include primarily carbon dioxide (CO_2), with much smaller amounts of nitrous oxide (N_2O) and methane (CH_4), often from unburned natural gas. Other sources of GHG emissions include sulfur hexafluoride (SF_6) from high voltage power equipment and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. Because different GHGs have different warming potential (i.e., the amount of heat trapped by a certain mass of a GHG), and CO_2 is the most common reference gas for climate change, GHG emissions often are quantified and reported in carbon dioxide-equivalent (CO_2e) emissions.

For example, SF_6, while representing a small fraction of the total GHGs emitted annually worldwide, is a very potent GHG with 22,800 times the global warming potential of CO_2 (IPCC, 2007) on a per mass basis. Therefore, an emission of 1 metric ton of SF_6 would be reported as an emission of 22,800 metric tons CO_2e. Large emission sources are reported in million metric tons of CO_2e.

The global warming potentials (GWP) of CH_4 and N_2O are 25 times and 298 times that of CO_2, respectively (IPCC, 2007).[2] These GWP ratios are provided by the IPCC. Historically, GHG emission inventories have been calculated using the GWPs from the IPCC's Second Assessment Report (SAR). The IPCC updated the GWP values based on the latest science in its Fourth Assessment Report (AR4). The updated GWPs in the IPCC AR4 have begun to be used in recent GHG emissions inventories. By applying the GWP ratios, project-related CO_2e emissions can be tabulated in metric tons per year. Typically, the GWP ratio corresponding to the warming potential of CO_2 over a 100-year period is used as a baseline.

Carbon Dioxide (CO_2): CO_2 is the most abundant GHG in the atmosphere and is primarily generated from fossil fuel combustion from stationary and mobile sources.

Methane (CH_4): CH_4 is emitted from biogenic sources (i.e., resulting from the activity of living organisms), incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. The GWP of CH_4 is 21 in the IPCC SAR and 25 in the IPCC AR4.

Nitrous Oxide (N_2O): N_2O produced by human-related sources including agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of N_2O is 310 in the IPCC SAR and 298 in the IPCC AR4.

Hydrofluorocarbons (HFCs): HFCs are fluorinated compounds consisting of hydrogen, carbon, and fluorine. They are typically used as refrigerants in both stationary refrigeration and mobile air conditioning systems. The GWPs of HFCs ranges from 140 for HFC-152a to 11,700 for HFC-23 in the IPCC SAR and 124 for HFC-152a to 14,800 for HFC-23 in the IPCC AR4.

Perfluorocarbons (PFCs): PFCs are fluorinated compounds consisting of carbon and fluorine. They are primarily created as a byproduct of aluminum production and semiconductor manufacturing. The GWPs of PFCs range from 6,500 to 9,200 in the IPCC SAR and 7,390 to 17,700 in the IPCC AR4.

Sulfur Hexafluoride (SF_6): SF_6 is a fluorinated compound consisting of sulfur and fluoride. It is a colorless, odorless, nontoxic, nonflammable gas. It is most commonly used as an electrical insulator in high-voltage equipment that transmits and distributes electricity. SF_6 has a GWP of 23,900 in the IPCC SAR and 22,800 in the IPCC AR4.

2 The California Air Resources Board (CARB) reports GHG emission inventories for California using the GWP values from the IPCC AR4. Although the IPCC has released AR5 with updated GWPs, ARB has not yet updated the statewide GHG inventory or the scoping plan with the AR5 GWPs.

Source of Greenhouse Gas Emissions

There are two general sources of GHG emissions, anthropogenic and biogenic.

Anthropogenic GHG emissions derive from the combustion of fossil fuels. Energy-related CO_2 emissions, resulting from fossil fuel exploration and use, account for approximately 85 percent of the human-generated GHG emissions in the United States, primarily in the form of CO_2 emissions from burning fossil fuels (USEPA, 2017). Anthropogenic emissions also include by-products of certain human-managed biological processes, such as anaerobic decomposition of organic waste in landfills, wastewater treatment, and treatment of wastes from confined animal facilities such as dairies.

Biogenic GHG emissions are derived from natural sources, including the natural decomposition of biomass[3] and combustion of biomass or biomass-derived fuels.

The distinction between anthropogenic and biogenic sources of GHG emissions is important because these sources have different impacts on the global carbon cycle. Carbon in fossil fuel reservoirs, such as coal seams and oil and gas deposits, was removed from the atmosphere by plants over millions of years. Through geologic processes, this carbon accumulated in deposits and was isolated from the active carbon cycle. Without human intervention, fossil-fuel carbon would remain isolated from the active carbon cycle into the future. Through extraction and combustion of fossil fuels, humans release this carbon, increasing the total amount of carbon in the atmosphere and in the active carbon cycle (USEPA, 2011).

In contrast to fossil-fuel carbon, carbon present in biomass is cycling through the atmosphere and global carbon cycle on a much faster scale. For example, over the course of a year, carbon removed from the atmosphere by growing corn is released back into the atmosphere through the harvest, and subsequent combustion or decomposition of the corn biomass. Over short time scales, the mass of carbon released by the decomposition of biomass will generally equal the mass of carbon taken up by living organisms. Because biogenic carbon is constantly being released and taken up in the carbon cycle, biogenic CO_2 emissions do not act to increase the total amount of carbon in the atmosphere in the same way as the release of carbon from fossil fuels (USEPA, 2011).

Of these, for the San Anselmo Flood Risk Reduction Project EIR analysis, the anthropogenic emissions are more important, as they are the ones that would be emitted by the construction equipment used to implement the Project's flood risk reduction elements. The biogenic GHG emissions from the Project would be negligible.

[3] Biomass is non-fossilized organic matter from plants, animals, and microorganisms, including products, byproducts, and wastes from agriculture, forestry and related industries, as well as the non-fossilized biodegradable fractions of industrial and municipal wastes, including gases and liquids recovered from its decomposition.

4.3.2 Physical Setting

4.3.2.1 Regional Topography, Meteorology, and Climate

The potential for high pollutant concentrations developing at a given location depends upon the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind, and the ability of the atmosphere to disperse the contaminated air. The atmospheric pollution potential, as the term is used here, is independent of the location of emission sources and is instead a function of factors such as topography and meteorology.

The Project would take place in Ross Valley, which is a 28-square mile watershed in the southeastern portion of Marin County in the San Francisco Bay Area. The Project would occur in two locations: one in the upper portion of the Fairfax Creek subwatershed and one in downtown San Anselmo, along San Anselmo Creek in the subwatershed of the same name. The climate of the greater San Francisco Bay Area, including Marin County, is a Mediterranean-type climate characterized by warm, dry summers and mild, wet winters. The climate is determined largely by a high-pressure system that is often present over the eastern Pacific Ocean off the West Coast of North America. In winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the region. During the winter rainy periods, inversions are weak or nonexistent, winds are often moderate and air pollution potential is very low. During winter periods when the Pacific high becomes dominant, inversions become strong and often are surface-based; winds are light and pollution potential is high. These periods are characterized by winds that flow out of the Central Valley into the Bay Area and often include tule fog. The air pollution potential is lowest for those regions closest to the San Francisco Bay, due largely to good ventilation and less influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally results in elevated pollutant levels. Wind flow patterns are controlled by air circulation in the atmosphere, which is affected by air pressure and the variable topography of the coastal areas adjacent to the San Francisco Bay (BAAQMD, 2017a).

Marin County is bounded on the west by the Pacific Ocean, on the east by San Pablo Bay, on the south by the Golden Gate, and on the north by the Petaluma Gap. Most of Marin's population lives in the eastern part of the county, in small, sheltered valleys. These valleys act like a series of miniature air basins. Although there are a few mountains above 1,500 feet, most of the terrain is only 800 to 1,000 feet high, which usually is not high enough to block the marine layer. In southern Marin, the distance from the ocean is short and elevations are lower, resulting in higher incidence of maritime air in the area. Wind speeds are highest along the west coast of Marin, averaging about 8 to 10 miles per hour. The complex terrain in central Marin creates sufficient friction to slow the air flow. The prevailing wind directions throughout Marin County are generally from the northwest. In the summer months, areas along the coast are usually subject to onshore movement of cool marine air. In the winter, proximity to the ocean keeps the coastal regions relatively warm, with temperatures varying little throughout the year. Coastal temperatures are usually in the high-50's in the winter and the low-60's in the summer. The warmest months tend to be September and October. The eastern side of Marin County has warmer weather than the western side because of its distance from the ocean and because the hills that separate eastern Marin from western Marin occasionally block the flow of the marine air. The temperatures of cities next to the Bay are moderated by the cooling effect of the Bay in the summer and the warming effect of the Bay in the winter. For example, San Rafael experiences average maximum summer temperatures in the low-80's and average minimum winter temperatures in the low-40‘s (BAAQMD, 2017a).

Air pollution potential is highest in eastern Marin County, where most of population is located in semi-sheltered valleys. In the southeast, the influence of marine air keeps pollution levels low. As development moves further north, there is greater potential for air pollution to build up because the valleys are more sheltered from the sea breeze. While Marin County does not have many polluting industries, the air quality on its eastern side, especially along the U.S. 101 corridor, is affected by emissions from increasing motor vehicle use within and through the county.

4.3.2.2 Existing Air Quality

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network of air quality monitoring stations to measure the ambient concentrations of criteria pollutants. Existing levels of air pollutants in the study area can be inferred from ambient air quality measurements conducted by BAAQMD at its stations within and close to the Project area. The monitoring station that best represents the air quality in the Project area is located at 534 4th Street in San Rafael. **Table 4.3-1** shows a 5-year (2012 through 2016[4]) summary of data collected at this station for ozone, PM_{10}, $PM_{2.5}$, and NO_2. The table also compares the data to the California Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS).

As shown in Table 4.3-1, there were no exceedances of State and national ozone standards between 2012 and 2016. The 24-hour State PM_{10} standard was exceeded once over the 5 years, but there were no exceedances of the 24-hour national PM_{10} standard or the State annual average PM_{10} standard. The national 24-hour $PM_{2.5}$ standard was exceeded five times between 2013 and 2015. There were no measured exceedances of the annual average State or national $PM_{2.5}$ standards, or the NO_2 State standard. CO, SO_2, and lead were not monitored at the San Rafael station over the 5-year study period; however, concentrations of these pollutants are expected to be well below standards in the Project area.

4.3.2.3 Sensitive Receptors

For the purposes of air quality analysis, sensitive receptors are defined as facilities and land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples include residential areas, schools, hospitals, and daycare centers. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions sources, and/or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of

[4] The 2017 data are not yet available, as there is generally a 6-month data processing delay following the end of each calendar year.

TABLE 4.3-1
AIR QUALITY DATA SUMMARY (2012–2016) FOR THE PROJECT AREA

Pollutant	Monitoring Data by Year				
	2012	**2013**	**2014**	**2015**	**2016**
Ozone					
Highest 1-Hour Average (ppm)	0.076	0.081	0.088	0.081	0.088
Days over State Standard (0.09 ppm)	0	0	0	0	0
Highest 8-Hour Average (ppm)	0.057	0.069	0.068	0.070	0.067
Days over State Standard (0.070 ppm)	0	0	0	0	0
Days over National Standard (0.070 ppm)	0	0	0	0	0
Respirable Particulate Matter (PM_{10})					
Highest 24-Hour Average - State (µg/m^3)	37.1	**54.4**	40.9	42.0	27.0
Measured Days over State 24-Hour Standard (50 µg/m^3)	0	**1**	0	0	0
Highest 24-Hour – Average - National (µg/m^3)	36.1	51.5	39.0	42.2	26.6
Measured Days over National 24-Hour Standard (150 µg/m^3)	0	0	0	0	0
State Annual Average (Standard: 20 µg/m^3)	13.3	15.6	14.1	16.1	13.8
Fine Particulate Matter ($PM_{2.5}$)					
Highest 24-Hour Average (µg/m^3)	26.5	**44.9**	**38.1**	**36.3**	15.6
Measured Days over National Standard (35 µg/m^3)	0	**2**	**1**	**2**	0
State Annual Average (Standard: 12 µg/m^3)	--	--	10.8	--	--
National Annual Average (Standard: 12.0 µg/m^3)	8.0	10.7	10.7	8.7	6.5
Nitrogen Dioxide (NO_2)					
Highest Hourly Average (ppm)	0.052	0.049	0.062	0.044	0.045
Measured Days over State Standard (0.18 ppm)	0	0	0	0	0
Measured Days over National Standard (0.1 ppm)	0	0	0	0	0

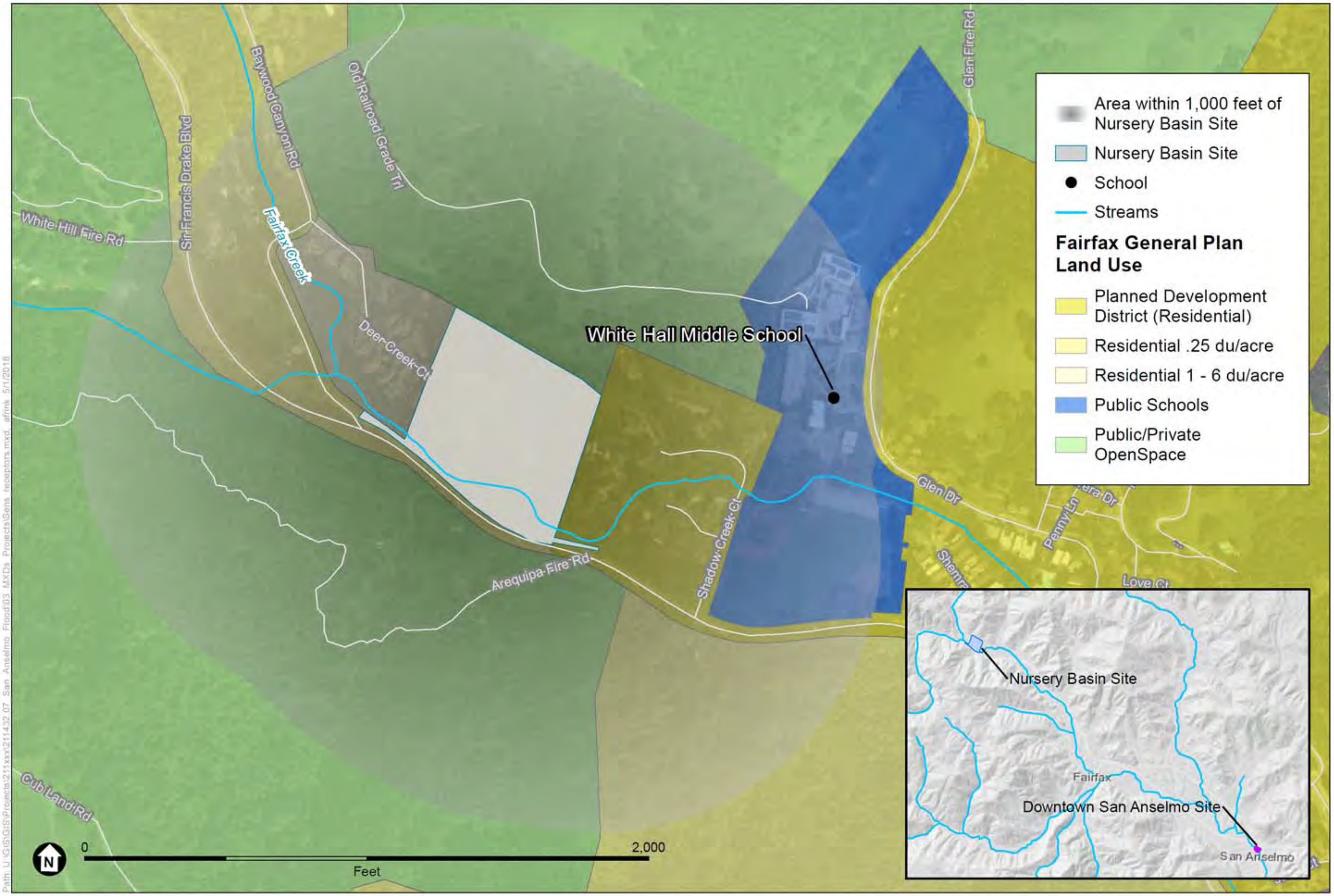
NOTES:
--- indicates that data are not available. Measurements are from the monitoring station at 534 4th Street in San Rafael.
ppm = Parts per million
µg/m^3 = Micrograms per cubic meter
bold text = exceedance concentration or number of days over a standard

SOURCE: CARB, 2017a.

time, which results in greater exposure to ambient air quality. Sensitive receptors in the Project area include residential neighborhoods and schools in the Town of San Anselmo and the unincorporated Marin County, just outside of the Town of Fairfax.

Sensitive land uses within 1,000 feet of each of the two Project sites are shown in **Figure 4.3-1a**, Sensitive Receptor Locations Nearest to the Nursery Basin Site, and **Figure 4.3-1b**, Sensitive Receptor Locations Nearest to the Downtown San Anselmo Site, and include the following:

1. Single-family residences located immediately east of the former Sunnyside Nursery property, which is the parcel on which the flood diversion and storage (FDS) basin would be constructed. (This Project's name for that FDS basin is "the Nursery Basin".)
2. Single-family residences located immediately west of the Nursery Basin site.
3. Single-family residences located approximately 150 feet south of the Nursery Basin site (across Sir Francis Drake Boulevard).

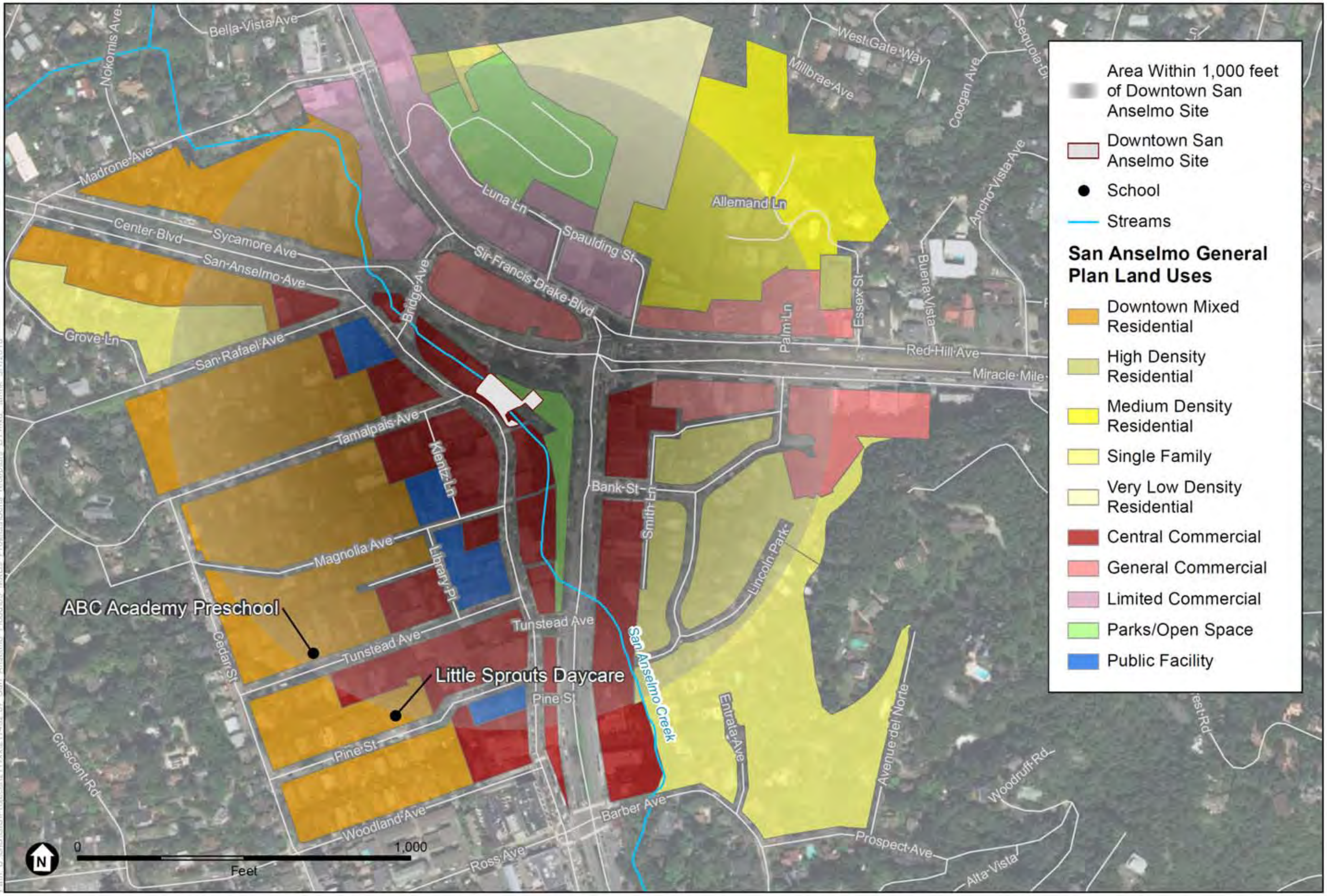


SOURCE: ESA

San Anselmo Flood Risk Reduction Project

Figure 4.3-1a
Sensitive Receptor Locations Nearest to the Project Site
Nursery Basin Site

ESA



SOURCE: ESA

San Anselmo Flood Risk Reduction Project

Figure 4.3-1b
Sensitive Receptor Locations Nearest to the Project Site
Downtown San Anselmo

ESA

4. Single-family residences located approximately 100 feet to the west of the Downtown San Anselmo site (across San Anselmo Avenue).
5. Single-family residences located approximately 300 feet to the east of the Downtown San Anselmo site (across Sir Francis Drake Boulevard).
6. Single-family residences located approximately 450 feet to the northwest of the Downtown San Anselmo site (across Sir Francis Drake Boulevard).
7. Single-family residences located approximately 600 feet to the northeast of the Downtown San Anselmo site (across Red Hill Avenue).
8. The White Hall Middle School located approximately 650 feet to the east of the Nursery Basin site.
9. ABC Academy Preschool located approximately 800 feet to the southwest of the Downtown San Anselmo site.
10. Little Sprouts Daycare located approximately 950 feet to the south of the Downtown San Anselmo site.

All other air quality sensitive receptors are located at greater distances from the Project sites and would be less impacted by Project emissions.

4.3.2.4 Existing GHG Emissions

Anthropogenic GHG emissions in the United States are derived mostly from the combustion of fossil fuels for transportation and power production. The total national anthropogenic GHG emissions in 2015 were approximately 6,587 million metric tons of CO_2e. Energy-related CO_2 emissions resulting from fossil fuel exploration and use account for more than three-quarters of the human-generated GHG emissions, primarily in the form of CO_2 emissions from burning fossil fuels. 29 percent of the GHG emissions were generated from electricity production, such as power plants; 27 percent from transportation, 21 percent from industrial processes while the remaining sources include, agriculture, forestry, residential and commercial uses, and waste management (USEPA, 2017).

Statewide emissions of GHG from relevant source categories for 2011 through 2015 are summarized in **Table 4.3-2**. In 2015, California produced 440.36 million metric tons of CO_2e emissions; Table 4.3-2 shows the percentages of GHG contributions by category for that year. Transportation was the source of 39 percent of the state's GHG emissions, followed by industrial sources at 23 percent, electricity generation at 19 percent, commercial and residential sources at 11 percent, and other sources comprising the remaining 8 percent.

In 2012, Marin County generated 477,456 metric tons of CO_2e emissions with 35 percent coming from transportation, 35 percent from residential and non-residential building energy, 23 percent from agriculture, and the remaining from off-road vehicles and equipment, solid waste generation, water conveyance, and wastewater treatment. GHG emissions from jurisdictions within the Project area are shown in **Table 4.3-3** below. These are the most recent GHG inventories available for each jurisdiction in the region that has conducted an inventory. Most of these jurisdictions don't measure their emissions on a regular basis.

TABLE 4.3-2
CALIFORNIA GREENHOUSE GAS EMISSIONS (MILLION METRIC TONS CO_2E)

Emission Inventory Category	2011	2012	2013	2014	2015	
Transportation	164.7	164.38	163.05	164.89	169.38	38.5%
Industrial	101.08	101.46	104.27	104.69	102.97	23.4%
Electricity Generation	88.3	95.33	89.84	88.37	84.09	19.1%
Residential	32.03	30.04	31.19	26.26	26.93	6.1%
Commercial	20.73	21.11	21.64	21.37	22.17	5%
Agriculture & Forestry	35.28	36.42	34.93	36.03	34.65	7.8%
Other	0.25	0.24	0.18	0.24	0.17	<0.1%
Total Gross Emissions	**442.37**	**448.98**	**445.1**	**441.85**	**440.36**	**100%**

SOURCE: CARB, 2017b.

TABLE 4.3-3
GREENHOUSE GAS EMISSIONS WITHIN MARIN COUNTY (MILLION METRIC TONS CO_2E)

Emission Inventory Category	Marin County (2012)	Larkspur (2005)	Corte Madera (2013)	Fairfax (2010)	Ross (2005)	San Anselmo (2005)
Residential	111,484	23,746	15,204	13,472	8,239	23,850
Industrial/Commercial	55,142	17,463	12,751	2,770	1,102	7,396
Transportation	166,773	63,055	25,562	16,232	7,268	36,292
Waste	9,362	1,958	1,422	1,109	600	2,168
Water	1,157	--	277	134	--	--
Wastewater	5,562	--	364	280	--	--
Off-road	17,126	--	654	519	--	--
Agriculture	110,850	--	--	--	--	--
Total Gross Emissions	**477,456**	**106,222**	**56,234**	**34,516**	**17,209**	**69,706**

SOURCE: Marin County, 2014; City of Larkspur, 2010; Marin Climate & Energy Partnership (MCEP), 2016; MCEP, Town of Fairfax General Plan Implementation Committee, 2014; Town of Ross, 2010; Town of San Anselmo, 2011.

4.3.3 Regulatory Setting

Established federal, state, and regional regulations provide the framework for analyzing and controlling air pollutant emissions and thus general air quality. The USEPA is responsible for implementing the programs established under the federal Clean Air Act (CAA), such as establishing and reviewing the federal ambient air quality standards and reviewing State Implementation Plans (SIPs), described further below. However, the USEPA has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented. In California, CARB is responsible for establishing and reviewing the state ambient air quality standards, developing and managing the California SIP, securing approval of this plan from the USEPA, and identifying TACs. CARB also regulates mobile emissions sources in California, such as construction equipment, trucks, and automobiles, and oversees the activities of air quality management districts, which are organized at the county or regional level. An air quality management district is primarily responsible for regulating stationary emission sources at facilities within its geographic area and for preparing the air quality plans that are required under the federal CAA and 1988 California CAA. The BAAQMD is the regional agency with regulatory authority over emission sources in the nine-county SFBAAB.

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.3.3.1 Federal and State Regulations

Regulation of criteria air pollutants is achieved through both national and state ambient air quality standards and emissions limits for individual sources. Regulations implementing the federal CAA and its subsequent amendments established national ambient air quality standards for seven criteria pollutants: ozone, NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$, and lead. California has adopted more stringent state ambient air quality standards for most of the criteria air pollutants. In addition, California has established state ambient air quality standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Because of the meteorological conditions in the state, there can be considerable difference between state and federal standards in California, as shown in **Table 4.3-4**.

The ambient air quality standards are intended to protect public health and welfare, and they incorporate a margin of safety. They are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including people with asthma, the very young, elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels somewhat above the ambient air quality standards before adverse health effects are observed.

Attainment Status

Under amendments to the federal CAA, USEPA has classified air basins or portions thereof as either “attainment” or “non-attainment” for each criteria air pollutant, based on whether or not the national standards have been achieved. The California CAA, which is patterned after the federal CAA, also requires areas to be designated as “attainment” or “non-attainment” for the state standards. Thus, areas in California have two sets of attainment/non-attainment designations: one set with respect to the national standards and one set with respect to the State of California standards. Table 4.3-4 shows the attainment status of the SFBAAB with respect to the national and state ambient air quality standards for different criteria pollutants.

Federal Regulations

The USEPA is responsible for implementing programs established by the federal CAA, such as establishing and reviewing the NAAQS for the following air pollutants: CO, ozone, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead. The federal CAA also requires the USEPA to designate areas (counties or air basins) as attainment or non-attainment with respect to each criteria pollutant, depending on whether the area meets the NAAQS. If an area is designated as non-attainment, it does not meet the NAAQS and its district is required to create and maintain a SIP for achieving compliance with the NAAQS. Conformity to the SIP is defined under the 1990 CAA amendments as conformity

TABLE 4.3-4
AMBIENT AIR QUALITY STANDARDS AND SAN FRANCISCO BAY AREA AIR BASIN ATTAINMENT STATUS

Pollutant	Averaging Time	State Standard	Attainment Status for California Standard	Federal Primary Standard	Attainment Status for Federal Standard
Ozone	8 Hour	0.070 ppm	Non-Attainment	0.070 ppm	Non-Attainment
	1 Hour	0.09 ppm	Non-Attainment	---	---
Carbon Monoxide	8 Hour	9.0 ppm	Attainment	9 ppm	Attainment
	1 Hour	20 ppm	Attainment	35 ppm	Attainment
Nitrogen Dioxide	Annual Average	0.030 ppm	---	0.053 ppm	Attainment
	1 Hour	0.18 ppm	Attainment	0.100 ppm	Unclassified
Sulfur Dioxide	Annual Average	---	---	0.030 ppm	Attainment
	24 Hour	0.04 ppm	Attainment	0.14 ppm	Attainment
	1 Hour	0.25 ppm	Attainment	0.075 ppm	Attainment
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 $\mu g/m^3$	Non-Attainment	---	---
	24 Hour	50 $\mu g/m^3$	Non-Attainment	150 $\mu g/m^3$	Unclassified
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 $\mu g/m^3$	Non-Attainment	12.0 $\mu g/m^3$	Unclassified/Attainment
	24 Hour	---	---	35 $\mu g/m^3$	Non-Attainment
Sulfates	24 Hour	25 $\mu g/m^3$	Attainment	---	---
Lead	Calendar Quarter	---	---	1.5 $\mu g/m^3$	Attainment
	30-Day Average	1.5 $\mu g/m^3$	Attainment	---	---
	3-Month Rolling Average	---	---	0.15 $\mu g/m^3$	Unclassified
Hydrogen Sulfide	1 Hour	0.03 ppm	Unclassified	No Federal Standard	---
Vinyl Chloride	24 Hour	0.010 ppm	No information available	---	---
Visibility Reducing Particles	8 Hour	Extinction of 0.23/km; visibility of 10 miles or more	Unclassified	No Federal Standard	---

NOTES:
ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter

SOURCE: BAAQMD, 2017b.

with the plan's purpose in eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of these standards. Air quality within the SFBAAB does not attain the federal standards for ozone or $PM_{2.5}$.

State Regulations

CARB is the agency delegated responsibility for preparing and submitting the SIP to the USEPA. CARB also oversees air quality policies in California and has established CAAQS for NO_2, CO, PM_{10}, $PM_{2.5}$, SO_2, ozone, lead, sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles. Most of the CAAQS are at least as stringent (and typically more stringent) as the NAAQS.

The California CAA was approved in 1988 and requires each local air district in the state to prepare an air quality plan to achieve compliance with the CAAQS. Similar to the USEPA, the CARB designates counties or air basins in California as attainment or non-attainment with respect to the CAAQS. Air quality within the SFBAAB does not attain the state standards for ozone, PM_{10}, or $PM_{2.5}$.

Executive Order S-3-05

Executive Order S-3-05 was established by Governor Arnold Schwarzenegger in June 2006, and establishes statewide emission reduction targets through the year 2050 as follows:

1. By 2010, reduce GHG emissions to 2000 levels;
2. By 2020, reduce GHG emissions to 1990 levels; and
3. By 2050, reduce GHG emissions to 80 percent below 1990 levels.

This executive order does not include any specific requirements that pertain to the Project; however, future actions taken by the state to implement these goals may affect the Project, depending on the specific implementation measures that are developed.

Assembly Bill 32

California Assembly Bill (AB) 32,[5] the Global Warming Solutions Act of 2006, is the cornerstone of state efforts to reduce GHG emissions. As described below, the law requires CARB to establish a statewide GHG emissions cap for 2020 based on 1990 emission levels, develop a mandatory reporting program of GHG emissions, adopt regulations for discrete early actions to reduce GHG emissions, prepare a scoping plan to identify how emissions reductions will be achieved, and adopt a regulation that establishes a market-based compliance mechanism (also referred to as “Cap and Trade”).

Statewide GHG Emissions Cap

In 2007, CARB established the statewide GHG emissions limit that must be achieved by 2020, equivalent to the statewide GHG emissions levels in 1990, at 427 million metric tons of CO_2e. This figure is approximately 30 percent below projected “business-as-usual” emissions of 596 million metric tons of CO_2e for 2020, and about 10 percent below average annual GHG emissions during the period of 2002 through 2004 (CARB, 2009b).

Climate Change Scoping Plan

In December 2008, CARB approved the AB 32 Scoping Plan outlining the state’s strategy to achieve the 2020 GHG emissions limit (CARB, 2009a). The Scoping Plan estimated a reduction of 174 million metric tons CO_2e from the transportation, energy, agriculture, forestry, and high climate-change-potential sectors, and proposed a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify California’s energy sources, save energy, create new jobs, and enhance public health.

5 AB 32 is codified in California Health and Safety Code Division 25.5, Sections 38500 et seq.

The Scoping Plan must be updated every 5 years to evaluate the mix of AB 32 policies to ensure that California is on track to achieve the 2020 GHG reduction goal.

In response to the 2030 GHG reduction target stipulated in Executive Order B-30-15 (see discussion below), CARB released the 2017 Climate Change Scoping Plan Update in January 2017 (CARB 2017c). The 2017 Climate Change Scoping Plan Update (Update) sets the groundwork to reach California's long-term climate goals set forth in Executive Orders S-3-05 and B-16-2012 (the latter of these ordered State agencies to facilitate the rapid commercialization of zero-emission vehicles (ZEVs), setting a target for the number of them on California roads and also set a goal for reduction of emissions from the transportation sector). The Update highlights California's progress toward meeting the near-term 2020 GHG emission reduction goals defined in the initial Scoping Plan.

The Update builds upon the initial Scoping Plan with new strategies and recommendations and identifies opportunities to leverage existing and new funds to further drive GHG emission reductions through strategic planning and targeted low carbon investments. The Update also outlines the strategies the State will implement to achieve the 2030 GHG reduction target, which build on the Cap-and-Trade Regulation; the Low Carbon Fuel Standard; improved vehicle, truck, and freight movement emissions standards; increasing renewable energy; and strategies to reduce methane emissions from agricultural and other wastes by using it to meet California's energy needs. The Scoping Plan Update also comprehensively addresses GHG emissions from natural and working lands of California, including the agriculture and forestry sectors. The Scoping Plan Update considers the following scenarios:

Proposed Scenario: Continuing the Cap-and-Trade Program combined with an additional 20 percent reduction of GHGs in the refinery sector.

Alternative 1: Direct regulations on a wide variety of sectors, such as specific required reductions for all large GHG sources, more renewables, etc.

Alternative 2: A carbon tax to put a price on carbon, instead of the Cap-and-Trade Program.

Alternative 3: All Cap-and-Trade. This would remove the refinery measure and keep the LCFS at 10 percent.

Alternative 4: Cap-and-Tax. This would place a declining cap on industry, and natural gas and fuel suppliers, while also requiring them to pay a tax on each ton of GHG emitted.

CARB was scheduled to consider the proposed scenario and alternatives and potential adoption of the 2017 Climate Change Scoping Plan Update in late June 2017; however, CARB has postponed this to an undetermined future date (CARB 2017d).

Senate Bill 97

In 2007, the California State Legislature passed Senate Bill (SB) 97, which required amendment of the State CEQA *Guidelines* to incorporate analysis of, and mitigation for, GHG emissions from projects subject to CEQA. The amendments took effect March 18, 2010. The amendments add Section 15064.4 to the State CEQA Guidelines, specifically addressing the potential significance of GHG emissions. Section 15064.4 neither requires nor recommends a specific analytical methodology or quantitative criteria for determining the significance of GHG emissions. Rather, the section calls for a "good faith effort" to "describe, calculate or estimate" GHG emissions and indicates that the analysis of the significance of any GHG impacts should include consideration of the extent to which the project would:

Increase or reduce GHG emissions;

Exceed a locally applicable threshold of significance; or

Comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions."

The State CEQA *Guidelines* also state that a project may be found to have a less-than-significant impact related to GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Section 15064(h)(3)).

Executive Order B-30-15

In April 2015, Governor Edmund G. Brown Jr. issued an executive order to establish a California GHG reduction target of 40 percent below 1990 levels by 2030 (Office of Governor Edmund G. Brown Jr., 2015). Reaching this emission reduction target will make it possible for California to reach its ultimate goal of reducing emissions 80 percent under 1990 levels by 2050, as identified in Executive Order S-3-05. In 2016, the Legislature passed SB 32, which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels. Within Executive Order B-30-15, the Governor directed the following:

Established a new interim statewide reduction target to reduce GHG emissions to 40 percent below 1990 levels by 2030.

Ordered all state agencies with jurisdiction over sources of GHG emissions to implement measures to achieve reductions of GHG emissions to meet the 2030 and 2050 reduction targets.

Directed CARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of CO_2e.

Executive Order B-30-15 also specifically addresses the need for climate adaptation and directs state government to:

Incorporate climate change impacts into the State's 5-Year Infrastructure Plan;

Update the Safeguarding California Plan, the state climate adaption strategy to identify how climate change will affect California infrastructure and industry and what actions the state can take to reduce the risks posed by climate change;

Factor climate change into state agencies' planning and investment decisions; and

Implement measures under existing agency and departmental authority to reduce GHG emissions (Office of the Governor, 2015).

Executive Order B-30-15 requires CARB to update the AB 32 Climate Change Scoping Plan to incorporate the 2030 target. The 2030 Draft Scoping Plan will serve as the framework to define the State's climate change priorities for the next 15 years and beyond. As discussed above, in January 2017, CARB released the 2017 Climate Change Scoping Plan Update to outline the strategies the State will implement to achieve the 2030 GHG reduction target. Whether the Project would or would not conflict with Executive Order B-30-15's GHG emissions goal is addressed in Section 4.3.4.

4.3.3.2 Regional Regulations and Agencies

Bay Area Air Quality Management District

The Project areas are within the jurisdiction of the BAAQMD, which is the local agency delegated responsibility for preparing, adopting, and implementing stationary and area air emission control measures and standards.

BAAQMD Air Quality Plans

The 1977 CAA amendments require regional planning and air pollution control agencies to prepare a regional Air Quality Plan to outline the measures by which both stationary and mobile sources of pollutants can be controlled in order to achieve all standards specified in the CAA. The California CAA also requires development of air quality plans and strategies to meet state air quality standards in areas designated as non-attainment (with the exception of areas designated as non-attainment for the state particulate matter standards). Maintenance plans are required for attainment areas that had previously been designated non-attainment in order to ensure continued attainment of the standards. (As indicated above, air quality plans developed to meet federal requirements are referred to as SIPs.)

For state air quality planning purposes, the SFBAAB is classified as a serious non-attainment area for the 1-hour ozone standard. The "serious" classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that the BAAQMD update the Clean Air Plan every 3 years to reflect progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data. The BAAQMD's record of progress in implementing previous measures must also be reviewed. The most recently adopted air quality plan to address nonattainment issues for the SFBAAB is the 2017 Bay Area Clean Air Plan (2017 Clean Air Plan).

The 2017 Clean Air Plan provides a regional strategy to protect public health and protect the climate by continuing progress toward attaining all state and federal air quality standards; eliminating health risk disparities from exposure to air pollution among Bay Area communities; transitioning the region to a post-carbon economy needed to achieve GHG reduction targets for 2030 and 2050; and providing a regional climate protection strategy that will put the Bay Area on a pathway to help achieve those GHG reduction targets. The 2017 Plan includes a wide range of 85 control measures designed to decrease emissions of the air pollutants that are most harmful to residents, such as particulate matter, ozone, and TACs; to reduce emissions of methane and other "super-GHGs" that are potent climate pollutants in the near-term; and to decrease emissions of CO by reducing fossil fuel combustion (BAAQMD, 2017c).

4.3.3.3 Local Plans and Policies

Marin County

Countywide Plan

The following goals and policies in the Marin Countywide Plan (Marin County Community Development Agency, 2007) are relevant to the Project.

> **Goal AIR-1: Improved Regional Air Quality.** Promote planning and programs that result in the reduction of airborne pollutants measured within the county and the Bay Area.
>
> > ***Policy AIR-1.2: Meet Air Quality Standards.*** Seek to attain or exceed the more stringent of federal or State Ambient Air Quality Standards for each measured pollutant.
> >
> > ***Policy AIR-1.3: Require Mitigation of Air Quality Impacts.*** Require projects that generate potentially significant levels of air pollutants, such as quarry, landfill operations, or large construction projects, to incorporate best available air quality mitigation in the project design.
> >
> > ***Implementing Program AIR-1.g*:** Require control measures for construction and agricultural activity. Require reasonable and feasible measures to control particulate emissions (PM-10 and PM-2.5) at construction sites and during agricultural tilling activity, pursuant to the recommendations in the BAAQMD CEQA Guidelines, which may include the following:
> >
> > 1. Watering active construction or agricultural tilling areas.
> > 2. Covering hauled materials.
> > 3. Paving or watering vehicle access roads.
> > 4. Sweeping paved and staging areas.
>
> **Goal AIR-4:** Minimization of Contributions to Greenhouse Gases. Prepare policies that promote efficient management and use of resources in order to minimize greenhouse gas emissions. Incorporate sea level rise and more extreme weather information into the planning process.
>
> > ***Policy AIR-4.1: Reduce Greenhouse Gas Emissions.*** Adopt practices that promote improved efficiency and energy management technologies; shift to low-carbon and renewable fuels and zero emission technologies.
> >
> > ***Implementing Program AIR-4.c: Reduce Methane Emissions Released from Waste Disposal.*** Encourage recycling, decrease waste sent to landfills, require landfill methane recovery, and promote methane recovery for energy production from other sources. (See PFS-3.)
>
> **Goal EN-3:** Adopt Green Building Standards. Integrate green building requirements into the development review and building permit process.
>
> > ***Policy EN-3.1: Initiate Green Building Initiatives.*** Encourage and over time increasingly require sustainable resource use and construction with nontoxic materials.
> >
> > ***Implementing Program EN-3.c: Divert Construction Waste.*** Continue to implement and improve the Construction and Demolition Waste Recovery Ordinance, requiring building projects to recycle or reuse a minimum of 50% of unused or leftover building materials.

Implementing Program EN-3.d: Encourage Fly Ash in Concrete. Provide incentives and consider regulations requiring new building projects that use a substantial amount of concrete to incorporate at least 25% fly ash to offset some of the energy use and greenhouse gas emissions associated with the manufacturing of cement.

Goal PFS-4: Efficient Processing and Reduced Landfill Disposal of Solid Waste. Minimize, treat, and safely process solid waste materials in a manner that protects natural resources from pollution while planning for the eventual reuse or recycling of discarded material to achieve zero waste.

Policy PFS-4.4: Promote Regulatory Efforts. Support State legislative or regulatory efforts that will aid in achieving zero waste.

Implementing Program PFS-4.b: Divert Construction Waste. Continue to implement the construction and demolition recycling waste ordinance to divert construction waste from landfills.

Marin County Climate Action Plan

The Marin County Climate Action Plan 2014 Update (Marin County, 2014), builds on the County's 2006 GHG Reduction Plan and provides an update of GHG emissions in 2012, forecasts of emissions for 2020, and an assessment of actions that the County will take to further reduce emissions by 2020. The update includes two targets:

Reduce GHG emissions from community activities in the unincorporated areas of Marin County by at least 30 percent below 1990 levels by 2020; and

Reduce GHG emissions from the County's municipal activities by at least 15 percent below 1990 levels by 2020.

The update includes a variety of regulatory and incentive-based strategies that aim to reduce GHG emissions from both existing and new development in the County, supplement State programs, and achieve additional emissions reductions. There are 13 local community actions and 8 local municipal actions included in the update. The following action is relevant to the Project.

SP Waste-2. Construction and Demolition Reuse and Recycling Ordinance: All building and demolition permits must demonstrate a 50% minimum of reused or recycled construction and demolition materials. This ordinance was passed in September 2003. Increase the C&D [Construction and Demolition] diversion rate of to 65% for all new construction projects.

The following adaptation action in the Marin County Climate Action Plan is relevant to the Project.

Stagger activities like construction to cooler times of day.

Although most of the Marin County Climate Action Plan measures would not apply to the activities associated with the implementation of a flood risk reduction project, the GHG emissions inventory for the Marin County Climate Action Plan included forecasted emissions for off-road construction equipment (based on CARB's OFFROAD model)[6]; therefore, Project-related

6 See https://www.arb.ca.gov/msei/categories.htm

construction emissions that would occur in unincorporated Marin County would be covered by and subject to the Climate Action Plan.

Marin Climate and Energy Partnership

The Marin Climate and Energy Partnership (MCEP) was initiated in 2007 to recognize the need for a partnership platform that would allow collaboration between jurisdictions in Marin County on the complex GHG reduction challenge. The MCEP's goal was to bring together representatives of all 11 Marin jurisdictions, the County, Marin Municipal Water District, and Transportation Authority of Marin, to develop the MCEP structure and goals, and to develop the necessary resources to plan and implement coordinated GHG reduction strategies among all local governments in Marin County, along with the transportation and water agencies.

One mission of the MCEP is to reduce GHG emission levels to the targets of Marin County and local municipalities in compliance with the standards set by AB 32, while also meeting the criteria air pollutant reduction goals of the BAAQMD. MCEP is directed by a Steering Committee consisting of one representative from each partner jurisdiction and agency, working in collaboration with relevant staff liaisons from member entities to implement a coordinated approach to local and regional emissions reduction targets and climate action planning goals.

Town of San Anselmo

General Plan

The San Anselmo General Plan (Town of San Anselmo, 2015) contains the following conservation policy guidelines that apply to air quality and GHG emissions throughout the planning area:

1. Air, water, and noise pollution shall be prevented or minimized.

7. Construction shall be located and designed to avoid or minimize the hazards from earthquake, erosion, landslides, floods, fire, and accidents.

13. The Town and County shall take measures to reduce existing and future inefficient or unnecessary energy or natural resources consumption (The State Secretary for Resources has recently required that Environmental Impact Reports contain mitigation measures to reduce inefficient and unnecessary consumption of energy). Recyclable and biodegradable materials shall be utilized and used materials shall be recycled or reused whenever possible.

Climate Action Plan

The Climate Action Plan for the Town of San Anselmo proposes an emissions reduction target of 15 percent below 2005 levels by 2020, which is consistent with the State's direction to local governments in the AB 32 Scoping Plan (Town of San Anselmo, 2011). With emissions projected to increase under the business-as-usual scenario even as reduction efforts are initiated, achieving the target would require a 20.3 percent reduction from projected 2020 emissions levels. The local measures presented in the plan along with state reductions would result in total emissions approximately 27 percent below 2005 levels, enough to allow the Town to surpass a reduction target by 2020. The following actions are relevant to the Project.

3.3 Land Use and Transportation. Recommended Actions:

7. Encourage the use of fuel-efficient and low GHG-emitting vehicles and driver behaviors.

   b. Adopt and implement a policy requiring limitations on idling for commercial vehicles, construction vehicles, buses and other similar vehicles, beyond state law, where feasible.

8. Purchase or lease low or zero-emissions vehicles and the most fuel efficient models possible for the Town fleet, including police patrol cars and construction vehicles.

3.6 Waste Reduction, Recycling and Zero Waste. Recommended Action:

4. Adopt local amendments to the 2010 California Green Building Standards Code to require 50% construction and demolition waste diversion for construction, demolition and renovation projects, as proposed in the JPA's model ordinance.

Town of Fairfax

Neither of the Project sites are within the jurisdictional boundaries of the Town of Fairfax, but the former Sunnyside Nursery property is immediately adjacent to the Town's western boundary. As such, the following information on the Town's General Plan and Climate Action Plan are presented for information purposes.

General Plan

The following goals, objectives, and policies relevant to air quality and GHG emissions are in the Town of Fairfax's 2010 General Plan (Town of Fairfax, 2012). A number of more detailed programs support each of these policies; they are described fully in the Conservation (CON) Element of the General Plan. As noted elsewhere in this document, neither Project element would take place within the Fairfax town limits, but these goals, objectives, and policies are presented here for informational purposes.

Goal CON-1: Energy Conservation and Climate.

***Objective CON-1.1*:** Integrate reduction of the use of non-renewable energy resources and GHG emissions into planning for the Town of Fairfax.

Policy CON-1.1.1: Develop and implement a Climate Action Plan for Fairfax, including within its scope both the operations of the Town government and the activities of citizens, and including both stationary and mobile sources.

Policy CON-1.1.3: Encourage green building techniques for all new and remodel construction within the Town of Fairfax.

Policy CON-1.1.4: Participate in statewide and countywide efforts toward energy conservation, renewable energy generation and GHG reduction.

***Objective CON-1.2*:** Reduce consumption of non-renewable energy resources and reduce GHG emission by the residents and Town of Fairfax.

Policy CON-1.2.1: Implement energy efficiency and use of sustainable energy resources by Town government.

Goal CON-2: Air Quality.

Objective CON-2.1**:** Improve air quality through proper planning and building decisions.

Policy CON-2.1.2: All planning decisions shall require application of existing air quality guidelines and best practices to minimize air quality impact.

Program CON-2.1.2.1: Require new uses and development projects that generate significant toxic air contaminants, particulates or odors to include adequate buffer zones, setbacks or other mitigation measures to protect existing or future sensitive receptors.

Program CON-2.1.2.2: As a condition of approval for discretionary projects, require dust control measures consistent with the "Feasible Control Measures for Construction Emissions of PM10" of the BAAQMD CEQA Guidelines, or its successor document.

Program CON-2.1.2.3: As a condition of approval for demolition permits, require applicants to demonstrate compliance with applicable BAAQMD standards and procedures for mitigating the risk of exposure to lead paint and asbestos.

Program CON-2.1.2.4: As a condition of approval, require emission control measures for construction equipment that are appropriate to the specifics of the project and as recommended by the BAAQMD.

Objective CON-2.3**:** Improve air quality through cooperation and coordination with regional, State, federal and non- profit agencies.

Policy CON-2.3.2: Support air quality initiatives from the State of California.

Program CON-2.3.2.1: Implement regulations issued by the CARB or other State regulatory agency regarding air pollutant and GHG emissions.

Climate Action Plan

This Climate Action Plan supports the Town's emissions reduction target of 20 percent below 2005 levels by 2020, which exceeds the State's direction to local governments to reduce emissions by 15 percent below 2005 levels. The local actions identified in the Clean Air Plan combined with reductions already realized in the community between 2005 and 2010 and State reductions would reduce emissions in Fairfax by approximately 27 percent below 2005 levels in year 2020, enough to allow the Town to exceed its reduction target of 20 percent below the 2005 baseline (MCEP, 2014). Identified measures primarily relate to natural systems and sequestration, transportation and land use, green building, energy efficiency and renewable energy, waste reduction, recycling and zero waste, water and wastewater, and education and citizen involvement. The following actions are relevant to the Project.

Waste Reduction, Recycling, and Green Waste: Community Mitigation Measures:

Construction and Demolition Waste. Divert 94% of construction and demolition waste from landfills.

Although most of the Town of Fairfax Climate Action Plan measures would not apply to the activities associated with the implementation of a flood risk reduction project, the GHG emissions inventory for the Climate Action Plan included forecasted emissions for off-road construction equipment (based on CARB's OFFROAD model); therefore, Project-related construction emissions that would occur in the Town of Fairfax would be covered by and subject to the Climate Action Plan.

4.3.4 Impacts and Mitigation Measures

This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the proposed Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section. Mitigation measures are recommended, as necessary, to reduce significant impacts to less-than-significant levels.

4.3.4.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact on air quality or related to GHG emissions if it would:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation;

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);

d) Expose sensitive receptors to substantial pollutant concentrations;

e) Create objectionable odors affecting a substantial number of people;

f) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or

g) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

4.3.4.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in air pollutant and GHG emissions or other air quality impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. Mitigation measures are identified, as necessary, to reduce significant impacts.

Air Quality

The evaluation of potential impacts to regional and local air quality that may result from the construction and long-term operations of the Project is conducted as follows. Additional details are provided in **Appendix B**.

Consistency with Air Quality Management Plan

The BAAQMD is required, pursuant to the Clean Air Act, to reduce emissions of criteria pollutants for which the SFBAAB is in non-attainment of the CAAQS (i.e., ozone, PM_{10}, and $PM_{2.5}$) and NAAQS (i.e., ozone and $PM_{2.5}$). The BAAQMD's 2017 Clean Air Plan contains a comprehensive list of pollution control strategies directed at reducing emissions and achieving the CAAQS and NAAQS. These strategies are developed, in part, based on regional growth projections prepared by the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). Projects that are consistent with the assumptions used in the Clean Air Plan do not interfere with attainment because the growth is included in the projections utilized in the formulation of the Clean Air Plan. Thus, projects, uses, and activities that are consistent with the applicable growth projections and control strategies used in the development of the Clean Air Plan would not jeopardize attainment of the air quality levels identified in the Clean Air Plan, even if they exceed the BAAQMD's emissions thresholds.

Criteria Air Pollutants

As described above under Regulatory Framework, the SFBAAB experiences low concentrations of most pollutants when compared to federal or State standards and is designated as either in attainment or unclassified for most criteria pollutants, with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for the State and/or federal standards.

By definition, regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions are considered to contribute to the existing, cumulative air quality conditions. If a project's contribution to cumulative air quality conditions is considerable, then the project's impact on air quality would be considered significant (BAAQMD, 2017a).

Table 4.3-5 identifies quantitative criteria air pollutant significance thresholds and is followed by a discussion of each threshold. Projects that would result in criteria pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB. Both sets of thresholds (average daily and maximum annual) apply to operational emissions from a given project. Construction emissions are assessed solely with respect to the average daily thresholds, pursuant to BAAQMD guidance, because of the temporary nature of construction-related emissions (BAAQMD, 2017a).

The thresholds of significance for criteria air pollutants are based on substantial evidence presented in Appendix D of the BAAQMD CEQA Air Quality Guidelines and BAAQMD's *Revised Draft Options and Justification Report* concerning CEQA thresholds (BAAQMD, 2017a; BAAQMD, 2010).

TABLE 4.3-5
CRITERIA AIR POLLUTANT SIGNIFICANCE THRESHOLDS

Pollutant	Construction-Related	Operations-Related	
	Average Daily Emissions (pounds per day)	Average Daily Emissions (pounds per day)	Maximum Annual Emissions (tons per year)
ROG	54	54	10
NO_X	54	54	10
PM_{10}	82 (exhaust)	85	15
$PM_{2.5}$	54 (exhaust)	54	10
PM_{10} / $PM_{2.5}$ (fugitive dust)	Construction dust ordinance or other best management practices to control fugitive dust emissions	none	

SOURCE: BAAQMD, 2017a

The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants that may contribute to an existing or projected air quality violation is based on the State and Federal Clean Air Acts' emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NO_X, the offset emissions level is an annual average of 10 tons per year (or 54 pounds per day) (BAAQMD, 2010). These levels represent emissions below which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants that could result in increased health effects.

The Federal New Source Review program was created under the Federal Clean Air Act to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of Federal health-based ambient air quality standards. For PM_{10} and $PM_{2.5}$, the emissions limit under the New Source Review program is 15 tons per year (82 pounds per day) and 10 tons per year (54 pounds per day), respectively. These emissions limits represent levels at which a source is not expected to have a significant impact on air quality (BAAQMD, 2010).

Although the regulations specified above apply to new or modified stationary sources, the Project would generate ROG, NO_X, PM_{10}, and $PM_{2.5}$ emissions as a result of increases in vehicle trips, energy use, and construction activities. Therefore, the identified thresholds can be applied to the construction and operational phases of the Project. If the Project would result in emissions below these thresholds it would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ozone precursors or particulate matter.

Fugitive dust emissions are typically generated during construction phases. Studies have shown that the application of best management practices (BMPs) at construction sites significantly controls fugitive dust (Western Regional Air Partnership, 2006), and individual measures have been shown to reduce fugitive dust by anywhere from 30 to 90 percent (BAAQMD, 2010). The BAAQMD has identified eight Basic Construction Mitigation Measures to control fugitive dust emissions from construction activities for all projects, and 13 Additional Construction Mitigation Measures for all projects where construction-related emissions would exceed one or more of the BAAQMD's significance thresholds (BAAQMD, 2017a).

Construction Impacts

Construction of the Project would generate temporary criteria pollutant exhaust emissions through the use of heavy-duty construction equipment, such as excavators and forklifts, and through vehicle trips generated from worker vehicles and haul trucks traveling to and from the Project sites. In addition, fugitive dust emissions would result from demolition of a commercial building and various soil-handling and debris-management activities. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of construction activity, and prevailing weather conditions.

Emissions were estimated for the Project using the California Emissions Estimator Model (CalEEMod) (version 2016.3.2), which is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify criteria pollutant and GHG emissions from a variety of projects. CalEEMod was developed in collaboration with the air districts of California. Regional data (e.g., emission factors, trip lengths, meteorology, source inventory) have been provided by the various California air districts to account for local requirements and conditions. The model is considered to be an accurate and comprehensive tool for quantifying air quality and GHG impacts from projects throughout California, and is recommended by the BAAQMD.[7]

Average daily emissions during construction are forecasted by assuming a conservative estimate of construction activities (i.e., assuming all construction occurs at the earliest feasible date) and applying the appropriate emissions factors for each source of emissions. The emissions are estimated using the CalEEMod software. The input values used in CalEEMod were adjusted to be Project-specific based on equipment types and the construction schedule. Construction haul and vendor truck emissions during grading, concrete pouring, and structure construction were evaluated using regional heavy-duty truck emission factors from EMFAC2017. Daily truck trips and default CalEEMod trip length data (10.8 miles for worker trips, 14.6 miles for vendor trips, and 20 miles for haul truck trips) were used to assess roadway emissions from truck exhaust, as well as typical CARB idling times of local emissions on-site. Detailed calculations are provided in Appendix B of this Draft EIR. It should be noted that the average daily emissions are predicted values based on the assumption that construction of the two Project elements (the Nursery Basin and the removal of the building at 634-636 San Anselmo Avenue in Downtown San Anselmo) would occur at the same time. Thus, average daily emissions represent the emissions that would occur for every day of Project construction when combining concurrent construction activities at the two sites in 2019, over a period of approximately seven months. The average daily emissions are compared to the BAAQMD average daily emissions thresholds.

7 See: California Emissions Estimator Model webpage at: http:// caleemod.com/.

Operational Impacts

Following construction, the operation and maintenance of the Downtown San Anselmo element would be very similar to current management practices in the current creek channel at this site. These activities would be periodic debris or litter removal, vegetation management, sediment removal, and so on. At the Nursery Basin site, there would be periodic activity to remove accumulated sediment or weeds, inspect and repair the basin's filling and draining infrastructure, and so on. Sediment may be removed at least annually from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel. One routine, annual sediment removal would occur in the dry season to reduce effects on water quality and aquatic species. The amount of sediment removed in that routine maintenance action would vary depending on storm events and sediment moving into the creek each year. During especially wet years, a second sediment removal action may be necessary. The removal would be done using a bulldozer in the creek and an excavator working from the maintenance access road, top of the diversion structure, or top of the side-weir, as needed to reach the deposited material. Up to 1,600 cubic yards of sediment may be removed from Fairfax Creek per sediment removal event. Removed sediment would be hauled to a site within Marin County for beneficial reuse pursuant to the Flood Control District's Stream Maintenance Program or to Redwood Landfill. Approximately 290 cubic yards, requiring 33 truckloads, would be generated each day during sediment removal; about one week would be required to remove 1,600 cubic yards of sediment.

Operational emissions were estimated for the Project using the CalEEMod software for the off-road excavator and EMFAC2017 for the on-road haul trucks commuting workers. Excavator emissions that would be generated during sediment removal were estimated assuming the excavator would operate 10 hours per day for six days each year. Operational haul truck emissions during sediment removal were evaluated assuming trucks would operate six days each year (based on the removal of 290 cubic yards per day), using regional heavy-duty truck emission factors from EMFAC2017. Daily truck trip amounts and CalEEMod default trip length data (10.8 miles for worker trips, 14.6 miles for vendor trips, and 20 miles for haul truck trips) were used to assess roadway emissions from truck exhaust, and typical CARB-recommended idling times were used to estimate local truck emissions on-site. Detailed calculations are provided in Appendix B of this Draft EIR. It should be noted that the average daily emissions are predicted values based on the assumption that the off-road excavator and on-road haul trucks would only be operating six days per year. Thus, average daily emissions represent total emissions that would occur over six days of sediment removal divided by 365 total days each year. The average daily emissions are compared to the BAAQMD average daily emissions thresholds.

Other Criteria Pollutants

Regional concentrations of CO in the Bay Area have not exceeded the State standards in the past 11 years, and SO_2 concentrations have never exceeded the standards. The primary source of CO emissions from development projects is vehicle traffic. Construction-related SO_2 emissions represent a negligible portion of the total basin-wide emissions, and construction-related CO emissions represent less than five percent of the Bay Area total basin-wide CO emissions. As discussed previously, the Bay Area is in attainment for both CO and SO_2. Furthermore, the BAAQMD has demonstrated, based on modeling, that to exceed the California ambient air quality standard of 9.0 ppm (8-hour average) or 20 ppm (1-hour average) for CO, Project traffic in addition to existing traffic would need to exceed 44,000 vehicles per hour at affected intersections (or 24,000 vehicles per hour where vertical and/or horizontal mixing is limited). The Project will not generate any vehicle trips outside of construction vehicles, because it does not have an operational component. Daily construction vehicle trips range from 60 (worker trips only) to 350 (worker trips, haul trips, and other truck trips) one-way trips. This is significantly less than 24,000 vehicles per hour. Therefore, given the Bay Area's attainment status and the limited CO and SO_2 emissions that could result from the Project, the Project would not result in a cumulatively considerable net increase in CO or SO_2, and a quantitative analysis relative to these pollutants is not required.

Toxic Air Contaminants Impacts (Construction and Operations)

Any project that would have the potential to expose sensitive receptors to substantial levels of toxic air contaminants that would result in an incremental cancer risk of 10.0 in one million or greater, a hazard index of 1.0 or greater, or an increase in ambient $PM_{2.5}$ concentrations of 0.3 $\mu g/m^3$ or greater annual average would be considered to have a significant impact on sensitive receptors (BAAQMD, 2017a). The $PM_{2.5}$ threshold for construction is applied to exhaust emissions only, not fugitive dust emissions.

TAC emissions in the form of DPM would be generated during construction of the Project, primarily associated with heavy-duty equipment exhaust during demolition, excavation, and grading activities. Construction activities associated with the Project would be transitory and short term in nature. The Office of Environmental Health Hazards Assessment (OEHHA) is responsible for developing and revising guidelines for performing health risk assessments (HRAs) under the state's Air Toxics Hot Spots Program Risk Assessment (AB 2588) regulation. In March 2015, OEHHA adopted revised guidelines that update the previous guidance by incorporating advances in risk assessment with consideration of infants and children using Age Sensitivity Factors (ASF). A screening-level construction HRA was performed in accordance with the revised OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA Guidance) (OEHHA, 2015). The analysis incorporates the estimated construction emissions, as previously discussed, and dispersion modeling using the USEPA AERSCREEN model, the USEPA's recommended screening-level air quality model based on the AMS/EPA Regulatory Model (AERMOD) model (USEPA 2016a).

During long-term operations, TACs could be emitted as part of periodic maintenance operations, cleaning, painting, etc., and from periodic visits from delivery trucks and service vehicles. However, these occasional activities are expected to be similar to existing flood control and creek channel maintenance activities in the area and would not result in a considerable net increase in long-term emissions. The long-term exposure to off-site sensitive receptors would be minimal. As the Project consists of a building demolition, a flood diversion and storage basin, floodwalls, and other flood risk management facilities, the Project would not include sources of substantive TAC emissions identified by the BAAQMD or CARB siting recommendations. Thus, a qualitative health risk analysis is appropriate for long-term Project operations.

Odors

For odors, BAAQMD recommends that potential impacts be evaluated if a potential source of objectionable odors is proposed at a location near existing sensitive receptors or if sensitive receptors are proposed to be located near an existing source of objectionable odors. Combustion emissions from the use of diesel fuel in construction equipment, as well as tar or asphalt used for any paving improvements, could generate localized objectionable odors. If sensitive receptors are located in the immediate vicinity of these activities, odors could be perceivable and constitute a nuisance impact. Odor impacts are evaluated based on the location of sensitive receptors relative to the source of construction-related odors and the duration and intensity of these odors.

Greenhouse Gas Emissions

The evaluation of potential impacts associated with GHG emissions that may result from the Project was conducted as follows. Additional details are provided in Appendix B.

The Climate Action Registry General Reporting Protocol provides procedures and guidelines for calculating and reporting GHG emissions from general and industry-specific activities. Although the General Reporting Protocol identifies no numerical thresholds of significance or specific protocols, it provides a framework for calculating and reporting GHG emissions for proposed projects.

For purposes of this analysis, it is considered reasonable and consistent with criteria pollutant calculations to consider those GHG emissions resulting from Project-related incremental (net) increases in the use of off-road and on-road mobile vehicles compared to existing conditions. This includes Project construction activities such as demolition, hauling, and construction worker trips. Since potential impacts resulting from GHG emissions are long-term rather than acute, GHG emissions are calculated on an annual basis.

The General Reporting Protocol provides a range of basic calculation methods. However, they are typically designed for existing buildings or facilities and are not directly applicable to planning and development situations where the buildings or facilities do not yet exist, or for projects that remove buildings or facilities. As a result, this section relies on calculation guidance from state and regional agencies with scientific expertise in quantifying GHG emissions, such as CARB and the BAAQMD. GHG emissions are estimated using CalEEMod.

For land use projects with operations that are not stationary sources, the BAAQMD's CEQA Guidelines recommend use of an operational significance threshold of 1,100 metric tons CO_2e per year and for stationary source projects the recommended significance threshold is 10,000 metric tons CO_2e per year (BAAQMD, 2017a). The Project would include no new stationary sources of GHG emissions, and operation of the Project does not involve activities that would generate a net increase in GHG emissions. For this reason, the stationary source significance threshold of 10,000 metric tons CO_2e per year is not an appropriate threshold to gauge impact significance of the Project.

Therefore, even though the Project is not a typical land use development project, this EIR nonetheless uses the significance threshold of 1,100 metric tons CO_2e per year to evaluate whether the Project's GHG emissions could have a significant impact on the environment. Use of this threshold results in approximately 59 percent of all projects being above the significance threshold and having to implement feasible mitigation measures to meet their CEQA obligations. These projects account for approximately 92 percent of all GHG emissions anticipated to occur between now and 2020 from new land use development in the Bay Area (BAAQMD, 2017a). If all land use-related Project emissions are mitigated to below this threshold, it would represent an overall reduction in new land use project-related emissions of up to 92 percent.

It is acknowledged that this significance threshold was developed to focus on emissions reductions by 2020, and that BAAQMD staff and CARB have not yet provided guidance or recommendations for significance thresholds to evaluate consistency with emissions reduction goals for years beyond 2020; however, since the Executive Order B-30-15 emissions reductions goal of lowering GHG emissions to 40 percent below 1990 levels by 2030 is roughly equivalent to reducing emissions by 42 percent below current levels and the Executive Order S-3-05 emissions reductions goal of lowering GHG emissions to 80 percent below 1990 levels by 2050 is roughly equipment to reducing emissions by 81 percent below current levels, the 1,100 metric tons CO_2e per year threshold can be used as a rough gauge to determine if the Project would be consistent with these post 2020 goals. For discussion relative to the potential for the Project to result in emissions (including GHG emissions) that could conflict with the BAAQMD's 2017 Clean Air Plan, refer to Impact 4.3-2 and Impact 4.3-3 below.

Construction Emissions

The BAAQMD has not adopted a significance threshold for construction-related GHG emissions; however, it requires that the lead agency disclose those emissions and make a determination of impacts in relation to meeting AB 32 reduction goals. The SCAQMD guidance, *Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold*, recognizes that construction-related GHG emissions from projects "occur over a relatively short-term period of time" and that "they contribute a relatively small portion of the overall lifetime project GHG emissions" (SCAQMD, 2008). The guidance recommends that construction GHG emissions should be "amortized over a 30-year project lifetime, so that GHG reduction measures will address construction GHG emissions as part of the operational GHG reduction strategies." In accordance with SCAQMD guidance, GHG emissions from construction have been amortized over the 30-year lifetime of the Project.

Construction emissions are forecasted by assuming a conservative estimate of construction activities (i.e., assuming all construction occurs at the earliest feasible date) and applying the appropriate emissions factors. The output values used in this analysis were adjusted to be Project-specific based on equipment types and the construction schedule. These values were then applied to the same construction phasing assumptions used in the criteria pollutant analysis to generate GHG emissions values for construction.

Operational Emissions

As discussed above for air quality, operation of the Project may involve the annual removal of sediment from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel. GHG emissions were estimated for the excavator/bulldozer, haul truck trips, and worker commutes following the methods presented above for air quality. Detailed calculations are provided in Appendix B of this Draft EIR. It should be noted that annual GHG emissions are predicted values based on the assumption that the off-road excavator/ bulldozer and on-road haul trucks and commuting worker vehicles would only be operating six days per year. Thus, annual emissions represent total emissions that would occur over six days of sediment removal. The average annual emissions are compared to the BAAQMD annual emissions threshold.

4.3.4.3 Impacts and Mitigation Measures

Impact 4.3-1: Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation. (*Less than Significant with Mitigation*)

As discussed above, construction activities associated with the Project would involve the use of diesel powered construction equipment, such as graders, excavators, bulldozers, loaders, dump trucks, etc., that would generate exhaust in the form of both criteria air pollutants and criteria air pollutant precursors. In addition, exhaust emissions would be generated from vehicle trips associated with material delivery/debris hauling and commuting workers. Construction activities would also generate fugitive dust (including PM_{10} and $PM_{2.5}$) during excavation, grading, spoils placement, and vehicle travel on both paved and unpaved surfaces. Construction of the Nursery Basin element is anticipated to take approximately seven to eight months (147 total workdays was the figure used in estimating emissions). Implementation of the Downtown San Anselmo element is anticipated to take 3-4 months (75 total workdays was used in estimating emissions). It was assumed that construction would begin in 2019 and construction activities at the two sites would occur concurrently; thus, the total construction period is 147 workdays, or seven total months. Construction-related emissions for each Project element is a function of the construction activity involved, including the type, size, and amount of construction equipment used, duration of equipment use, the amount of required auto/light-truck and heavy truck trips, and the average mileage of those trips.

The duration of each construction phase for each Project element was provided by the Project's design engineers, which also provided an estimate for the construction equipment fleet for each construction phase for each of the Project elements, along with an estimated number of on-road equipment mobilization trips, soil off-haul truck trips, water truck trips, and other miscellaneous truck trips. Regarding heavy-duty trucks for material movement, the Nursery Basin would involve the excavation of 28,028 cubic yards of material, requiring 1,933 haul truck roundtrips. There would also be an additional 811 heavy-duty truck roundtrips for mobilization of equipment and delivery of construction materials. The Downtown San Anselmo element would require the excavation of 1,600 cubic yards of material, requiring 170 haul truck roundtrips. There would also be an additional 432 truck roundtrips for mobilization of equipment and delivery of construction materials. EMFAC2017 emission factors were used to estimate criteria pollutant emissions from offsite heavy-duty truck and commuting worker vehicle travel that would be associated with construction activities. The total number of one-way trips (2 per load) as indicated above was multiplied by the CalEEMod default one-way trip length for haul trips (10.8 miles for worker trips, 14.6 miles for vendor trips, and 20 miles for haul truck trips) to determine the total vehicle miles traveled.

Regarding additional truck trips, the Nursery Basin would involve 660 water truck roundtrips, 360 flatbed truck trips, and 735 pickup truck roundtrips; the Downtown San Anselmo work would require 235 water truck roundtrips, 144 flatbed truck trips, and 375 pickup truck roundtrips. Emissions from onsite truck travel for water trucks and pickup trucks, onsite truck idling, and pickup truck trips to and from the Project site were calculated outside CalEEMod using EMFAC2017 emission factors and the following activity data. For all truck types, it was assumed that they would be driving 20% of the time at 5 miles per hour (at the site) and idling 15% of the time across an average 8-10-hour workday at the Project sites. For haul trucks, it was assumed that idling activities would total 15 minutes per round trip, representing three separate 5-minute idling occurrences: check-in to the site or queuing at the site boundary upon arrival, on-site idling during loading/unloading, and check-out of the site or queuing at the site boundary upon departure. For pickup trucks, the total number of one-way trips (2 per load) as indicated above was multiplied by the CalEEMod default one-way trip length for vendor trips (14.6 miles) to determine the total vehicle miles traveled.

Because construction associated with both Project elements could occur simultaneously, it is conservatively assumed that construction of both elements would occur simultaneously. In order to calculate average daily emissions for each Project element individually, total emissions for each Project element were divided by the total number of construction workdays for each Project element (as listed above). In order to calculate total average daily emissions for both Project elements combined, total emissions for both Project elements were divided by the total number of construction workdays for the Nursery Basin (147 work days). This means that the sum of the average daily emissions for each Project element is not equal to the total average daily emissions for the Project as a whole.

Table 4.3-6 presents unmitigated construction emissions of ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust, and compares these emissions to the BAAQMD construction thresholds. An exceedance of any one of these significance thresholds would indicate that the Project could result in an air quality standard being exceeded or contribute substantially to an existing or projected air quality violation. As shown in the table, no emissions would exceed the BAAQMD thresholds. Therefore, this would constitute a less-than-significant impact.

To compare the estimated Project construction emissions to the BAAQMD significance thresholds, the emissions must be exhaust only (i.e., no fugitive dust) and in an average daily format. It is assumed that each piece of equipment associated with construction of the Project would operate 8-10 hours per day for varying amounts of days depending on the type of construction activity as well as the schedule for each Project element. Average hours per day for each equipment type were estimated by dividing the total work hours for the equipment types by the total workdays required to construct the given element. It is assumed that each Project element would result in an average of 30 roundtrip worker trips per day, 2 to 142 roundtrip heavy truck trips per day for the Nursery Basin, and 1 to 34 roundtrip heavy truck trips per day for the Downtown San Anselmo work

TABLE 4.3-6
ESTIMATED AVERAGE DAILY CONSTRUCTION EXHAUST EMISSIONS (POUNDS/DAY)

Project Element and Emissions Source	Average Daily Emissions (pounds per day)[1]			
	ROG	**NO_X**	**PM_{10} (exhaust)**	**$PM_{2.5}$ (exhaust)**
Nursery Basin				
Off-Road Equipment	1.0	11.3	0.5	0.5
On-Road Trucks	0.7	14.4	0.2	0.2
Worker Trips	0.3	0.2	<0.1	<0.1
Subtotal	*2.0*	*25.8*	*0.8*	*0.7*
Downtown San Anselmo				
Off-Road Equipment	0.6	5.7	0.3	0.3
On-Road Trucks	0.4	6.3	<0.1	<0.1
Worker Trips	0.3	0.2	<0.1	<0.1
Subtotal	*1.2*	*12.2*	*0.4*	*0.4*
Grand Total[2]	**2.7**	**32.1**	**1.0**	**0.9**
Mitigated Total[3]	**1.7**	**26.3**	**0.5**	**0.4**
BAAQMD Significance Thresholds	54	54	82	54
Threshold Exceeded?	No	No	No	No

NOTES:
1 In order to calculate average daily emissions for each Project element individually, total emissions for each Project element were divided by the total number of construction workdays for each Project element (147 workdays for the Nursery Basin and 75 workdays for Downtown San Anselmo).
2 In order to calculate total average daily emissions for both Project elements combined, total emissions for both Project elements were divided by the total number of construction workdays for the Nursery Basin (147 work days). This means that the sum of the average daily emissions for each Project element is not equal to the total average daily emissions for the Project as a whole. **Bold** values exceed the BAAQMD thresholds.
3 Although emissions would not exceed the BAAQMD's significance thresholds, the Project would result in a significant impact with regard to exposure of sensitive receptors to toxic air contaminants, as discussed in Impact 4.3-4. Because Mitigation Measure 4.3-4 to reduce toxic air contaminants would also reduce criteria pollutant emissions, mitigated emissions are presented here for informational purposes.

SOURCE: Appendix B.

(including water truck trips). A summary of the estimated maximum average daily construction emissions delineated by Project element and emissions source that would be associated with the Project during construction (2019) is presented in Table 4.3-6. Refer to Appendix B for the calculation sheets that were used to estimate the maximum daily average emissions that would be associated with construction of the proposed Project.

As shown in Table 4.3-6, average daily construction equipment and vehicle exhaust emissions of NO_x would be approximately 32.1 pounds per day, which would not exceed the BAAQMD's significance threshold of 54 pounds per day. Therefore, there would not be a significant impact with respect to the potential to cause a violation of an ozone and/or NO_2 air quality standard, or contribute substantially to an existing or projected violation of an ozone and/or NO_2 air quality standard. Emissions of ROG, PM_{10} exhaust, and $PM_{2.5}$ exhaust would also not exceed the BAAQMD's respective significance criteria; therefore, impacts associated with these pollutants would be less than significant.

In addition to exhaust emissions, emissions of fugitive dust would also be generated by construction activities associated with grading and earth disturbance, travel on paved and unpaved roads, etc. With regard to fugitive dust emissions, the BAAQMD Guidelines focus on implementation of recommended dust control measures rather than a quantitative comparison of estimated emissions to a significance threshold. For all projects, the BAAQMD recommends the implementation of its *Basic Control Mitigation Measures*. Therefore, implementation of the BAAQMD's fugitive dust Basic Control Measures, which are contained in **Mitigation Measure 4.3-1**, would reduce impacts associated with fugitive dust emissions.

The BAAQMD recommends but does not require that projects with estimated emissions that exceed the significance thresholds implement additional control measures. That list of the BAAQMD's Additional Construction Mitigation Measures is as follows:

1. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.
2. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.
3. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.
4. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
5. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
6. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
7. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6- to 12-inch compacted layer of wood chips, mulch, or gravel.
8. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.
9. Minimize the idling time of diesel powered construction equipment to 2 minutes.
10. Use low volatile organic compound (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).
11. Require that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM10.
12. Require all contractors use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines.

Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures.

To limit dust, criteria pollutants, and precursor emissions associated with construction, the following BAAQMD-recommended Basic Construction Measures shall be implemented and included in all contract specifications for components constructed under the Project:

1) All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2) All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3) All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4) All vehicle speeds on unpaved roads shall be limited to 15 mph.
5) All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6) Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7) All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8) Post a publicly visible sign with the telephone number and person to contact at the Flood Control District regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

Significance after Mitigation: Mitigation Measure 4.3-1 would require the implementation of BAAQMD's Basic Construction Measures, which would reduce criteria pollutants to less-than-significant levels.

Impact 4.3-2: Construction of the Project would result in emissions that could conflict with the 2017 Clean Air Plan. (*Less than Significant*)

The Bay Area is currently designated as a nonattainment area for state and national ozone standards, state particulate matter (both PM_{10} and $PM_{2.5}$) standards, and federal $PM_{2.5}$ (24-hour) standard. The BAAQMD's 2017 Clean Air Plan – Spare the Air, Cool the Climate (2017 Clean Air Plan) is the applicable air quality plan that has been prepared to address ozone and particulate matter nonattainment as well and other issues, such as TAC and GHG emissions (BAAQMD, 2017c). The 2017 Clean Air Plan updates the BAAQMD's 2010 Clean Air Plan to comply with State air quality planning requirements.

The BAAQMD CEQA Guidelines recommends that a project's consistency with the current air quality plan be evaluated using the following three criteria: does the project (in this case, the Project) support the goals of the air quality plan; does the project include applicable control measures from the air quality plan; and would the project not disrupt or hinder implementation of any control measures from the air quality plan? If it can be concluded with substantial evidence that the answers to the three criteria are in the affirmative, then the BAAQMD considers the project to be consistent with air quality plans prepared for the Bay Area.

The primary goals of the 2017 Clean Air Plan are to attain air quality standards, reduce population exposure, and protect public health in the Bay Area, and reduce GHG emissions and protect the climate. The BAAQMD-recommended measure for determining if a project supports the goals in the current clean air plan is consistency with BAAQMD thresholds of significance. If project emissions would not exceed the thresholds of significance after the application of all feasible mitigation measures, the project would be consistent with the goals of the 2017 Clean Air Plan. As indicated in the discussion under Impact 4.3-1, the Project would result in pollutant emissions that would be less than the BAAQMD significance thresholds after implementation of **Mitigation Measures 4.3-1**. Therefore, the Project would be considered to support the primary goals of the 2017 Clean Air Plan.

The 2017 Clean Air Plan contains 85 control measures aimed at reducing air pollution in the Bay Area. Projects that incorporate all feasible air quality plan control measures are considered consistent with the 2017 Clean Air Plan. The 2017 Clean Air Plan does not contain any measures specific to flood control activities and therefore, no inconsistency with the 2017 Clean Air Plan has been identified. With no specific control measures from the 2017 Clean Air Plan applicable to flood control and management programs, the Project would not be considered to hinder implementation of any of the 2017 Clean Air Plan control measures.

Mitigation Measure: Mitigation Measure 4.3-1 BAAQMD Basic Construction Measures.

Significance after Mitigation: With implementation of Mitigation Measure 4.3-1 (as part of Impact 4.3.1; see discussion above), the above-listed mitigation measures, the Project would not be in conflict with the 2017 Clean Air Plan. This impact would thus be *less than significant*.

Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that would not exceed air quality standards and conflict with the 2017 Clean Air Plan. (*Less than Significant*)

As noted above for the Nursery Basin site, sediment may be removed at least annually from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel. The removal would be done using a bulldozer. Approximately 290 cubic yards, requiring 33 truckloads, would be generated each day during sediment removal; about one week would be required to remove 1,600 cubic yards of sediment. EMFAC2017 emission factors were used to estimate criteria pollutant emissions from offsite heavy-duty truck and commuting worker vehicle travel that would be associated with operational activities. The total number of loads as indicated above was multiplied by the CalEEMod default one-way trip length for haul trips (20 miles) to determine the total vehicle miles traveled.

As discussed above, operational activities associated with the Project would involve the use of diesel powered construction equipment, such as an excavator or bulldozer that would generate exhaust in the form of both criteria air pollutants and criteria air pollutant precursors. In addition, exhaust emissions would be generated from vehicle trips associated with sediment removal and commuting workers. These activities would also generate fugitive dust (including PM_{10} and $PM_{2.5}$) during excavation and vehicle travel on both paved and unpaved surfaces.

Table 4.3-7 presents unmitigated operational emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$, and compares these emissions to the BAAQMD operational thresholds. An exceedance of any one of these significance thresholds would indicate that the Project could result in an air quality standard being exceeded or contribute substantially to an existing or projected air quality violation. As shown in the table, no emissions would exceed the BAAQMD thresholds.

TABLE 4.3-7
ESTIMATED AVERAGE DAILY AND AVERAGE ANNUAL OPERATIONAL EXHAUST EMISSIONS (POUNDS/DAY AND TONS/YEAR)

Project Element and Emissions Source	Average Daily Emissions (pounds per day)[1]				Average Annual Emissions (tons per year)[2]			
	ROG	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Nursery Site FDS Basin								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Downtown San Anselmo Section								
Off-Road Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Worker Trips	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Grand Total	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
BAAQMD Significance Thresholds	54	54	82	54	10	10	15	10
Threshold Exceeded?	No	No	No	No	No	No	No	No

NOTES:
1 In order to calculate average daily emissions, total emissions during the six days of sediment removal were divided by the total number of days each year (365).
2 Average annual emissions represent total emissions during the six days of sediment removal.

SOURCE: ESA, 2018. See Appendix B.

As shown in Table 4.3-7, average daily operational equipment and vehicle exhaust emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ would not exceed the BAAQMD's significance thresholds. In addition to exhaust emissions, emissions of fugitive dust would also be generated by operational activities associated with excavation and earth disturbance, travel on paved and unpaved roads, etc. As shown in the table, total PM10 (exhaust and dust) would not exceed the BAAQMD's significance thresholds. Therefore, operational emissions would not result in an air quality standard being exceeded or contribute substantially to an existing or projected air quality violation. Consequently, this would constitute a less-than-significant impact.

Mitigation Measure: None required.

Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions. (*Less than Significant with Mitigation*)

Construction and operational activities associated with the Project would result in the short-term generation of DPM emissions from the use of off-road diesel equipment required to construct the proposed components, and from construction material deliveries and debris/spoils removal using on-road heavy-duty trucks. As discussed previously, DPM is a complex mixture of chemicals and particulate matter that has been identified by the State of California as a TAC with potential cancer and chronic non-cancer effects. The dose to which receptors are exposed is the primary factor affecting health risk from TACs. Dose is a function of the concentration of a substance (or substances) in the environment and the duration of exposure to the substance. According to the Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments (HRAs), which determine the lifetime exposure of sensitive receptors to TAC emissions, should be based on a 30-year exposure period when assessing TACs (such as DPM) that have only cancer or chronic non-cancer health effects. However, for short term activities such as construction, such HRAs should be limited to the duration of the emission-producing activities associated with the project, unless the activities occur for less than 6 months. Activities that would last more than 2 months, but less than 6 months, are recommended to be evaluated as if they would last for 6 months. OEHHA does not recommend conducting health risk assessments for projects that would last less than 2 months (OEHHA, 2015).

As noted earlier, construction activities associated with the Project would take place over a 7- to 8-month period. The BAAQMD has identified a distance of 1,000 feet from the source to the closest sensitive receptor locations within which community health risk thresholds would be applicable to gauge the significance of health risk-related impacts. Impacts are quantified for the maximum impacted sensitive receptors. The 1,000-foot radius used herein is a conservative metric to identify sensitive receptors in the vicinity of the Project Sites. It follows that the impact analysis examines existing baseline conditions and foreseeable future conditions. The BAAQMD considers projects that are estimated to result in a cancer risk of 10 in one million, a chronic or acute hazard index of 1.0, or an increase in ambient $PM_{2.5}$ concentrations of 0.3 $\mu g/m^3$ or greater annual average to be a significant health risk (BAAQMD, 2017a). The $PM_{2.5}$ threshold for construction is applied to exhaust emissions only, and does not include concentrations of fugitive dust (BAAQMD, 2017a). Depending on the distance separating construction activities from the nearest sensitive receptors and the concentration of construction DPM and $PM_{2.5}$ exhaust emissions generated by the components of the Project, health risk impacts on sensitive receptors could be significant.

Construction of the proposed Project would occur in the vicinity (i.e., within 1,000 feet) of sensitive receptors for durations ranging from three to seven months. Therefore, a screening-level HRA using the USEPA AERSCREEN model and OEEHA guidance (2015) was conducted to estimate the maximum cancer risk resulting from exposure to DPM associated with construction of the Project. To estimate maximum average annual DPM concentrations, the DPM emission rates used in AERSCREEN for each Project element were based on the total PM_{10} emissions resulting from Project construction for both off-road equipment and the portion of on-road trucks traveling near the receptors, as discussed above under Impact 4.3-1.

In order to calculate cancer risk associated with exposure to DPM, the average DPM concentration during the three to seven months of construction activities (depending on the element) must be estimated using AERSCREEN. AERSCREEN estimates maximum 1-hour concentrations; in order to estimate annual average concentrations for the HRA, a scaling factor of 0.1 was used (USEPA 2016b). In order to calculate maximum 1-hour concentrations, AERSCREEN assumes that emissions occur 24 hours per day, 365 days per year. Therefore, in order to estimate the actual concentrations to which sensitive receptors would be exposed to during the three to seven months of construction activities, a DPM emission rate was calculated to represent emissions occurring only during construction activities. To do this, total pounds of DPM for each Project element was divided by the total number of calendar for each element and 24 hours per day to determine average emissions in terms of grams per second for entry into AERSCREEN. These emission rates therefore assume emissions will occur 7 days per week, 24 hours per day over the entirety of the construction period for each Project element, in order to calculate annual average DPM concentrations for the cancer risk analysis.

In order to calculate annual average $PM_{2.5}$ exhaust concentrations from construction, the average $PM_{2.5}$ exhaust concentration during the entire year of 2019 must be estimated using AERSCREEN. To arrive at the appropriate annual average concentrations for the entire year of 2019, even though construction activities only occur for three to seven months during the year for each element, a $PM_{2.5}$ exhaust emission rate during construction activities was calculated. To do this, total pounds of $PM_{2.5}$ exhaust for each Project element was divided by the total number of calendar days for each element and 24 hours per calendar day to determine average emissions in terms of grams per second for entry into AERSCREEN. These emission rates therefore assume emissions would occur 7 days per week, 24 hours per day over the entirety of the construction period in order to calculate the 2019 annual average concentrations associated with construction.

The AERSCREEN model was run assuming a 3.89 meter emission release height and 1.4 meter initial vertical dimension (representing off-road equipment), an area source type with dimensions representing the construction site for each Project element (185 meters by 150 meters for the Nursery Basin site and 50 meters by 40 meters for the Downtown San Anselmo site), rural parameters for the Nursery Basin site and urban parameters for the Downtown San Anselmo site, a flagpole receptor height of 1.5 meters, and default AERSCREEN model inputs for other parameters.

Once average annual DPM concentrations were estimated using AERSCREEN, cancer risks were calculated using the latest guidance from OEHHA (2015) and BAAQMD (2016). Cancer risk as a result of exposure to DPM occurs exclusively through the inhalation pathway (OEHHA, 2015). Therefore, the screening-level HRA only evaluates cancer risks from inhalation and no other exposure pathways (e.g., dermal and ingestion pathways). Risk was calculated for nearby residents, daycares, and schools. Because child resident exposure assumptions are more conservative than those for adult resident's, a conservative approach of considering all off-site receptors as initially child residents were used in this screening-level HRA. The exposure parameters used to estimate excess lifetime cancer risk for all potentially exposed populations for the HRA were obtained using risk assessment guidelines from OEHHA (2015) and BAAQMD (2016). The estimated excess lifetime cancer risks for children receptors (resident, daycare, and school) were adjusted using the ASFs recommended in the California Environmental Protection Agency (Cal/EPA) OEHHA Technical Support Document (Cal/EPA, 2009) and OEHHA guidance (2015). This approach accounts for an "anticipated special sensitivity to carcinogens" of infants and children. Cancer risk estimates are weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to 2 years of age and by a factor of three for exposures that occur from 2 years through 15 years of age. No weighting factor (i.e., an ASF equal to one, which is equivalent to no adjustment) is applied to ages 16 to 70 years. **Table 4.3-8** shows the ASFs to be used for all child receptors.

TABLE 4.3-8
EXPOSURE PARAMETERS

Exposure Parameter	Receptor Type and Age Group			
	Resident		Daycare	School
	3rd Trimester	Age 0<2 Years	Age 0<2 Years	Age 2<9 Years
Dose Factors				
Daily Breathing Rate (L/kg day or L/kg 8 hrs)[1]	361	1090	1200	640
Inhalation Absorption Factor (unitless)	1	1	1	1
Exposure Frequency (days/365 days)[2]	0.96	0.96	0.68	0.49
Cancer Risk Factors				
Inhalation Cancer Potency Factor (mg/kg-day)	1.1	1.1	1.1	1.1
Age Sensitivity Factor (unitless)	10	10	10	10
Exposure Duration (years)[3] - Nursery Site FDS Basin	0.25	0.31	0.56	0.56
Exposure Duration (years)[3] - Downtown San Anselmo Section	0.25	0.03	0.28	0.28
Averaging Time (years)	70	70	70	70
Fraction of Time at Home (unitless)[4]	1.0	1.0	1.0	1.0

NOTES:
1 Daily breathing rates are from OEEHA (2015) based on BAAQMD guidance (2016) as follows: for child residents, 95th percentile 24-hour breathing rates (OEHHA Table 5.6) for 3rd trimester and age 0<2 years; for child daycare, 95th percentile 8-hour moderate intensity breathing rates (OEHHA Table 5.8) age 0<2 years; for school, 95th percentile 8-hour moderate intensity breathing rates (OEHHA Table 5.8) for age 2<9 years.
2 Exposure frequency from BAAQMD, 2016.
3 Exposure duration represents 0.56 years (~7 months) for the Nursery Site FDS Basin and 0.28 years (~3.5 months) for the Downtown San Anselmo Section.
4 Fraction of time at home from OEHHA Table 8 (OEHHA, 2015). FAH factors equal to one (FAH = 1.0) for the following age groups: 3rd trimester to < 2 years and 2 to < 16 years per BAAQMD guidance (2016), because there may be schools within cancer risk isopleths of one in a million or greater.

SOURCES: OEHHA, 2015; BAAQMD, 2016.

Table 4.3-8 summarizes key age-specific factors used in the screening-level HRA based on OEHHA guidance. OEHHA recommends risk be analyzed for the following exposure durations (residency times): 30 years for the Maximally Exposed Individual Sensitive Receptor (MEISR) and 9 years for central tendency.[8] The 9- and 30-year exposures are chosen to coincide with USEPA's estimates of the average (9 years) and high-end estimates (30 years) of residence time (OEHHA, 2015). Risk was calculated for all receptor types (resident, daycare, and school). In order to calculate the chronic hazard index; the chronic inhalation Reference Exposure Level (REL) for DPM of 5 $\mu g/m^3$ was used (CARB, 2017e). Refer to Appendix B for the calculation sheets that show all assumptions used to estimate the cancer risk and chronic hazard index associated with construction of the proposed Project.

As discussed in Section 4.3.2 above, the nearest sensitive receptors to each Project element are single-family residences located immediately east and west to the Nursery Basin site and single-family residences located approximately 100 feet to the west of the Downtown San Anselmo site.

Unmitigated construction activities at these distances can result in moderate to high sensitive receptor exposure to DPM emissions, causing potentially significant health risk impacts. **Table 4.3-9** presents unmitigated cancer risk and the chronic hazard index associated with construction emissions of DPM, and compares these emissions to the BAAQMD thresholds. **Table 4.3-10** presents unmitigated $PM_{2.5}$ exhaust concentrations associated with construction emissions, and compares these emissions to the BAAQMD thresholds. Refer to Appendix B for the calculation sheets that show all assumptions used to estimate the cancer risk and chronic hazard index that would be associated with construction of the proposed Project.

TABLE 4.3-9
ESTIMATED CONSTRUCTION CANCER RISK AND CHRONIC HAZARD INDEX

Project Element and Emissions Source	Maximum Cancer Risk (# in 1 million)			Chronic Hazard Index		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site FDS Basin						
Maximum Risk	**34.6**	n/a[1]	3.4	0.1	n/a[1]	<0.1
BAAQMD Significance Thresholds	10.0	10.0	10.0	1.0	1.0	1.0
Significant Impact?	Yes	No	No	No	No	No
Downtown San Anselmo Section						
Maximum Cancer Risk	**18.0**	2.1	0.3	0.2	<0.1	<0.1
BAAQMD Significance Thresholds	10.0	10.0	10.0	1.0	1.0	1.0
Threshold Exceeded?	Yes	No	No	No	No	No

NOTES:
1 n/a = not applicable. There are no daycare receptors within 1,000 feet of the Nursery Site FDS Basin.
2 **Bold** values exceed the BAAQMD thresholds.

SOURCE: ESA, 2018. See Appendix B.

8 "Central Tendency" exposure is an estimate of the average experienced by the affected population, based on the amount of agent present in the environment and the frequency and duration of exposure.

TABLE 4.3-10
ESTIMATED CONSTRUCTION ANNUAL AVERAGE $PM_{2.5}$ EXHAUST CONCENTRATIONS

Project Element and Emissions Source	Annual Average $PM_{2.5}$ Exhaust Concentrations ($\mu g/m^3$)		
	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site FDS Basin			
$PM_{2.5}$ Exhaust Concentrations	**0.47**	n/a [1]	**0.36**
BAAQMD Significance Threshold	0.30	0.30	0.30
Significant Impact?	Yes	No	Yes
Downtown San Anselmo Section			
$PM_{2.5}$ Exhaust Concentrations	**0.82**	0.05	0.06
BAAQMD Significance Thresholds	0.30	0.30	0.30
Threshold Exceeded?	Yes	No	No

NOTES:
1 n/a = not applicable. There are no daycare receptors within 1,000 feet of the Nursery Site FDS Basin.
2 **Bold** values exceed the BAAQMD thresholds.

SOURCE: ESA, 2018. See Appendix B.

The construction activities within 1,000 feet of sensitive receptors that would pose the highest health risks would be at the Downtown San Anselmo Section site because work at this site is surrounded by residential sensitive receptors, with the nearest being located approximately 100 feet from the construction boundary. As shown in Table 4.3-9, cancer risk exceeds the BAAQMD threshold of 10.0 cancers per million individuals for both Project elements for residential receptors. The maximum cancer risk would be 34.6 chances per million for the Nursery Site FDS Basin and 18.0 chances per million for the Downtown San Anselmo Section, both of which exceed the BAAQMD's significance threshold of 10.0. Therefore, this would constitute a significant impact. The maximum chronic hazard index would be 0.1 for the Nursery Site FDS Basin and 0.2 for the Downtown San Anselmo Section, which would be less than the BAAQMD's significance threshold of 1.0. As shown in Table 4.3-10, the annual average $PM_{2.5}$ exhaust concentrations exceed the BAAQMD threshold of 0.3 $\mu g/m^3$ for both Project elements for residential receptors. The maximum annual average $PM_{2.5}$ exhaust concentrations would be 0.47 $\mu g/m^3$ for the Nursery Site FDS Basin and 0.82 $\mu g/m^3$ for the Downtown San Anselmo Section, both of which exceed the BAAQMD's significance threshold of 0.3 $\mu g/m^3$. Therefore, this would constitute a significant impact. The reason for the lower risk at the Nursery Basin site compared to the risk at the San Anselmo site, even though the residences near the Nursery Basin are close to the source of emissions, is because the Nursery Basin construction site would be larger than the San Anselmo construction site, which means that DPM is more thoroughly dispersed over a larger area before impacting nearby receptors. The San Anselmo construction site would be much smaller, which means that there would be less dispersion of DPM at the site, and downwind concentrations would be greater at nearby sensitive receptor locations.

Pursuant to implementation of **Mitigation Measure 4.3-4**, all off-road diesel-powered equipment (more than 25 horsepower) used for projects under the Project would be equipped with engines that achieve USEPA Tier 4 interim emissions standards. Mitigated emissions were estimated assuming that all off-road equipment would use Tier 4 interim engines, per CalEEMod. This would reduce uncontrolled project-related DPM and $PM_{2.5}$ exhaust emissions by 75-85 percent. **Table 4.3-11** presents a summary of the cancer risk and chronic hazard index associated with construction emissions of DPM with implementation of Mitigation Measure 4.3-4 **Table 4.3-12** presents a summary of the $PM_{2.5}$ exhaust concentrations associated with construction emissions with implementation of Mitigation Measure 4.3-4. Refer to Appendix B for the calculation sheets that show all assumptions used to estimate the mitigated cancer risk and chronic hazard index that would be associated with construction of the proposed Project.

TABLE 4.3-11
ESTIMATED MITIGATED CONSTRUCTION CANCER RISK AND CHRONIC HAZARD INDEX

Project Element and Emissions Source	Maximum Cancer Risk (# in 1 million)			Chronic Hazard Index		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site FDS Basin						
Maximum Risk	6.6	n/a[1]	0.7	<0.1	n/a[1]	<0.1
BAAQMD Significance Thresholds	10	10	10	1	1	1
Significant Impact?	No	No	No	No	No	No
Downtown San Anselmo Section						
Maximum Cancer Risk	5.6	0.6	<0.1	<0.1	<0.1	<0.1
BAAQMD Significance Thresholds	10	10	10	1	1	1
Threshold Exceeded?	No	No	No	No	No	No

NOTES:
1 n/a = not applicable. There are no daycare receptors within 1,000 feet of the Nursery Site FDS Basin

SOURCE: ESA, 2018. See Appendix B.

TABLE 4.3-12
ESTIMATED MITIGATED CONSTRUCTION ANNUAL AVERAGE $PM_{2.5}$ EXHAUST CONCENTRATIONS

Project Element and Emissions Source	Annual Average $PM_{2.5}$ Exhaust Concentrations ($\mu g/m^3$)		
	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site FDS Basin			
$PM_{2.5}$ Exhaust Concentrations	0.10	n/a[1]	0.08
BAAQMD Significance Threshold	0.30	0.30	0.30
Significant Impact?	No	No	No
Downtown San Anselmo Section			
$PM_{2.5}$ Exhaust Concentrations	0.28	0.02	0.02
BAAQMD Significance Thresholds	0.30	0.30	0.30
Threshold Exceeded?	No	No	No

NOTES:
1 n/a = not applicable. There are no daycare receptors within 1,000 feet of the Nursery Site FDS Basin.

SOURCE: ESA, 2018. See Appendix B.

Mitigation Measure 4.3-4: Tier 4 Engines for Construction Equipment.

All off-road equipment greater than 25 horsepower that operates for more than 20 total hours over the entire duration of construction activities shall have engines that meet the USEPA or CARB Tier 4 interim or Tier 4 Final off-road emission standards.

Significance after Mitigation: As shown in Table 4.3-11, with implementation of Mitigation Measure 4.3-4, the maximum cancer risk would be mitigated to approximately 6.6 chances per million for the Nursery Basin element and 5.6 chances per million for the Downtown San Anselmo element, which would be less than the BAAQMD's significance threshold of 10.0. The chronic hazard indices for both Project Elements would remain below the BAAQMD's significance threshold of 1.0 with mitigation. As shown in Table 4.3-12, maximum annual average $PM_{2.5}$ exhaust concentrations would be mitigated to approximately 0.1 $\mu g/m^3$ for the Nursery Basin and 0.28 $\mu g/m^3$ for Downtown San Anselmo, which would be less than the BAAQMD's significance threshold of 0.3 $\mu g/m^3$. Therefore, the significant impact with respect to the potential to expose sensitive receptors to TACs, including DPM emissions, would be reduced to a *less than significant* level with mitigation incorporated.

Impact 4.3-5: Construction of the Project would not result in objectionable odors. (*Less than Significant*)

Combustion emissions from the use of diesel fuel in construction equipment, as well as tar or asphalt used for any paving improvements, could generate localized objectionable odors. If sensitive receptors are located in the immediate vicinity of these activities, odors could be perceivable and constitute a nuisance impact. Construction of the proposed Project would take seven to eight months to complete and would take place within the construction hours specified by the applicable local ordinance. Construction equipment and paving activities would not be static, and on any given day may take place at different parts of the construction site, which would help to not expose any one set of receptors to odors over the entire duration of the construction period. Any objectionable odors generated by Project construction and operational activities and perceived by sensitive receptors would occur on a short-term basis, or would be intermittent. This would be a less-than-significant impact when sensitive receptors are present in the immediate vicinity.

Although this impact is already less than significant and no mitigation is necessary, the California Code of Regulations Section 2485 requirements, with more stringent BAAQMD idling-time limitations, have been incorporated into Mitigation Measures 4.3-1 (BAAQMD Basic Construction Measures) (see Impact 4.3-1, above, for description), which would further limit diesel odors generated by construction vehicles. Even if odors are temporarily perceivable by any receptors in the immediate vicinity, it is highly unlikely that a substantial number of people would be affected. Therefore, the Project's construction impacts related to objectionable odors would be less than significant.

Mitigation Measures: None required.

Impact 4.3-6: Construction and operation of the Project would result in GHG emissions that would not have a significant impact on the environment or conflict with applicable plans and policies in place to reduce GHG emissions. (*Less than Significant*)

Conflict with Applicable Plans and Policies

CARB's Climate Change Scoping Plan

In support of HSC Division 25.5, the State has promulgated specific laws aimed at GHG reductions applicable to the Project. The primary focus of many of the statewide and regional mandates, plans, policies and regulations is to address worldwide climate change. Due to the complex physical, chemical and atmospheric mechanisms involved in global climate change, there is no basis for concluding that the Project's less than significant increase in annual GHG emissions would cause a measurable change in global GHG emissions necessary to influence global climate change. Newer construction materials and practices, energy efficiency requirements, and newer appliances tend to emit lower levels of air pollutant emissions, including GHGs, as compared to those built years ago; however, the net effect is difficult to quantify. The GHG emissions of the Project alone would not likely cause a direct physical change in the environment. According to CAPCOA, "GHG impacts are exclusively cumulative impacts; there are no non-cumulative GHG emission impacts from a climate change perspective" (CAPCOA 2008). It is global GHG emissions in their aggregate that contribute to climate change, not any single source of GHG emissions alone.

Table 4.3-13, *Consistency with Applicable Greenhouse Gas Reduction Strategies*, contains a list of GHG-reducing strategies potentially applicable to the Project. The analysis describes the consistency of the Project with these strategies that support the State's strategies in the Climate Change Scoping Plan to reduce GHG emissions. The Climate Change Scoping Plan relies on a broad array of GHG reduction actions, which include direct regulations, alternative compliance mechanisms, incentives, voluntary actions, and market-based mechanisms such as the Cap-and-Trade program. As shown below, the Project would incorporate characteristics to reduce waste generation and reduce vehicle travel consistent with statewide strategies and regulations. As a result, the Project would not conflict with applicable Climate Change Scoping Plan strategies and regulations to reduce GHG emissions.

Furthermore, in addition to the Project's consistency with applicable GHG reduction strategies, the Project would not conflict with the future anticipated statewide GHG reductions goals. CARB has outlined a number of potential strategies for achieving the 2030 reduction target of 40 percent below 1990 levels. These potential strategies include renewable resources for half of the State's electricity by 2030, increasing the fuel economy of vehicles and the number of zero-emission or hybrid vehicles, reducing the rate of growth in VMT, supporting high-speed rail and other alternative transportation options, and use of high-efficiency appliances, water heaters, and heating, ventilation, and air conditioning (HVAC) systems (Energy + Environmental Economics 2015). The Project would benefit from statewide and utility-provider efforts towards increasing the portion of electricity provided from renewable resources. The Project would also benefit from statewide efforts towards increasing the fuel economy standards of vehicles. While CARB is in the process of developing a framework for the 2030 reduction target in the Scoping Plan, the Project would support or not impede implementation of these potential reduction strategies identified by CARB.

TABLE 4.3-13
CONSISTENCY WITH APPLICABLE GREENHOUSE GAS REDUCTION STRATEGIES

Sector / Source	Category / Description	Consistency Analysis
Energy		
California Renewables Portfolio Standard	Increases the proportion of electricity from renewable sources to 33 percent renewable power by 2020.	**Consistent.** During operations, the Project would use electricity provided by Pacific Gas & Electric (PG&E), which has already achieved 33 percent renewables as of 2017.
California Renewables Portfolio Standard and SB 350	Increases the proportion of electricity from renewable sources to 33 percent renewable power by 2020. SB 350 requires 50 percent by 2030.	**Consistent.** The Project would use electricity provided by PG&E, which is required to meet the 2050 performance standard.
Mobile Sources		
AB 1493 (Pavley Regulations)	Reduces GHG emissions in new passenger vehicles from model year 2012 through 2016 (Phase I) and model years 2017–2025 (Phase II). Also reduces gasoline consumption to a rate of 31 percent of 1990 gasoline consumption (and associated GHG emissions) by 2020.	**Consistent.** The Project would be consistent with this regulation and would not conflict with implementation of the vehicle emissions standards.
Low Carbon Fuel Standard (Executive Order S-01-07)	Establishes protocols for measuring life-cycle carbon intensity of transportation fuels and helps to establish use of alternative fuels.	**Consistent.** The Project would be consistent with this regulation and would not conflict with implementation of the transportation fuel standards.
Advanced Clean Cars Program	In 2012, CARB adopted the Advanced Clean Cars (ACC) program to reduce criteria pollutants and GHG emissions for model year vehicles 2015 through 2025. ACC includes the Low-Emission Vehicle (LEV) regulations that reduce criteria pollutants and GHG emissions from light- and medium-duty vehicles, and the Zero-Emission Vehicle (ZEV) regulation, which requires manufacturers to produce an increasing number of pure ZEVs (meaning battery electric and fuel cell electric vehicles), with provisions to also produce plug-in hybrid electric vehicles (PHEV) in the 2018 through 2025 model years.	**Consistent.** The standards would apply to all vehicles used by construction workers and maintenance workers associated with the Project.
Solid Waste		
California Integrated Waste Management Act (IWMA) of 1989 and Assembly Bill (AB) 341	The IWMA mandated that state agencies develop and implement an integrated waste management plan which outlines the steps to be taken to divert at least 50 percent of their solid waste from disposal facilities. AB 341 directs CalRecycle to develop and adopt regulations for mandatory commercial recycling and sets a statewide goal for 75 percent disposal reduction by the year 2020.	**Consistent.** The Project would be served by a solid waste collection and recycling service that may include mixed waste processing, and that yields waste diversion results comparable to source separation and consistent with Citywide recycling targets.
Other Sources		
Climate Action Team	Reduce diesel-fueled commercial motor vehicle idling.	**Consistent.** The Project would be consistent with the CARB Air Toxics Control Measure to limit heavy duty diesel motor vehicle idling to no more than 5 minutes at any given time.
	Achieve California's 50 percent waste diversion mandate (Integrated Waste Management Act of 1989) to reduce GHG emissions associated with virgin material extraction.	**Consistent.** The Project would meet this requirement as part of its compliance with the County's and Town's requirements and the CALGreen Code.

SOURCE: ESA 2018.

Conflict with Executive Order B-30-15 or Executive Order S-3-05 Emissions Reduction Goals

As described in the *Greenhouse Gas Emissions* discussion above, the 1,100 metric tons CO_2e per year threshold can be used as a rough gauge to determine if the Project would be consistent with the goals identified in Executive Orders B-30-15 or S-3-05. As shown in Table 4.3-14 below, the GHG emissions associated with the proposed Project would not exceed the emissions significance threshold, which indicates that implementation of the Project would be consistent with the State's GHG emission reduction goals for years 2030 and 2050. Therefore, the Project would not conflict with Executive Orders B-30-15 or S-3-05 and the associated impact would be less than significant.

Conflict with Local GHG Reduction Plans and Policies

Though all the jurisdictions within the Project area; including Marin County, Town of San Anselmo, and the adjacent Town of Fairfax; have adopted climate action plans to reduce GHG emissions and meet the State's AB 32 goals (see section 4.3.3 *Regulatory Setting* above), none of the adopted plans contain any measures specific to flood control and management activities such as those proposed by the Flood Control District associated with the proposed Project. In addition, as an independent special district, the Flood Control District is not strictly required to comply with Marin County ordinances, plans, or policies or those of the towns within the County. However, the Flood Control District does endeavor to be consistent with those policies and ordinances whenever feasible.

The Marin County Countywide Plan and Climate Action Plan include a number of actions to reduce waste-related emissions from construction, increase the use of recycled materials used during construction, and reduce construction and demolition debris. These actions and policies include Implementing Program AIR-4.c (Reduce Methane Emissions Released from Waste Disposal), Implementing Program EN-3.c (Divert Construction Waste), Implementing Program EN-3.d (Encourage Fly Ash in Concrete), and Implementing Program PFS-4.b (Divert Construction Waste). Potentially relevant GHG-reduction policies in the Marin County Climate Action Plan 2014 Update include SP Waste-2 (Construction and Demolition Reuse and Recycling Ordinance). Similarly, the Town of San Anselmo's General Plan and Climate Action Plan include a number of actions to reduce GHG emissions from construction vehicles and reduce construction and demolition debris. Potentially relevant General Plan Policies for reduction of GHG emissions include conservation policy guidelines #1, #7, and #13. Potentially relevant GHG-reduction policies of the Town of San Anselmo Climate Action Plan include Waste Reduction, Recycling and Zero Waste recommended action #4 (require 50% construction and demolition waste diversion for construction projects).

Although the Flood Control District is not strictly required to comply with these actions and policies, the Flood Control District will do its best to ensure that activities during Project construction and operation will be consistent with these actions and policies. The Flood Control District would also make use of the existing construction & demolition infrastructure in the county, leading to consistency with the majority of the actions and policies listed above.

Construction GHG Emissions

For projects that are not stationary sources, such as those proposed under the Project, the BAAQMD CEQA Guidelines recommend use of an operational significance threshold of 1,100 metric tons per year of CO_2e (BAAQMD, 2017a). This threshold was developed with consideration of the AB 32 emission reduction goals. The BAAQMD has not adopted significance thresholds for construction-related GHG emissions; however, it requires that the lead agency disclose those emissions and make a determination of impacts in relation to meeting AB 32 reduction goals. For construction-related GHG emissions, other air districts (e.g., South Coast Air Quality Management District (SCAQMD)) have recommended that total emissions from construction be amortized over a period of 30 years (meant to represent the life of the project) and added to operational emissions and then compared to the operational significance threshold (SCAQMD, 2008).

GHG emissions would be generated primarily during Project construction activities from the use of heavy-duty off-road construction equipment and automobile and truck trips required to transport workers, materials, and debris to and from the Project sites. **Table 4.3-14** presents construction emissions generated by the proposed project.

TABLE 4.3-14
ESTIMATED TOTAL CONSTRUCTION AND OPERATIONAL GHG EMISSIONS (METRIC TONS CO_2E)

Project Element and Emissions Source	Total Annual Emissions (metric tons CO_2e per year)		
	Construction Emissions	Operational Emissions	Construction + Operational Emissions
Nursery Basin			
Off-Road Equipment	120.4	16.0	136.4
On-Road Trucks	281.6	12.9	294.5
Worker Trips	31.6	0.4	32.0
Subtotal	*433.6*	*29.3*	*462.9*
Downtown San Anselmo			
Off-Road Equipment	38.1	0.0	38.1
On-Road Trucks	65.8	0.0	65.8
Worker Trips	16.1	0.0	16.1
Subtotal	*120.0*	*0.0*	*120.0*
Grand Total	**553.5**	**29.3**	**582.8**
Total Emissions Amortized over 30 Years	18.5	29.3	47.8
BAAQMD Significance Threshold	1,100	1,100	1,100
Threshold Exceeded?	No	No	No

SOURCE: ESA, 2018. See Appendix B.

Operational GHG Emissions

As noted above, for projects that are not stationary sources, such as those proposed under the Project, the BAAQMD CEQA Guidelines recommend use of an operational significance threshold of 1,100 metric tons per year of CO_2e (BAAQMD, 2017a). GHG emissions during operations would be generated primarily from the occasional use of heavy-duty off-road construction equipment (e.g. excavator, bulldozer), and automobile and truck trips associated with sediment removal and commuting workers at the Nursery Basin site. Table 4.3-14 presents operational emissions generated by the proposed project.

Total Construction and Operational Emissions

As shown in Table 4.3-14, GHG emissions generated by construction of the proposed Project would total approximately 554 metric tons CO_2e over the approximately 3-7 month construction period, which equates to a 30-year amortized annual average value of approximately 19 metric tons CO_2e (refer to the Approach to Analysis section above for additional information regarding the methods used to estimate the Project's short-term construction emissions and Appendix B for all assumptions associated with the GHG construction emissions). Also shown in Table 4.3-14, GHG emissions generated by operation of the proposed Project would total approximately 29 metric tons CO_2e over the approximately six days of sediment removal (refer to the Approach to Analysis section above for additional information regarding the methods used to estimate the Project's operational emissions and Appendix B for all assumptions associated with the GHG operational emissions).

Impact Conclusion

In summary, the GHG emissions analysis provided above and the Project's consistency with applicable regulatory plans and policies to reduce GHG emissions demonstrates that the Project would substantially comply with or exceed the GHG reduction actions and strategies outlined in CARB's Climate Change Scoping Plan (as shown in Table 4.3-13) and the State's GHG emission reduction goals for years 2030 and 2050 through Executive Order B-30-15 and Executive Order S-3-05. In addition, although not required, the Project would generally be consistent with the goals and policies of the general plans and climate action plans of Marin County, the Town of San Anselmo, and the Town of Fairfax.

As shown in Table 4.3-14, 30-year amortized construction GHG emissions that would be associated with the Project are approximately 19 metric tons CO_2e per year. These emissions would not exceed the 1,100 metric tons CO_2e per year significance threshold. Also shown in Table 4.3-14, annual average operational GHG emissions that would be associated with the Project are approximately 29 metric tons CO_2e per year. These emissions would also not exceed the 1,100 metric tons CO_2e per year significance threshold. Combined construction and operational annual emissions would be approximately 48 metric tons CO_2e, which would not exceed the 1,100 metric tons CO_2e per year significance threshold. This would therefore be a *less-than-significant* impact.

Mitigation Measures: None required.

4.3.5 References – Air Quality and Greenhouse Gas Emissions

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4.4 Energy, Mineral, Forest, and Agricultural Resources

This section evaluates the potential impacts of the San Anselmo Flood Risk Reduction Project (Project) on energy, mineral, forest, and agricultural resources. This section also provides an overview of the physical and regulatory setting that applies to energy, mineral, forest, and agricultural resources surrounding the Project sites and presents and discusses the potential Project impacts and appropriate mitigation measures, as necessary.

4.4.1 Environmental Setting

4.4.1.1 Energy Supply

California's major sources of energy are petroleum products (i.e., gasoline, diesel, and oil), electricity, and natural gas. The California Energy Commission (CEC) indicates that California crude resources in 2016 came from in-State (34.10 percent), Alaska (11.41 percent), and foreign sources (54.49 percent) (CEC, 2017a). In 2015, California's in-state energy generation plus net imports totaled 296,041 gigawatt hours. Energy generation by source included hydroelectric (5 percent), nuclear (6 percent), natural gas (40 percent), and renewable (15 percent), as well as coal and other imports (34 percent) (CEC, 2017b).

4.4.1.2 Mineral Resources

Eight sites within Marin County are designated by the State as having significant mineral resources and four additional sites are Marin County permitted resource sites (Marin County Community Development Agency, 2007). While the total value of remaining deposits in local quarries has not been determined, it is anticipated that construction activities requiring mined materials must transport these materials into the County from elsewhere (Marin County Community Development Agency, 2007). Based on review of Map 3-5 from the 2007 Marin Countywide Plan, there are no State of California Designated Mineral Resources Sites or Marin County permitted resource sites at either of the Project sites.

4.4.1.3 Forest Resources

Marin County, including Ross Valley, is widely known for its diverse natural beauty, including forested landscapes. While there is no timber production within Ross Valley, there is a mixture of forested vegetation that provides aesthetic, recreational and environmental benefits. Figure 4.5-2 (in Section 4.5, Biological Resources) shows that the Downtown San Anselmo site is mostly developed urban/suburban land, with ornamental and riparian vegetation surrounding the site. A majority of the vegetation at the former Sunnyside Nursery site has been removed leaving annual grassland and oak woodland and riparian vegetation on its margins. Though this site was once a commercial plant nursery, it was not timberland. The Project sites are not zoned for forest land or timberland uses. No national or state forest lands are mapped in the watershed. Section 4.4, Biological Resources, includes further discussion of the various vegetation communities at the

Project sites and in the watershed, and Section 4.14, Parks and Recreation, includes a discussion of the open space preserves and watershed lands that support forested landscapes.

4.4.1.4 Agricultural Resources

In Marin County, farms and ranches account for approximately 50 percent of the land, or 167,000 acres, with dairies and livestock ranches dominating (University of California Cooperative Extension, 2011). However, within the Towns of San Anselmo and Fairfax and the unincorporated areas around them, there are no zoned agricultural lands. The former Sunnyside Nursery site, which is located in unincorporated Marin County, is designated as commercial land.

4.4.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.4.2.1 Federal Regulations

No federal regulations pertaining to mineral or agricultural resources are applicable to land in the Project vicinity or for Project activities, as land affected by the Project is not in the public domain and the Project does not implement federal programs. Federal regulations related to energy use are described below.

National Energy Conservation Policy Act

The National Energy Conservation Policy Act serves as the underlying authority for federal energy management goals and requirements. Signed into law in 1978, it has been regularly updated and amended by subsequent laws and regulations. This act is the foundation of most federal energy requirements.

National Energy Policy Act of 2005

The National Energy Policy Act of 2005 sets equipment energy efficiency standards and seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles; constructing energy-efficient buildings; and improving the energy efficiency of commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), signed in 2007, strengthens the key energy management goals for the federal government and sets more challenging goals than the Energy Policy Act of 2005. The energy reduction and environmental performance requirements of Executive Order 13423 were expanded upon in Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance), signed in 2009.

4.4.2.2 State Regulations

California Energy Commission

The CEC was established by the Warren-Alquist Act in 1974 and is the State's primary energy policy and planning agency (CEC, 2015). The CEC has five major responsibilities: forecasting future energy needs and keeping historical energy data; licensing thermal power plants 50 megawatts or larger; promoting energy efficiency through appliance and building standards; developing energy technologies and supporting renewable energy; and planning for and directing state response to energy emergencies.

Administered by the CEC, the California Energy Action Plan (EAP) was adopted in 2003 and a second EAP was adopted by both the CEC and the California Public Utilities Commission (CPUC) in 2005 (CEC, 2017c). The EAP established shared goals and specific actions to ensure that adequate, reliable, and reasonably priced electrical power and natural gas supplies are achieved and provided through policies, strategies, and actions that are cost-effective and environmentally sound for California's consumers and taxpayers. Also, incorporated in the EAP are specific actions reflecting the importance of transportation fuels to California's economy and the need to mitigate the environmental impacts caused by their use, as well as the importance of taking actions in the near term to mitigate California's contributions to climate change from the electricity, natural gas, and transportation sectors. In 2008, the EAP was updated to expand on the State's actions in the context of global climate change and include the passage of Assembly Bill 32, the California Global Warming Solutions Act of 2006 (CEC, 2017c).

California Public Utilities Commission

The CPUC was established in 1911 as the Railroad Commission and was expanded in 1912 to regulate privately owned electric, natural gas, telecommunications, water, railroad, and marine transportation companies, including PG&E. The CPUC ensures that consumers receive safe and reliable utility services at reasonable rates, protects against fraud, and promotes the health of California's economy (CPUC, 2017).

California Independent System Operator

The California Independent System Operator was established in 1998 and is a non-profit organization that independently manages the flow of electricity in California. It provides open access to the grid, ensuring equal access and a competitive energy market. In addition, it facilitates over 28,000 market transactions each day to ensure that enough power is available to meet demands (California Independent System Operator, 2017).

CALGreen Building Code

The 2016 California Green Building Standards Code, as specified in Title 24, Part 11 of the California Code of Regulations, specifies building standards to improve public health, safety, and general welfare by enhancing the design and construction of buildings through the use of building concepts having a positive environmental impact and encouraging sustainable construction practices. The provisions of this code apply to the planning, design, operation, construction, replacement, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such building structures throughout California. A waste management plan may be necessary if the local jurisdiction does not a have construction and demolition waste management ordinance that is more stringent than the code (CALGreen, 2017).

Surface Mining and Reclamation Act of 1975

The Surface Mining and Reclamation Act of 1975 was enacted to encourage the production, conservation, and protection of California's mineral resources (California Department of Conservation [DOC], 2016a). Together, the DOC's Office of Mine Reclamation and the State Mining and Geology Board oversee administration of the act's requirements. The State Mining and Geology Board designates areas of statewide or regional significance. As described above, eight sites in Marin County have been designated as having significant mineral resources.

California Farmland Conservancy Program

Administered by the DOC, the California Farmland Conservancy Program (CFCP) was established in 1996 to encourage the conservation of agricultural lands in perpetuity. The CFCP supports agricultural land conservation efforts by providing grant funding for local entities to purchase agricultural conservation easements. Agricultural conservation easements are voluntary legal agreements that permanently prohibit non-agricultural uses on land, while allowing the landowner to continue making agricultural management decisions on their land. Grant funds are made available to non-profit land trusts and local governments to purchase conservation easements from landowners. In addition, CFCP provides grants to local entities for planning and technical assistance associated with developing local and regional farmland conservation strategies. As of January 2015, CFCP funded over 175 conservation easements (DOC, 2016b).

Farmland Mapping and Monitoring Program and Important Farmland

Administered by DOC, the Farmland Mapping and Monitoring Program (FMMP) provides maps and statistical data for analyzing impacts to the state's agricultural resources (DOC, 2016c). Using existing land use data and Natural Resources Conservation Service soil survey data, FMMP compiles Important Farmland Maps. Important Farmland Maps include eight defined categories (DOC, 2016d):

1. **Prime Farmland** is farmland with the best combination of physical and chemical characteristics for long-term agricultural production and the soil quality, growing season, and moisture supply required to sustain high crop yields. This land has been used for irrigated agriculture at some point within the 4 years prior to mapping.
2. **Farmland of Statewide Importance** is farmland similar to Prime Farmland except that some conditions such as slopes or soil moisture have minor shortcomings. This land has been used for irrigated agriculture at some point within the 4 years prior to mapping.
3. **Unique Farmland** is farmland used for providing crops with high economic value, even though the land may have lesser quality soils. This land is typically irrigated, but may include non-irrigated crops. This land has been cropped at some point within the 4 years prior to mapping.

4. **Farmland of Local Importance** is farmland defined by each county's local advisory committee and adopted by its board of supervisors. Farmland of Local Importance either is currently producing or has the capability to produce, but does not meet the definition of Prime Farmland, Farmland of Statewide Importance, or Unique Farmland.
5. **Grazing Land** is land with existing vegetation that is suitable for livestock grazing.
6. **Urban and Built-up Lands** are lands not included in the other categories. This land is occupied by structures with a density of at least one dwelling unit per 1.5 acres, or approximately six structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, and public utility structures, and for other developed purposes.
7. **Water** includes perennial water bodies with an extent of at least 40 acres.
8. **Other Lands** do not meet the criteria of the previous categories. Examples of other lands include low-density rural developments, vegetative and riparian areas not suitable for livestock grazing, confined-animal agriculture facilities, strip mines, borrow pits, water bodies smaller than 40 acres, and vacant and non-agricultural land surrounded on all sides by urban development and greater than 40 acres.

Farmland is defined in Appendix G (Environmental Checklist) of the State CEQA *Guidelines* as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland.

Williamson Act

The California Land Conservation Act of 1965, referred to as the Williamson Act, is one of the state's primary agricultural land protection programs (DOC, 2016f). The law allows local governments to enter into contracts with private landowners to protect lands within agricultural preserves for agricultural and open space purposes for 10 to 20 years. Landowners agree to forego the possibility of development or conversion to non-agricultural or open space purposes and local governments forego a portion of its property taxes. In addition, from 1971 to 2009 the state paid an average of $22.7 million a year to offset the differential tax rates (DOC, 2016f). State budget constraints have limited its ability to continue providing funding for subvention payments to local governments to offset the differential tax rates.

Farmland Security Zones were authorized by a 1998 amendment to the Williamson Act. Farmland Security Zone contracts are similar to Williamson Act contracts, except that they increase the duration and protection of Williamson Act contracts, and provide greater tax benefits to landowners. Farmland Security Zone contracts have a minimum initial term of 20 years that renew automatically each year. In addition, they provide an additional 35 percent tax benefit over the standard Williamson Act contract (DOC, 2016e).

Forest Land, Timberland, and the Forest Taxation Reform Act

Forest land is defined as land that can support 10-percent native tree cover and allows for management of forest resources including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits (PRC Section 12220(g)). Timberland is land that is not owned by the federal government and is a subset of forest land that is available for growing tree crops used to produce lumber and other forest products (PRC Section 4526). Timberland

Production Zones are areas zoned for growing and harvesting timber (California State Board of Equalization, 2012). The Forest Taxation Reform provides guidelines that allow cities to adopt Timberland Production Zones on qualifying timberland to protect those lands from incompatible uses.

4.4.2.3 Local Regulations

Marin Agricultural Land Trust

The Marin Agricultural Land Trust (MALT) is a non-profit organization established in 1980 to permanently protect agricultural land in Marin County for agricultural use (MALT, 2016). MALT protects working farms by purchasing agricultural conservation easements on farmland. To date, MALT has worked with over 80 farming families to protect farmland in perpetuity on more than 48,500 acres.

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan (Marin County Community Development Agency, 2007) are relevant to the Project.

Energy Efficiency

Goal EN-1.1: Adopt Energy Efficiency Standards.

Goal EN-1.4: Reduce Energy Use in County Facilities. Continue to integrate energy efficiency and conservation into all County functions.

Goal EN-2.2: Adopt Renewable Energy Building Standards. Integrate technically and financially feasible renewable energy requirements into development and building standards.

Goal EN-3.1: Initiate Green Building Initiatives. Encourage and over time increasingly require sustainable resource use and construction with non-toxic materials.

Goal EN-3.3: Incorporate Green Building in County Facilities. Integrate green building practices into all County facilities.

Mineral Resources

Policies

Policy MIN-1.1**:** Preserve Mineral Resource Sites. Protect State-designated Class 2 production sites from encroachment by temporary or permanent land uses that would inhibit timely mineral extraction to meet market demand.

Policy MIN-1.3**:** Buffer Extraction Areas and Incompatible Land Uses. Create sufficient buffers between designated mineral resource sites or potential extraction areas and uses incompatible with mining, such as housing.

Policy MIN-1.3**:** Buffer Extraction Areas and Incompatible Land Uses. Create sufficient buffers between designated mineral resource sites or potential extraction areas and uses incompatible with mining, such as housing.

Implementing Programs

***Program MIN-1.l*:** Promote Alternative Materials and Conservation. Work with consumers of mined materials to reduce demand through use of alternative materials and by optimizing recycling of construction and demolition waste.

Agricultural Land Preservation

Goal AG-1.6: Limit Non-Agricultural Development. Limit non-agricultural development in the Agricultural Production Zone to residential and accessory uses that are ancillary to and compatible with agricultural production. Require dwellings and other non-agricultural development to be limited in size and grouped together in building envelopes covering no more than 5 percent of the property or as determined through a site-specific analysis of agricultural and environmental constraints and resources, with the remainder preserved for agricultural production. Residential and non-agricultural development on very large parcels may be limited to less than 5 percent of the land area.

Goal AG-1.7: Limit Ancillary Non-Agricultural Land Uses. Require non-agricultural land uses on agricultural lands to be ancillary to and compatible with agricultural land uses, agricultural production, and the rural character of the area and to enhance the economic viability of agricultural operations.

Goal AG-1.8: Maintain the Agricultural Land Base. Encourage private and public owners of lands that have traditionally been used for agriculture to keep land in agricultural use by continuing existing agricultural uses, developing compatible new agricultural uses, and/or leasing lands to agricultural operators.

Goal CD-1.d: Maintain Agriculture in the Inland Rural Corridor. Work with individual landowners; special districts; local, state, and federal agencies; and private groups to ensure that rural character is preserved, agricultural operations remain viable in the Inland Rural Corridor, and sensitive resources and existing communities are not threatened.

Forestry

Goal DES-1.3: Encourage Sustainable Urban Forestry. Promote the use of sustainable urban forestry practices that address long-term forest management, public education, and outreach.

Town of San Anselmo

The Town of San Anselmo General Plan does not include any goals or policies related to management of the resources addressed in this section.

Town of Fairfax

While the Project is not within the limits of the Town of Fairfax, it is adjacent to the Town; for this reason, Town of Fairfax policies and goals are presented for informational purposes. The Town of Fairfax General Plan includes the following goal and policies related to management of the types of resources addressed in this section (Town of Fairfax, 2012).

Conservation

Objective CON-1.1: Integrate reduction of the use of non-renewable energy resources and [greenhouse gas] GHG emissions into planning for the Town of Fairfax.

***Policy CON-1.1.3*:** Encourage green building techniques for all new and remodel construction within the Town of Fairfax.

Program CON-1.1.3.1: Develop and adopt a green building ordinance, requiring state-of-the-art, energy-efficient construction techniques for all new and remodel construction

Program CON-1.1.3.2: Provide and maintain links on the Town of Fairfax website to green building information and resources.

***Policy CON-1.1.4*:** Participate in statewide and countywide efforts toward energy conservation, renewable energy generation and GHG reduction.

Program CON-1.1.4.1: Continue the Town's membership in the Marin Energy Authority, or if not, then in other alternatives allowing the choice of renewable energy sources by Fairfax businesses and residents.

Program CON-1.1.4.2: Support Marin County's Greenhouse Gas Reduction Plan by implementing all feasible GHG mitigation measures outlined therein.

Program CON-1.1.4.3: Participate in the Cities for Climate Protection Campaign, administered by ICLEI – Local Governments for Sustainability.

Program CON-1.1.4.4: As part of any traffic study, require GHG emission analysis, according to the (State) CEQA *Guidelines* developed by the Governor's Office of Planning and Research.

Program CON-1.1.4.5: Identify other national and local programs supporting energy conservation, renewable energy generation and GHG reduction, and participate in them as appropriate.

4.4.3 Impacts and Mitigation Measures

4.4.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use;

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract;

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g));

d) Result in the loss of forest land or conversion of forest land to non-forest use;

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use;

f) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or

g) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Appendix F (Energy Conservation) and Appendix G (Environmental Checklist Form) of the State CEQA *Guidelines* do not list potential thresholds of significance for an evaluation of energy-related impacts. Therefore, for the purposes of this analysis, the following applicable thresholds of significance consistent with Appendix N of the County's Environmental Impact Review Guidelines (EIR Guidelines; Marin County, 1994), have been used to determine whether implementing the Project would result in a significant impact related to energy use. An impact related to energy resources is considered significant if implementation of the Project would do any of the following when compared against existing conditions:

a) Utilize energy, oil, or natural gas in an inefficient manner

b) Encourage activities that would result in the use of large amounts of energy, oil, or natural gas

c) Exceed the capacity of the energy supplier to supply the project's energy needs with existing or planned supplies

d) Require the development of new energy resources

Due to the nature of the Project, there would be no impacts related to the following criteria; therefore, no impact discussion is provided for the reasons described below:

1. ***Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.*** Implementation of the Project would not convert any Farmland to non-agricultural use because neither of the Project sites is zoned for agriculture or used for agriculture, and neither is mapped as prime, unique, or statewide farmland.

2. ***Conflict with existing zoning for agricultural use, or a Williamson Act contract.*** Implementation of the Project would not conflict with existing zoning for agricultural use or any Williamson Act contracts because none of the Project sites is zoned for agricultural use and none includes land with a Williamson Act contract.

3. ***Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)).*** Implementation of the Project would not conflict or cause rezoning of any forest land, timberland, or timberland zoned Timberland Production because none of the Project sites is on land zoned for these uses.

4. ***Result in the loss of forest land or conversion of forest land to non-forest use*.** As described above, the Project would not result in the loss of forest land or conversion of forest land to non-forest use.

5. ***Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use*.** The Project would not result in any other changes in the existing environment that could result in the conversion of Farmland to non-agricultural use, or conversion of forest land to non-forest use because neither of the Project sites is on Farmland or forest land.

6. ***Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.*** The Project would not change the availability of mineral resources because the Project sites do not contain any known mineral resource sites.

7. ***Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.*** The Project would not change the availability of mineral resources because the Project sites do not contain any known mineral resource sites.

4.4.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in energy, mineral, forestry, and agricultural resource impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. Mitigation measures are identified, as necessary, to reduce significant impacts. The analysis considers the Project, Appendixes F and G of the State CEQA *Guidelines*, Appendix N of the County's EIR Guidelines, current conditions, and applicable regulations, plans and policies.

4.4.3.3 Impacts and Mitigation Measures

Impact 4.4-1: Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources. (*Less than Significant with Mitigation*)

Implementation of the Project would require the use of energy resources for construction of the FDS basin at the former Sunnyside Nursery site (i.e., the Nursery Basin) and the Downtown San Anselmo Element to increase creek capacity. This energy use would primarily be in the form of petroleum products and electricity used to operate construction equipment and consumed during vehicle trips associated with material delivery/debris hauling and commuting workers. Indirect energy use would also occur and include the extraction, production, and transportation of goods and materials needed for construction. As described in Chapter 3, construction activities would be temporary and occur over a time period of four to six months for the Downtown San Anselmo Element, and six to eight months for the Nursery Basin. **Mitigation Measure 4.3-1, BAAQMD**

Basic Construction Mitigation Measures and BAAQMD's recommended Additional Construction Mitigation Measures (refer to Section 4.3, Air Quality and Greenhouse Gas Emissions), include measures (such as reducing vehicle and equipment engine idling times) that would reduce energy consumption and combustion of petroleum products by construction equipment.

Structure demolition would be subject to California Code of Regulations, Title 24, Part 11, 2016 California Green Building Code, effective January 1, 2017. This code requires that a minimum of 65 percent of non-hazardous construction and demolition waste is recycled and/or salvaged for reuse in an effort to divert debris from landfills. With implementation of the California Green Building Code standard requirements, impacts associated with Project energy use during construction would be less than significant.

Implementation of the Project would require the use of minimal energy resources for operation and maintenance of the Project elements. Maintenance of the Downtown San Anselmo Element would require minimal energy use and would likely be similar to existing creek maintenance activities. These activities would occur on an annual, or as-needed, basis. Energy use associated with operation and maintenance of the Nursery Basin would be similarly limited; activities such as using an excavator or backhoe to remove sediments deposited in the creek channel would occur just once or twice per year and would need less than a day of equipment use each time.

The energy used during maintenance would not result in a significant impact. Additionally, while the Project may involve the construction of ancillary structures for the Nursery Basin, the Project does not involve constructing buildings for human inhabitation, therefore no energy efficiency policies apply. For these reasons, energy impacts during Project operation would be less than significant.

> **Mitigation Measure 4.3-1: BAAQMD Basic Construction Mitigation Measures** (refer to Impact 4.3-1 in Section 4.3.4.3)
>
> **Significance after Mitigation:** Implementation of Mitigation Measures 4.3-1a and 4.3-1b would reduce construction equipment energy consumption and the impacts associated with the Project's use of energy to levels that would be less than significant.

4.4.4 References – Energy, Mineral, Forest, and Agricultural Resources

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4.5 Biological Resources

This section presents and discusses the biological resources associated with the San Anselmo Flood Risk Reduction Project (Project) construction, implementation, and operation. It provides an overview of the natural and physical environment and the regulatory setting that apply to the biological resources within the Project sites. The section then presents and discusses the potential Project impacts on those resources and appropriate mitigation measures, as necessary.

4.5.1 Physical Setting

Marin County, and the Ross Valley in particular, is a complex landscape containing a wide range of vegetation communities, aquatic habitats, land covers, elevations, and interfaces between natural and built environments.

4.5.1.1 Regional Setting

Marin County is located between the Pacific Ocean and San Francisco Bay in California's Coast Range. Elevations range from sea level up to 2,572 feet at the summit of Mount Tamalpais. Approximately 50 percent of the land area in Marin County is under public management as parks, open space, conservation easements, and watershed lands. Most developed areas are in the eastern part of the county, between the San Francisco Bay and Mount Tamalpais. Natural community types in the county include mixed evergreen forest, oak woodland, pine forest, Douglas fir/redwood forest, grassland, coastal beach dune, northern coastal scrub, chaparral, coastal salt marsh, riparian, and freshwater marsh. These communities support a wide range of plant and animal species, including special-status species (Marin County, 2007).

Vegetation communities in Marin have been altered by agriculture, livestock grazing, timber operations, road building, and urban and suburban development beginning in the nineteenth century. Native perennial grasslands have been mostly replaced by non-native annual grassland, and invasive species now have widespread distribution. Marshlands have been filled and developed, and creeks narrowed, culverted, and incised. Urban and suburban development have contributed to considerable fragmentation of the remaining natural areas and limited the available floodplain for creek systems (Marin County, 2007).

4.5.1.2 Project Setting

The Project would take place at two locations. The Downtown San Anselmo Element would be in San Anselmo Creek in the Town of San Anselmo (Downtown San Anselmo site). The Nursery Basin Element would be on Fairfax Creek in unincorporated Marin County, just outside the border of the Town of Fairfax, at the former Sunnyside Nursery site (Nursery Basin site). Both are in the Corte Madera Creek (or Ross Valley) Watershed, a 28-square mile watershed in the southeast of Marin County, in the California Floristic Province. This province has a Mediterranean-type climate characterized by hot, dry summers and cool, wet winters that result in high levels of plant endemism (i.e., being unique to a defined geographic location).

Corte Madera Creek is the main stream in the watershed and drains into San Pablo Bay. San Anselmo Creek and Fairfax Creek are major tributaries draining the slopes in the western and northern portions of the watershed. These and other smaller creeks total over 44 linear miles of stream channels and are the sources of flooding that the Project seeks to address. Figure 3-10 (in Chapter 3, *Project Description*) shows the Project sites along San Anselmo and Fairfax Creeks.

The upper stream reaches of both San Anselmo Creek and Fairfax Creek support relatively natural stream channels and the lower and middle reaches support urban creek habitat. Near the Project sites, both creeks are channelized with narrow, incised banks, and there are roads, parks, residences and businesses along the banks. In downtown San Anselmo, some commercial buildings stretch over the creek channel. Pedestrian walkways, low bridges, and narrow culverts also occur in San Anselmo and Fairfax Creeks in the vicinity of the Project sites. All of these features result in flow constrictions that contribute to flooding. Downstream of the Project sites, San Anselmo Creek flows into Corte Madera Creek. Corte Madera Creek is confined to a concrete-lined channel for approximately 1 mile and flows through densely developed areas in the cities of Larkspur and Corte Madera and the Town of Ross and unincorporated areas of Kentfield and Greenbrae. There is minimal capacity to accommodate floodwaters in the lower reaches. Most developable portions of the watershed are already developed.

The riparian corridors associated with both creeks support a wide range of vegetation communities and habitat types, as well as terrestrial and aquatic wildlife species, including special-status species in the vicinity of the Project sites. The following subsections summarize the existing habitats and biological resources in the vicinity of the Project sites.

The total area of the Project footprint at the Nursery Basin site and at the Downtown San Anselmo site, as well as the breakdown of those total areas into different habitat types and communities is listed in **Table 4.5-1**. These habitat types are illustrated in **Figures 4.5-1** and **Figure 4.5-2**.

TABLE 4.5-1
PROJECT FOOTPRINTS AND HABITAT AREAS AT THE PROJECT SITES (ACRES)

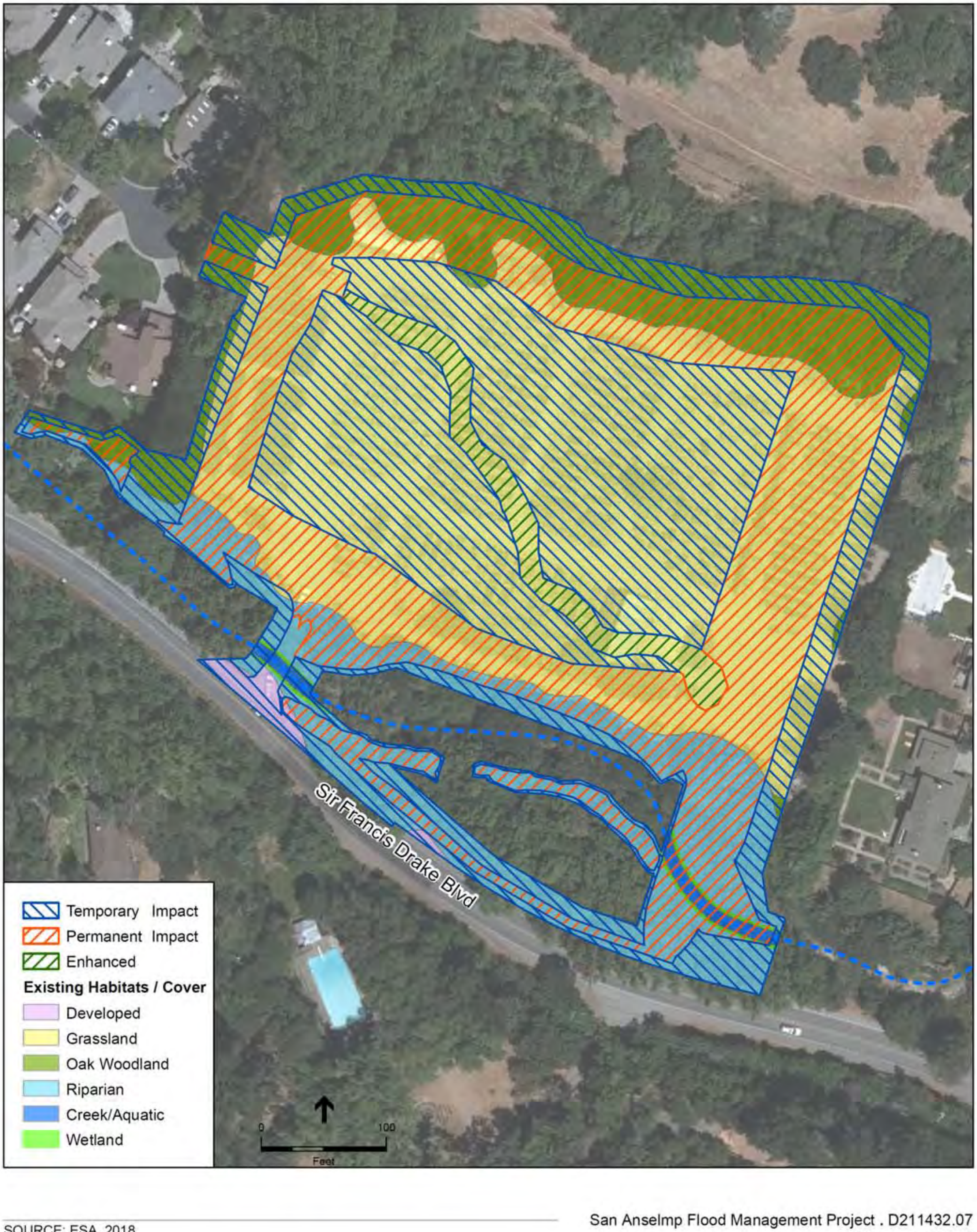
Habitat Type	Nursery Basin Site[1]	Downtown San Anselmo Site
Aquatic	0.04	0
Riparian	1.02	0.14
Wetland	0.02	0
Oak Woodland	0.81	0
Ornamental / Developed	0.05	0.17
Annual Grassland	3.65	0
Total	**5.59**	**0.31**

NOTE:
1 The Nursery Basin site is in a 7.7-acre parcel, portions of which would not be within the Project footprint.
SOURCE: ESA 2018; based on CH2M's 2018 designs overlain on ESA's habitat mapping.

SOURCE: ESA, 2018

San Anselmo Flood Management Project . D211432.07

Figure 4.5-1
Habitats and Impacts at 634-636 San Anselmo Avenue
(Downtown San Anselmo Site)



SOURCE: ESA, 2018

San Anselmp Flood Management Project . D211432.07

Figure 4.5-2
Habitats and Impacts at the Nursery Basin Site

4.5.1.3 Vegetation Communities and Wetlands

Figure 4.5-1 and Figure 4.5-2 above show the existing vegetation communities at the Project sites. Vegetation communities are defined from Mayer and Laudenslayer, 1988. As seen, the two Project sites are located along the creeks, in the riparian zone, and in disturbed annual grasslands and ornamental vegetation. Oak woodland borders the grassland in Fairfax and redwood trees (*Sequoia sempervirens*) border Creek Park in San Anselmo. The upper parts of the watershed are dominated by oak-bay woodland and mixed-evergreen forests, including coast redwood and Douglas fir (*Pseudotsuga menziesii*). The northern and eastern ridges include forests along with grasslands, chaparral, and northern coastal scrub. There are also several areas of serpentine outcroppings, featuring specialized native grasses and wildflowers.

In the lower reaches of the watersheds, urban/suburban land uses dominate, but there are also areas of oak woodlands and broadleaved evergreen forests, including California bay (*Umbellularia californica*), coast live oak (*Quercus agrifolia*), tanoak (*Lithocarpus densiflorus*), and Pacific madrone (*Arbutus menziesii*), and fragments of coniferous forest.

Wetlands (including seasonal freshwater wetlands, vernal pools, seeps and springs) are areas periodically or permanently inundated by surface or groundwater and support vegetation adapted to life in saturated soil. Wetlands have high inherent value to fish and wildlife and the potential for stormwater storage, groundwater recharge, and maintenance of water quality. No wetlands have been identified to date at the Project sites (USFWS, 2017b); however, jurisdictional wetlands may be present along the edges of the creek channel.

A jurisdictional delineation would need to be conducted and submitted to the U.S. Army Corps of Engineers (USACE) for verification to determine the extent of impact on jurisdictional wetlands and other waters of the U.S. and to support associated permitting. In advance of that formal delineation, this analysis conservatively assumes that the streams themselves (Fairfax Creek, San Anselmo Creek, and other unnamed tributaries) are jurisdictional other (non-wetland) waters of the U.S. and that narrow bands of instream wetlands are present on both banks of the two major creeks in the Project areas.

Annual grassland

Scrub and disturbed grassland vegetation occurs in open portions of the former Sunnyside Nursery Basin site, and may include bush monkeyflower *(Mimulus aurantiacus),* coyote brush (*Baccharis pilularis*), toyon (*Heteromeles arbutifolia*), and poison oak. Native and introduced grasses and forbs are dominated by wild oat (*Avena* sp.), ripgut brome (*Bromus diandrus*), soft chess (*B. hordeaceus*), quaking grass (*Briza minor*), California fescue (*Festuca californica*), Idaho fescue (*Festuca idahoensis*), purple needlegrass (*Stipa pulchra*), dogtail (*Cynosurus echinatus*), brodiaea (*Brodieaea* sp.), iris (*Iris* sp.), filaree (*Erodium* sp.), vetch (*Vicia* sp.) soap plant (*Chlorogalum pomeridianum*), and California poppy (*Eschscholzia californica*). Introduced French broom *(Genista monspessulana)* and Scotch broom *(Cytisus scoparius)* have invaded many areas. Serpentine soils and rock outcrops in grasslands host native bunchgrasses and other native plant species that have been displaced by non-native plants in other grassland. Most remaining natural communities are found in the higher portions of the watershed away from most development and are on publicly managed lands, such as parks and open space.

The flood diversion and storage (FDS) basin at the former Sunnyside Nursery (the Nursery Basin) includes annual grassland and ruderal vegetation (see Figure 4.5-2). Wildlife that use this habitat may include western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis catenifer catenifer)*, California vole (*Microtus californicus*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), and American badger (*Taxidea taxus*). Many bird species are found here, including house finch (*Haemorhous mexicanus*) and American robin (*Turdus migratorius*), and raptors such as white-tailed kite (*Elanus leucurus*), merlin (*Falco columbarius*), and red-tailed hawk (*Buteo jamaicensis*) may forage here.

Coast oak woodland

Mixed oak and evergreen woodlands occur along valley bottoms and lower slopes in the Nursery Basin site and include both coast live oak, valley oak (*Quercus lobata*), California bay, California buckeye (*Aesculus californica*), California black oak (*Q. kelloggii*), bigleaf maple (*Acer macrophyllum*), madrone, and Douglas fir. This community can be found on the periphery of the Nursery Basin site. Understory species include broom, along with honeysuckle (*Lonicera hispidula*), California huckleberry, poison oak, western sword fern (*Polystichum munitum*), and California hazelnut (*Corylus cornuta* var. *californica*). The variety of trees and shrubs provide nesting habitat for many bird species, and acorns provide food for insects, larger birds and mammals. Typical wildlife includes several species of salamanders and newts, western fence lizard, Sierran treefrog (*Pseudacris sierra*), black-tailed deer (*Odocoileus hemionus*), great horned owl (*Bubo virginianus*), acorn woodpecker (*Melanerpes formicivorus*), western scrub jay (*Aphelocoma californica*), and striped skunk (*Mephitis mephitis*), as well as raptors, including Cooper's hawk and merlin, and bats such as pallid bat (*Antrozous pallidus*), hoary bat (*Lasiurus cinereus*) and fringed myotis (*Myotis thysanodes*).

Valley foothill riparian

Valley foothill riparian habitat develops in the floodplains of streams, forming a transitional community between the aquatic and dry upland habitats. Dominant tree species include valley oak, California bay, California buckeye**,** and red alder (*Alnus rubra*). Common native understory species at the Project sites include California blackberry (*Rubus ursinus*), poison oak (*Toxicodendron diversilobum*), mugwort (*Artemisia douglasiana*), and sword fern. Common non-native species include English ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), Himalayan blackberry (*Rubus armeniacus*), and bull thistle (*Cirsium vulgare*). The diversity of habitats, corridor resources, abundant food, and available water, make riparian areas especially valuable to wildlife. Typical species may include western scrub jay, Wilson's warbler (*Cardellina pusilla)*, California slender salamander (*Batrachoseps attenuatus*), and Sierran treefrog. Riparian habitat is found along both San Anselmo and Fairfax Creeks at the Project sites (refer to Figure 4.5-1 and Figure 4.5-2).

Coniferous forest

Most forests along the creeks have been fragmented by roads and urban development, but in the upper reaches of the watershed substantial forestlands and woodland habitat remain. This habitat type is dominated by Douglas fir or coast redwood, tall, long-lived conifer species. It is commonly associated with coast live oak, California bay, canyon live oak (*Quercus chrysolepis*), tanoak, and Pacific madrone trees. This habitat type is found in moist coastal areas with heavy summer fog and in sheltered, moist locations along streams, canyons, and with seeps and springs, including in isolated fragments near Fairfax and San Anselmo creeks, in the vicinity of the Project sites. The sparse understory includes California huckleberry (*Vaccinium ovatum*), sword fern, and redwood sorrel (*Oxalis oregana*). The moist environment in the forest supports many amphibians. Typical animals found in redwood or Douglas fir forest include California slender salamander, gray fox, western gray squirrel *(Sciurus griseus*), great horned owl, and Steller's jay (*Cyanocitta stelleri*). Special-status species potentially occurring in this habitat include sharp-shinned hawk (*Accipiter striatus*), California giant salamander (*Dicamptodon ensatus)* and Santa Cruz black salamander (*Aneides niger*). The federally and state-listed threatened northern spotted owl (*Strix occidentalis*) nests in these woodlands on the slopes of Mount Tamalpais, but is not expected to nest in the developed lowlands of either Project site. This habitat type is located outside the Nursery Basin site.

The Project sites also contain ornamental vegetation (the lawn in Creek Park in San Anselmo), and developed areas, as shown on Figure 4.5-1.

4.5.1.4 Fish and Wildlife

Fish

San Anselmo Creek, Fairfax Creek, and their tributaries in the Corte Madera Creek Watershed support fish including California roach (*Hesperoleucus symmetricus*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento sucker (*Catostomus occidentalis)*, Pacific lamprey (*Entosphenus tridentatus*), riffle sculpin (*Cottus gulosus*), and prickly sculpin (*Cottus asper*). Lower, tidally-influenced portions of the watershed also support three-spine stickleback (*Gasterosteus aculeatus*), longjaw mudsucker (*Gillichthys mirabilis*), starry flounder (*Platichthys stellatus*), staghorn sculpin (*Leptocottus armatus*), and other species associated with San Francisco Bay.

Historically, Corte Madera Creek Watershed supported Coho salmon (*Oncorhynchus kisutch)*, with the last sighting in 1984 (Leidy et al., 2005). The Corte Madera Creek Watershed supports a central California Coast steelhead trout (*Oncorhynchus mykiss*) run, with San Anselmo and Cascade creeks supporting spawning and rearing habitat. Fish passage barriers (bedrock outcropping) on Fairfax Creek block steelhead from habitat in upper Fairfax Creek (Leidy et al., 2005).

Central Valley fall-run Chinook salmon (*Oncorhynchus tshawytscha*) have also been reported in Corte Madera Creek and presumably are strays from San Pablo Bay. Historically, the lower watershed also supported tidewater goby (*Eucyclogobius newberryi*), Sacramento perch

(*Archoplites interruptus*), and tule perch (*Hysterocarpus traskii*); which are now extirpated (Leidy, 2007). Introduced fish species include rainwater killifish (*Lucania parva*), western mosquitofish (*Gambusia affinis*), black crappie (*Pomoxis nigromaculatus*), and common carp (*Cyprinus carpio*) (Leidy, 2007).

Amphibious, Terrestrial, and Avian Wildlife

Streams and adjacent forested woodlands in the Project area support amphibious species such as the California newt (*Taricha torosa*) and California giant salamander (*Dicamptodon ensatus*). The adjoining woodlands, forests and grasslands also supportarboreal salamander (*Aneides lugubris*), California slender salamander, yellow-eyed salamander (*Ensatina eschscholtzii xanthoptica*), and Sierran treefrog. Reptiles in the Project area may include western fence lizard, Pacific gopher snake, western diamondback rattlesnake (*Crotalus atrox)*, ringneck snake (*Diadophis punctatus*), sharp-tailed snake (*Contia tenuis*), and California kingsnake (*Lampropeltis californiae*), among others. Migratory and resident bird species including tree swallow (*Tachycineta bicolor*), American robin, dark-eyed junco (*Junco hyemalis*), Western scrub jay, Wilson's warbler, Pacific-slope flycatcher (*Empidonax difficilis*), and Anna's hummingbird (*Calypte anna*) nest and forage in the Project area and within the riparian forests at the Project sites. Mammal species using the Project sites include coyote, raccoon (*Procyon lotor*), western gray squirrel and striped skunk.

4.5.1.5 Special-Status Species

Special-status species are plants and animals that are legally protected under the federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA), or other regulations or policies such as the California Fish and Game Code, the Migratory Bird Treaty Act (MBTA), California Species of Special Concern, plants identified as rare by the California Native Plant Society (CNPS), and others. More information on these regulations and the agencies that implement their protections is provided in Section 4.5.2, *Regulatory Setting*.

The Ross Valley region supports many special-status species. Updated database searches of the California Natural Diversity Database (CNDDB), the CNPS California Rare Plant Ranking (CRPR), the U.S. Fish and Wildlife Service (USFWS) species list generator, and the USFWS National Wetland Inventory list and the Point Blue Northern Spotted Owl Surveys, were used to generate lists of special-status species, designated critical habitats[1], and sensitive or otherwise protected habitats in the Project sites. **Table 4.5-2** presents the results of those database and records searches.

1 **Critical habitat** is defined by USFWA as the specific areas within the geographic area, occupied by the species at the time it was listed, that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection.

TABLE 4.5-2
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Invertebrates			
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	FE/--	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	**Low.** Project sites outside species' known distribution.
Callippe silverspot butterfly (*Speyeria callippe callippe*)	FE/--	Host plant is *Viola pedunculata*. Most adults found on East-facing slopes; males congregate on hilltops in search of females.	**Low.** Suitable habitat not found in Project sites.
California freshwater shrimp (*Syncaris pacifica*)	FE/SE	Shallow pools away from main streamflow. Winter: undercut banks with exposed roots. Summer: leafy branches touching water.	**Low.** Suitable habitat not found in Project sites.
Amphibians			
California giant salamander (*Dicamptodon ensatus*)	--/SSC	Vernal or temporary pools in annual grasslands, or open stages of woodlands. Typically adults use mammal burrows.	**Low**. Local occurrences are historical; however, could occur in wet forests under rocks and logs near streams and lakes.
California red-legged frog (*Rana draytonii*)	FT/SSC	Streams, freshwater pools, and ponds with overhanging vegetation. Also found in woods adjacent to streams. Requires permanent or ephemeral water sources such as reservoirs and slow moving streams and needs pools of >0.5 m depth for breeding.	**Low to Moderate**. Present in Marin County, but in Corte Madera Creek, breeding habitat is limited by high winter flows and the absence of suitable vegetated ponds or backwaters. May disperse through the Project sites.
Foothill yellow-legged frog (*Rana boylii*)	--/SSC	Partly-shaded, shallow streams & riffles with a rocky substrate in a variety of habitats; requires at least some cobble-sized substrate for egg-laying.	**Low.** Project sites on periphery of species occurrence and suitable habitat is lacking due to channel modifications and development. Species may migrate through Project sites.
Fish			
Tidewater goby (*Eucyclogobius newberryi*)	FE/SSC	Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water & high oxygen levels	**Absent.** Presumed extirpated from Corte Madera Creek Watershed. Suitable habitat not found in Project sites
Coho salmon – central California coast ESA (*Oncorhynchus kisutch*)	FE/SE	The Sacramento-San Joaquin River Delta, including the entire Delta, Suisun Bay, and five sloughs. Require beds of loose, silt-free, coarse gravel for spawning. Also need cover, cool water & sufficient dissolved oxygen.	**Absent.** Species was last recorded in Corte Madera creek in 1984.
Chinook salmon – Central Valley fall run (*Oncorhychus tshawyascha*)	--/SSC	Migrate through San Pablo Bay from spawning grounds in Central Valley rivers. Require beds of loose, silt-free, coarse gravel for spawning. Also need cover, cool water & sufficient dissolved oxygen.	**Low.** Occasional Chinook have been identified in Corte Madera Creek, presumably straying from San Pablo Bay but there is no extant run in the watershed.
Steelhead – central California Coast DPS (*Oncorhynchus mykiss*)	FT/--	Aquatic streams and drainages.	**Present.** Known to use Corte Madera Creek tributaries to spawn in the shallow streams. Critical habitat in the watershed.
Tomales roach (*Lavinia symmetricus* ssp.)	--/SSC	Aquatic streams and drainages.	**Low.** Suitable habitat not found in the Project sites.
Longfin smelt (*Spirinchus thaleichthys*)	FC/ST	Euryhaline, nektonic & anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.	**Low.** May occasionally use Corte Madera Creek tributaries to spawn in the shallow streams.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Reptiles			
Western pond turtle (*Actinemys marmorata*)	--/SSC	Ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation <6,000' in elevation. Require basking sites and upland habitat for egg laying (sandy banks and open, grassy fields)	**High.** Breeding habitat (undisturbed upland habitat adjacent to waterways) is limited in the watershed, but adult turtles may use non-breeding aquatic habitat along both creeks to disperse through the Project sites. Population in Phoenix Lake in Ross downstream of the Project area.
Birds			
Short-eared owl (*Asio flammeus*)	--/SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	**Low.** Suitable open habitat is fragmented in the Project sites due to roads and dense development.
Northern spotted owl (*Strix occidentalis caurina*)	FT/ST	In California, the northern spotted owl inhabits a mix of old and younger forests, featuring dense canopy closure of mature trees, abundant logs, standing snags, and live trees with broken tops.	**Moderate.** Northern spotted owl activity centers are present on the slope of Mt. Tamalpais and along tributaries including Ross Creek 0.25 miles away.
Burrowing owl (*Athene cunicularia*)	--/SSC	Nests and forages in low-growing grasslands with burrowing mammals.	**Low**. Project sites grasslands are too disturbed to provide suitable habitat. Species occurrences are documented north of the Project sites.
Western snowy plover (*Charadrius alexandrines nivosus*)	FT/SSC	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Low.** Suitable sandy, gravelly soil habitat not found in the Project sites.
Northern harrier (*Circus cyaneus*)	--/SSC	Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Low.** May forage over Corte Madera marsh, but Project sites lack suitable habitat. Nearest breeding CNDDB occurrence in Wildcat Marsh in Richmond, is 6 miles east of the Project sites.
White-tailed kite (*Elanus leucurus*)	--/CFP	Nests in shrubs and trees adjacent to grasslands, forages over grasslands and agricultural lands	**Low.** Suitable open grassland habitat is limited in the Project sites.
American peregrine falcon (*Falco peregrinus anatum*)	BCC/CFP	Nest consists of a scrape or a depression on rock, cliff or building ledge over an open site.	**Low.** Suitable foraging habitat in the Project sites, but nesting habitat is not present.
California black rail (*Laterallus jamaicensis*)	BCC/ST/CFP	Found in salt, brackish and freshwater marsh with dense vegetation for nesting habitat.	**Low.** Marsh habitat lacking in the Project sites.
Bank swallow (*Riparia riparia*)	--/ST	Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**Low.** Suitable habitat not found in the Project sites.
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	BCC/SSC	Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Low.** Marsh habitat lacking in the Project sites.
Alameda song sparrow (*Melospiza melodia pusillula*)	BCC/SSC	Salt marshes. Inhabits *Salicornia* marshes; nests low in *Grindelia* bushes (high enough to escape high tides) and in *Salicornia*.	**Low.** Marsh habitat lacking in the Project sites.
San Pablo song sparrow (*Melospiza melodia samuelis*)	BCC/SSC	Inhabits tidal sloughs in the *Salicornia* marshes; nests in *Grindelia* bordering slough channels.	**Low.** Marsh habitat lacking in the Project sites.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Birds (cont.)			
Ridgway's rail [California clapper rail] (*Rallus obsoletus*)	FE/SE/CFP	Found in salt and brackish marsh with well-defined tidal channels and dense growth of pickleweed; feeds on invertebrates in mud-bottomed sloughs.	**Low.** Marsh habitat lacking in the Project sites.
Mammals			
Pallid bat (*Antrozous pallidus*)	--/SSC	Grasslands, shrublands, woodlands, and forests. Common in arid regions with rocky outcroppings, particularly near water. Roosts in rock crevices, buildings, and under bridges. Very sensitive to disturbance.	**Moderate.** Although local occurrence is historical, suitable habitat is present in Project sites.
Hoary bat (*Lasiurus cinereus*)	--/--/ WBWG Medium	Prefers open habitats or habitat mosaics, with access to trees for cover & open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths. Requires water.	**Moderate**. Roosting habitat present near the aquatic features of the Project sites.
Western red bat (*Lasiurus blossevillii*)	WBWG High	Roosts primarily in trees, 2-40 ft aboveground, from sea level up through mixed conifer forests. Prefers habitat edges & mosaics with trees that are protected from above & open below with open areas for foraging.	**Low**. Habitat is not present within the Project sites.
Townsend's big-eared bat (*Corynorhinus townsendii*)	--/SSC	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	**Low.** Habitat is not present within the Project sites.
Point Reyes mountain beaver (*Aplodontia rufa phea*)	--/SSC	Coastal area of Point Reyes in areas of springs or seepages. North-facing slopes of hills & gullies in areas overgrown with sword ferns and thimbleberries.	**Absent.** Project sites are outside of species' known range.
San Pablo vole (*Microtus californicus sanpabloensis*)	--/SSC	Constructs burrow in soft soil. Feeds on grasses, sedges and herbs. Forms a network of runways leading from the burrow	**Absent.** Habitat is not present within the Project sites.
Saltmarsh harvest mouse (*Reithrodontomys raviventris*)	FE/SE/CFP	Pickleweed is primary habitat, but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow, builds loosely organized nests. Requires higher areas for flood escape.	**Low.** Marsh habitat lacking in the Project sites.
Salt-marsh wandering shrew (*Sorex vagrans halicoetes*)	--/SSC	Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among *Salicornia*.	**Low.** Marsh habitat lacking in the Project sites.
American badger (*Taxidea taxus*)	--/SSC	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	**Low.** Suitable open habitat lacking in the Project sites, which are highly disturbed.
Point Reyes jumping mouse (*Zapus trinotatus orarius*)	--/SSC	Primarily in bunch grass marshes on the uplands of Point Reyes. Also present in coastal scrub, grassland, and meadows.	**Absent.** Suitable coastal scrub or meadow habitat not found in the Project sites.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants			
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	FE/--/1B.1	Wet areas, marshes, and riparian banks, with other wetland species. May - July. 5-360m	**Low.** Project sites outside species' known distribution.
Napa false indigo (*Amorpha californica var. napensis*)	--/--/1B.2	Observations recorded in Monterey County and San Francisco Bay Area. Broadleafed upland forest, chaparral, or cismontane woodland. Perennial deciduous shrub. April - July. 30 – 735m	**Moderate.** Recent occurrences documented in openings in forest, woodland, or chaparral in the vicinity of Project sites.
Bent-flowered fiddleneck (*Amsinckia lunaris*)	--/--/1B.2	Observed in Marin County in cismontane woodland, valley and foothill grassland, or coastal bluff scrub. March - June. 3 – 500m	**Low.** Project sites are outside species' known distribution.
Franciscan manzanita (*Arctostaphylos franciscana*)	FE/--/1B.1	Serpentine outcrops in chaparral. February - April. 30 – 215m	**Low.** Project sites are outside species' known distribution.
Mt. Tamalpais manzanita (*Arctostaphylos montana* ssp. *montana*)	--/--/1B.3	Observations recorded in Marin and Humboldt County. Chaparral, valley and foothill grassland. Perennial evergreen shrub. February - April. 150 – 680m	**Low.** Recent occurrences documented on serpentine slopes, but suitable habitat is lacking in the Project sites.
Presidio manzanita (*Arctostaphylos montana* ssp. *ravenii*)	FE/SE/1B.1	Chaparral, coastal prairie, and coastal scrub in open and rocky serpentine slopes. February - March. 45 – 215m	**Low.** Project sites outside of species' known range.
Marin manzanita (*Arctostaphylos virgata*)	--/--/1B.2	Chaparral, mixed evergreen forest, redwood forest, closed-cone pine forest in Marin County on sandstone or granite. Perennial evergreen shrub. Endemic to CA. January - March. 1-800m	**Low.** Local occurrences documented in western portion of Ross Valley, but suitable habitat is lacking in the Project sites.
Coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*)	--/--/1B.2	Coastal dunes, marshes and swamps, and coastal scrub in mesic sites in dunes or along streams or coastal marshes. April - October. 0-155m	**Absent.** Possibly extirpated. Project sites outside species' known distribution.
Alkali-milk vetch (*Astragalus tener* var. *tener*)	--/--/1B.2	Alkali playa and flats, valley, annual, and foothill grassland, vernal pools, low ground, and flooded lands. March – June. 1-170 m.	**Absent.** Possibly extirpated. Project sites outside species' known distribution.
Thurber's reed grass (*Calamagrostis crassiglumis*)	--/--/2B.1	Freshwater wetlands, wetland-riparian. Perennial rhizomatous herb May - August. 10-60m	**Low.** Local occurrence is historical and freshwater marsh habitat is limited in the Project sites.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants (cont.)			
Tiburon mariposa –lily (*Calochortus tiburonensis*)	--/--/1B.1	Valley and foothill grassland on open, rocky, slopes in serpentine grassland. March – June. 50-150m	**Absent.** Endemic to Ring Mtn. Preserve on the Tiburon Peninsula.
Seaside bittercress (*Caramine angulate*)	--/--/2B.1	Wet areas, streambanks. January – July. 90-155 m.	**Absent.** Species is likely extirpated from Marin
Bristly sedge (*Carex comosa*)	--/--/2B.1	Lake margins, wet places; site below sea level is on a Delta island. May-September -5-1620 m.	**Absent.** Local occurrence is historical and Project sites outside species' known distribution.
Northern meadow sedge (*Carex praticola*)	--/--/2B.2	Moist to wet meadows. May – July. 0-3200m	**Low.** Project sites outside species' known distribution.
Tiburon paintbrush (*Castilleja affinis* var. *neglecta*)	FE/ST/1B.2	Open serpentine grassland slopes. April – June. 60-400m	**Low.** Project sites outside species' known distribution.
Nicasio ceanothus (*Ceanothus decornutus*)	--/--/1B.2	Maritime chaparral; serpentinite, rocky, sometimes clay. March – May. 235-290 m.	**Low.** Project sites outside species' known distribution.
Mason's ceanothus (*Ceanothus masonii*)	--/ /1B.2	Serpentine ridges or slopes in chaparral or transition zone. March – April. 180-460 m.	**Low.** Known occurrences west of Project sites, but suitable habitat is limited.
Point Reyes bird's-beak (*Chloropyron maritimum* ssp. *palustre*)	--/--/1B.2	A number of observations have been recorded in the San Francisco Bay Area in the South Bay, East Bay, and North Bay with observations recorded as far south as San Luis Obispo County, as well as to the north in Humboldt County. Coastal salt marsh, wetland-riparian. Annual herb (hemiparasitic).	**Low.** Marsh habitat lacking in the Project sites.
San Francisco Bay spineflower (*Chorizanthe cuspidata* var. *cuspidata*)	--/--/1B.2	Observed as far south as Monterey County, but most recordings are in the San Francisco Bay Area, which include; San Mateo, Alameda, San Francisco, Marin, and Sonoma County. Coastal Strand, Coastal Prairie, Northern Coastal Scrub. Annual herb.	**Absent.** Local occurrence is historical and Project sites outside species' known distribution.
Franciscan thistle (*Cirsium andrewsii*)	--/--/1B.2	Found in mesic, sometimes serpentinite. Broadleafed upland forest, coastal bluff scrub, coastal prairie, and coastal scrub	**Absent.** Project sites outside species' known distribution. Typically occurs in coastal bluffs of San Francisco.
Mt. Tamalpais thistle (*Cirsium hydrophilum* var. *vaseyi*)	--/--/1B.2	Observations recorded in San Francisco and Marin County in mixed evergreen forest, chaparral, wetland-riparian. Perennial herb.	**Low.** Occurs in eastern portion of Ross Valley in riparian, chaparral or forest habitats, but habitat is lacking in the Project sites.
Presidio clarkia (*Clarkia franciscana*)	FE/SE/1B.1	Serpentine outcrops in grassland or scrub. May – June. 20-305 m.	**Low.** Project sites outside species' known distribution.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants (cont.)			
Western leatherwood (*Dirca occidentalis*)	--/--/1B.2	Broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen & foothill woodland communities. 25-425 m.	**Low.** Project sites outside species' known distribution.
Koch's cord moss (*Entosthodon kochii*)	--/--/1B.3	Cismontane woodland with moss growing on soil on river banks. 185-365m	**Low.** Project sites outside species' known distribution.
Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*)	--/--/1B.2	Observations recorded in the San Francisco Bay Area include the East Bay and North Bay up to Mendocino County. Coastal prairie, chaparral, and valley grassland. Annual herb. May-September. 0-700m	**Low.** Likely to occur in grasslands in the vicinity, but suitable habitat is lacking in the Project sites.
Minute pocket moss (*Fissidens pauperculus*)	--/--/1B.2	Observations recorded along the west coast of California from Santa Cruz County to Del Norte, with observations recorded east in Butte County. Moss grows on damp soil along the coast and dry streambeds/streambanks.	**Low.** Project sites outside species' known distribution.
Fragrant fritillary *Fritillaria liliacea*	--/--/1B.2	Coastal scrub, valley and foothill grassland, coastal prairie. Often on serpentine; usually on clay soils, in grassland. February- April. 3-410 m.	**Low.** Project sites outside species' known distribution.
Marin checker lily (*Fritillaria lanceolata var. tristulis*)	--/--/1B.1	Perennial bulbiferous herb. Observations recorded in San Mateo and Marin County in canyons to riparian areas and serpentine rock outcrops. February – May. 15-150m	**Low.** Project sites outside species' known distribution.
Diablo helianthella (*Helianthella castanea*)	--/--/1B.2	South Bay, East Bay, and North Bay in chaparral, foothill woodland, Northern coastal scrub, and valley grassland. Perennial herb.	**Low.** Local occurrence is historical and suitable habitat is limited.
Congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*)	--/--/1B.2	Recorded observations have been made as far south as Los Angeles County, but primarily found in the South Bay, North Bay, and along the west coast of California up to Del Norte. Additional observations have been made in El Dorado County. Grassy valleys and hills, often in fallow fields; sometimes along roadsides. April – November. 20-560 m.	**Moderate.** Has potential to occur in grasslands in the Project sites.
Marin western flax (*Hesperolinon congestum*)	FT/ST/1B.1	Alameda, San Mateo, San Francisco, and Marin County with an additional observation recorded in Colusa County in chaparral and valley grassland. Annual herb. 60-370 m.	**Low.** Could occur in serpentine barrens and in serpentine grassland and chaparral.
Santa Cruz tarplant (*Holocarpha macradenia*)	FT/SE/1B.1	Monterey and Santa Cruz County, as well as the North Bay and East Bay in coastal prairie and valley grassland. Annual herb. June – October. 10-220 m.	**Low.** Local occurrence historical (1883) and possibly extirpated.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants (cont.)			
Thin-lobed horkelia (*Horkelia tenuiloba*)	--/--/1B.2	San Luis Obispo and Monterey County. Marin to Mendocino County and east to Colusa County in chaparral. Perennial herb.	**Moderate.** Could occur in sandy soils in forest or grassland of the Project sites.
Small groundcone (*Kopsiopsis hookeri*)	--/--/2B.3	Recorded in counties along the west coast of California including; Santa Cruz, Marin, and Lake County to Del Norte County in redwood forest. Found in open woods, shrubby places, generally on Gaultheria shallon. Perennial rhizomatous herb (parasitic). April – August. 120-1435m	**Low.** Occurs in redwood forest in the vicinity, but habitat is lacking in the Project sites.
Tamalpais lessingia (*Lessingia micradenia var. micradenia*)	--/--/1B.2	Marin and Lake County and chaparral and valley grassland. Usually on serpentine, in serpentine grassland or serpentine chaparral. Often on roadsides. Annual herb. June – October. 60-305 m	**Low.** Occurs in serpentine soils in the vicinity, but suitable habitat is lacking in the Project sites.
Marsh microseris (*Microseris paludosa*)	--/--/1B.2	Found along the west coast from San Luis Obispo County to Mendocino County. Occurs in northern coastal scrub and closed-cone pine forest. Perennial herb. April – June. 5-300m	**Low.** Local occurrences are historical and habitat is limited in the Project sites.
Marin County navarretia (*Navarretia rosulata*)	--/--/1B.2	Marin and Napa County in chaparral, dry, open rocky places, including closed-cone pine forest. In serpentine soils. Annual herb. May – July. 200-635m	**Low.** Local occurrence on serpentine slopes in the vicinity, but suitable habitat lacking in the Project sites.
White-rayed pentachaeta (*Pentachaeta bellidiflora*)	FE/SE/1B.1	Annual herb. Along the west coast from Monterey County to Marin County – none recorded in SF County, in valley grassland. March – May. 35-610m.	**Absent.** Local occurrence is historical and species is likely extirpated from Marin.
Choris' popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*)	--/--/1B.2	Mesic sites in chaparral, coastal scrub, coastal prairie. 15-100 m.	**Low.** Suitable habitat not found in Project sites.
Hairless popcornflower (*Plagiobothrys glaber*)	--/--/1A	South and East Bay from Santa Clara County to Alameda County, and Marin County in coastal salt marsh, wetland-riparian meadows, salt-marsh, coastal. Occurs almost always under natural conditions in wetlands. Annual herb. March – May. 5-125m.	**Absent.** Presumed extinct in California.
North Coast semaphore grass (*Pleuropogon hooverianus*)	--/ST/1B.1	North Bay, including Marin to Mendocino County. Farthest north in Del Norte County in mixed evergreen forest, north coastal coniferous forest, freshwater wetlands, wetland-riparian in meadows and vernal-pools. Usually occurs in wetlands, but occasionally found in non-wetlands. Perennial rhizomatous grass. April-June.	**Low.** Local occurrence on periphery of Project sites.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants (cont.)			
Oregon polemonium (*Polemonium carneum*)	--/--/2B.2	Coastal prairie and scrub in lower montane coniferous forest. April – September. 0-1830m	**Low.** Suitable habitat not found in Project sites.
Tamalpais oak (*Quercus parvula* var. *tamalpaisensis*)	--/--/1B.3	Marin County only. Lower montane habitats. Perennial evergreen. March- April.	**Low.** Occurrences in lower montane habitats in the vicinity of the Project sites.
Abode sanicle (*Sanicula maritima*)	--/--/1B.1	Occurs in chaparral, coastal prairie, meadows and seeps, and grassland in clay, serpentinite. Perennial herb. February – May. 30-240m.	**Low.** Local occurrences are historical and in San Francisco.
Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *rhizomata*)	--/--/1B.2	North Bay counties – Marin, Sonoma, and Mendocino in coastal salt marsh or wetland-riparian. Primary habitat is freshwater-marsh. Occurs almost always under natural conditions in wetlands. Perennial rhizomatous herb.	**Low.** Historical occurrence in vicinity, but marsh habitat is not present in the Project sites.
Marin checkerbloom (*Sidalcea hickmanii* ssp. *virdis*)	--/--/1B.2	Serpentine soils in chaparral habitats. May – June. 50-430m.	**Low.** Suitable habitat not found in Project sites.
San Francisco campion (*Silene verecunda* ssp. *verecunda*)	--/--/1B.2	Sandy habitats in coastal bluff scrub, chaparral, coastal prairie, coastal scrub, and grassland. February – August. 30-645m	**Low.** Suitable habitat not found in Project sites.
Santa Cruz microseris (*Stebbinsoseris decipiens*)	--/--/1B.2	Monterey, Santa Cruz, and Marin County Coastal Prairie, Chaparral, Mixed Evergreen Forest, Closed-cone Pine Forest, Northern Coastal Scrub. Weak affinity to serpentine soil. Annual herb. April – May. 10-500m	**Low.** Local occurrence on periphery of Project sites, but suitable habitat is not present in the Project sites.
Mt. Tamalpais jewelflower (*Streptanthus batrachopus*)	--/--/1B.3	Only found in the North Bay regions from Marin County to Mendocino and east to Colusa County. Chaparral, closed-cone pine forest. Annual herb. April – July. 335-670 m.	**Low.** Local occurrence on periphery of Project sites, but chaparral and pine forest do not occur in Project sites.
Tiburon jewelflower (*Streptanthus glandulosus* ssp. *niger*)	FE/SE/1B.1	Shallow, rocky serpentine slopes in grassland. May-June. 30-150m.	**Low.** Suitable habitat not found in Project sites.
Mt. Tamalpais bristly jewelflower (*Streptanthus glandulosus ssp. pulchellus*)	--/--/1B.2	Only found in Marin County. Chaparral, valley grassland. Moderate affinity to serpentine soil. Annual herb. May-August. 125-670 m.	**Low.** Occurrences on serpentine slopes in the vicinity of the Project sites.

TABLE 4.5-2 (CONTINUED)
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT SITES

Name	Listing Status	General Habitat Requirements	Potential for Species Occurrence Within the Project Sites
Plants (cont.)			
Two-fork clover (*Trifolium amoenum*)	FE/--/1B.1	South Bay (Santa Clara/San Mateo), East Bay and North Bay in valley grassland, wetland-riparian. Sometimes on serpentine soil, open sunny sites, swales, roadsides and eroding cliff faces. Annual herb. April-June. 5-415m.	**Low.** Historical sightings in vicinity of Project sites on serpentine soil in open sunny swales, but no recent occurrences.
Saline clover (*Trifolium hydrophilum*)	--/--/1B.2	Mesic, alkaline sites. April-June. 1-335 m.	**Low.** Known occurrence in Richmond. Unlikely to occur in Project sites.
San Francisco owl's-clover (*Triphysaria floribunda*)	--/--/1B.2	Usually serpentinite conditions in coastal prairie and scrub, and grassland. April-June. 10-160 m.	**Low.** Known occurrences in San Francisco. Unlikely to occur in Project sites.
Coastal triquetrella (*Triquetrella californica*)	--/--/1B.2	Grows within 30m from the coast in coastal scrub, grasslands and in open gravels on roadsides, hillsides, rocky slopes, and fields. On gravel or thin soil over outcrops. Moss. 10-100 m.	**Low.** Occurs on rocky slopes in coastal areas.

Status Codes:

USFWS (U.S. Fish and Wildlife Service)
- FE = Listed as Endangered by the Federal Government
- FT = Listed as Threatened by the Federal Government.
- FC = Listed as Candidate
- BBC = USFWS Bird of Conservation Concern

CDFW (California Department of Fish and Wildlife)
- SE = Listed as Endangered by the State of California
- ST = Listed as Threatened by the State of California
- CaT = Candidate Threatened by the State of California
- CFP = California Fully Protected species
- SSC = Species of Special Concern
- WBWG = Western Bat Working Group

California Native Plant Society:

List 1A=Plants presumed extinct in California
List 1B=Plants rare, Threatened, or Endangered in California and elsewhere
List 2= Plants rare, Threatened, or Endangered in California but more common elsewhere
List 3= Plants about which more information is needed
List 4= Plants of limited distribution
An extension reflecting the level of threat to each species is appended to each rarity category as follows:
- .1 – Seriously endangered in California
- .2 – Fairly endangered in California
- .3 – Not very endangered in California

Potential to Occur Categories:

Absent = The Project sites and/or immediate vicinities do not support suitable habitat for a particular species. Project sites may be outside of the species' known range.
Low Potential = The Project sites and/or immediate vicinities only provide limited habitat. In addition, the species' known range may be outside of the Project sites.
Moderate Potential = The Project sites and/or immediate vicinities provide suitable habitat.
High Potential = The Project sites and/or immediate vicinity provide ideal habitat conditions or the species has been observed.

SOURCES: California Department of Fish and Wildlife (CDFW), California Natural Diversity Data Base, 2017. Available online at http://dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp; California Native Plant Society, Inventory or Rare, Threatened and Endangered Plants of California, 2017. Available online at http://www.rareplants.cnps.org/; U.S. Fish and Wildlife Service (USFWS), iPac Information for Planning and Conservation. Online database powered by ECOS Environmental Conservation Online System, 2017a. Available online at https://ecos.fws.gov/ipac/.

Figure 4.5-3 and **Figure 4.5-4** show the results of the CNDDB searches for special-status plant and animal species in the vicinity of the Project sites. **Figure 4.5-5** shows critical habitat in the vicinity of the Project sites. Note that species shown on CNDDB figures include all species identified in the database searches for areas within two miles of the Project sites, though these species may have been extirpated from the region or not be in the categories of special-status species included in Table 4.5-2.

The rare plant and wildlife species distributions identified in those databases do not provide a comprehensive assessment of rare species distribution in the Project sites, because they are based on reported observations. To further refine the analysis, a reconnaissance-level survey of the Project sites was conducted on May 23, 2017 to assess the habitats present and the potential for special-status species occurrence.

As Table 4.5-2 and Figures 4.5-3 and 4.5-4 show, San Anselmo and Fairfax creeks support multiple special-status plants and animals. San Anselmo Creek also supports federally listed anadromous[2] fish species (refer to Figure 4.5-5). There are no reported occurrences of California red-legged frog (CRLF; *Rana draytonii*), a federal threatened species and California Species of Special Concern within the watershed (California Department of Fish and Wildlife [CDFW], 2017); however, this species occurs in other parts of Marin County and may pass through the watershed. Foothill yellow-legged frog (*Rana boylii*, a state candidate for listing) has been observed in upper San Anselmo Creek in Cascade Canyon (Michl, 2018) and may also occasionally be found in the lower watershed. Western pond turtle (WPT; *Actinemys marmorata*), a California Species of Special Concern, is found at Phoenix Lake in Ross, and has high potential to occur, while CRLF has low to moderate potential, and foothill yellow-legged frog has low potential (see Table 4.5-2). There are areas of suitable roosting habitat for the pallid bat (a California Species of Special Concern) and the hoary bat (a Western Bat Working Group species) at the Project sites. These and other special-status species that may occur in the Project sites are discussed below.

Central California Coast Steelhead (Oncorhynchus mykiss) FT

Central California Coast steelhead may be resident (non-migratory, known as rainbow trout) or may migrate to the open ocean (anadromous). Steelhead are unique among Pacific salmon in that ocean-migrating individuals may return to the ocean after spawning and return to freshwater to spawn one or more times. Eggs are laid in gravel nests called redds, and hatch into alevins (gravel-dwelling hatchlings), which mature into fry (juveniles emerged from stream gravels). Fry (juveniles) rear in freshwater typically 1 to 2 years until they become large enough to migrate to the ocean to finish maturing to adults.

Most spawning takes place from January through April during high creek flows. Steelhead select spawning sites with gravel substrate and with sufficient flow velocity to maintain circulation through the gravel and provide a clean, well-oxygenated environment for eggs. Steelhead fry generally rear in edgewater habitats with good cover and move gradually into pools and riffles as they grow larger. Young steelhead feed on aquatic and terrestrial insects. The upper lethal temperature for Pacific salmonids is in the range 24 to 25 degrees Celsius for continuous long-term exposure (Moyle, 2002).

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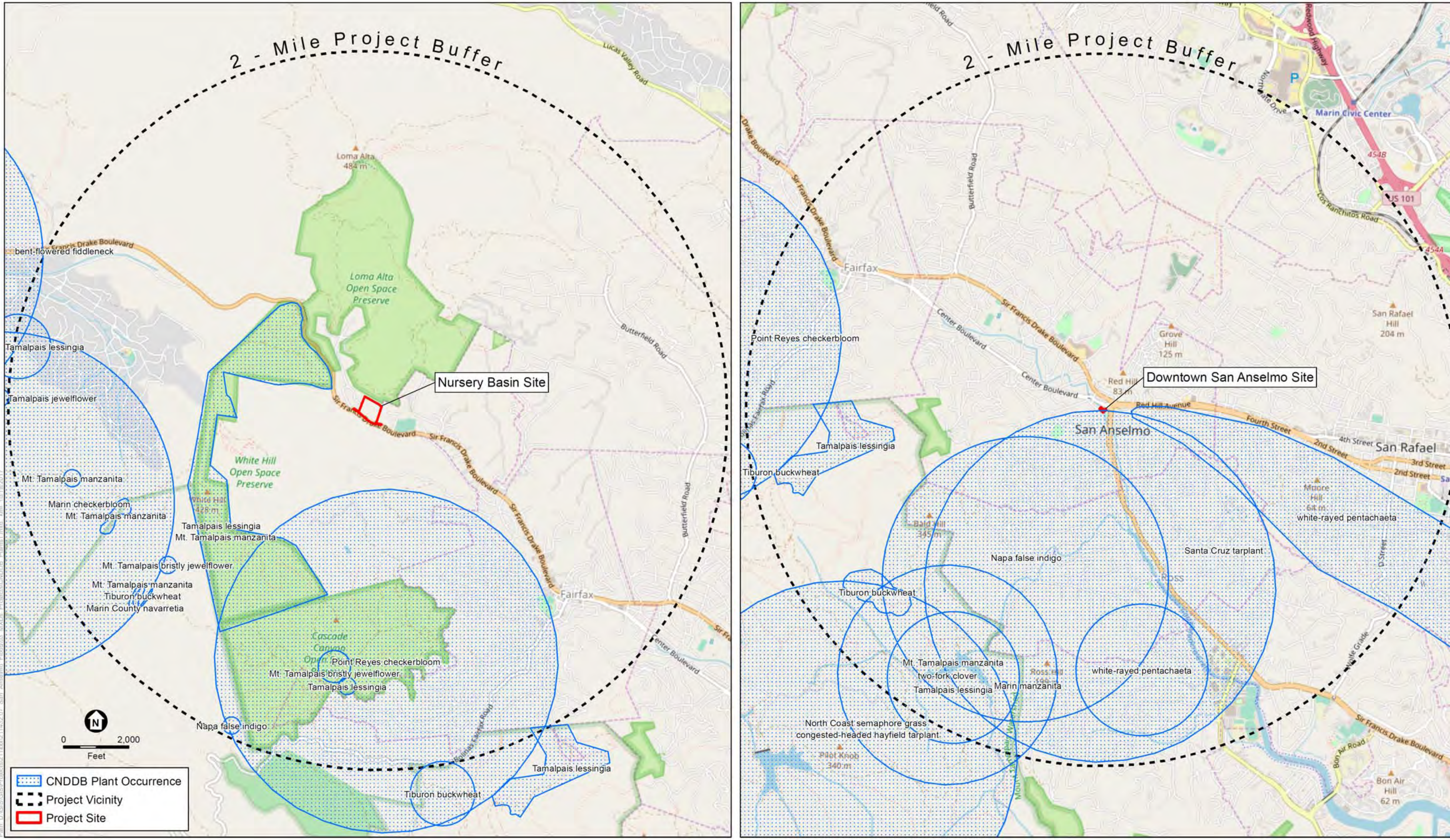
2 Fish that migrate between freshwater and the ocean during their life cycle.

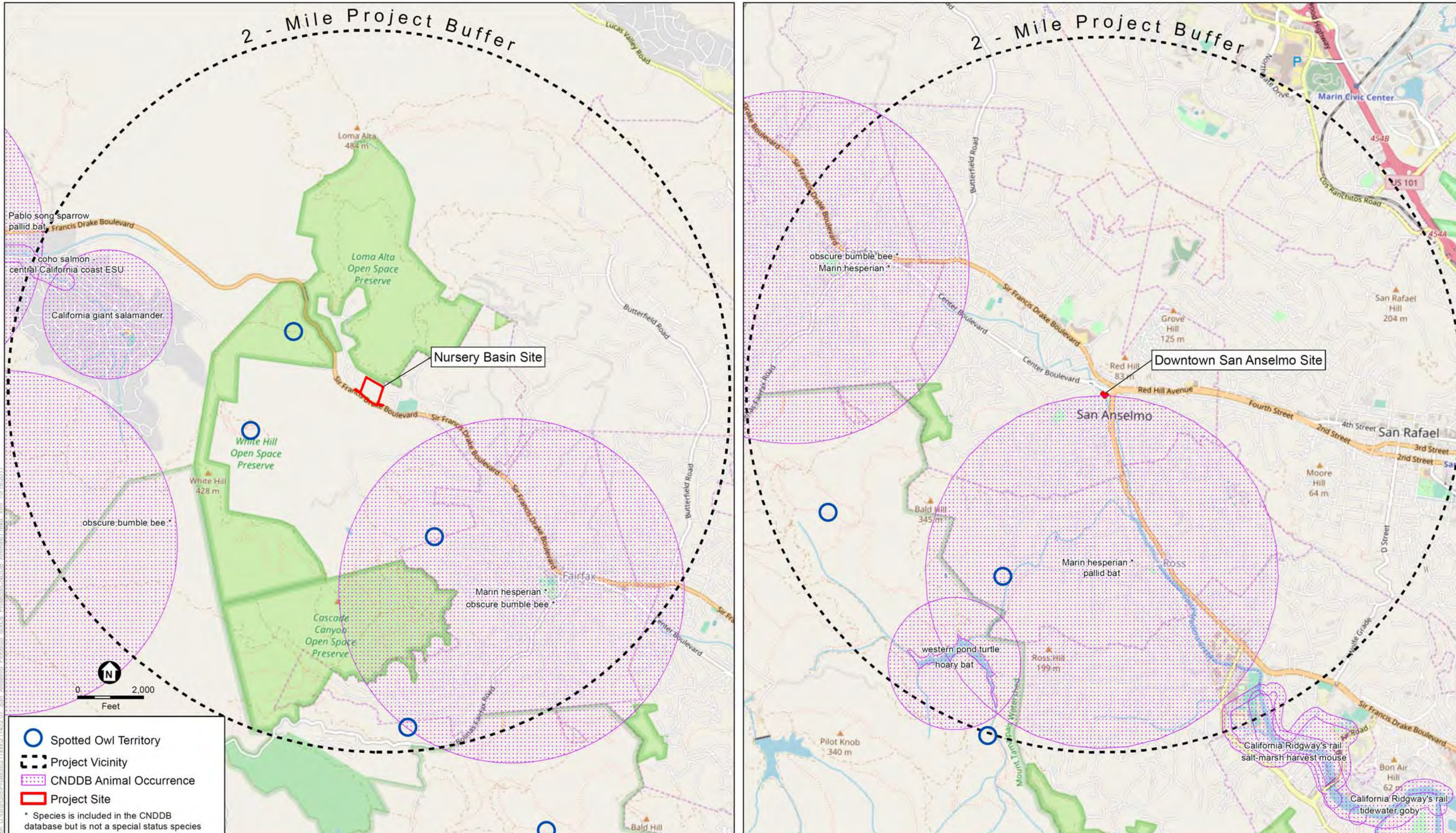


SOURCE: CDFW, 2017

ESA

San Anselmo Flood Risk Reduction Project

Figure 4.5-3
CNDDB Plant Occurrences within 2 Miles of the Project Sites

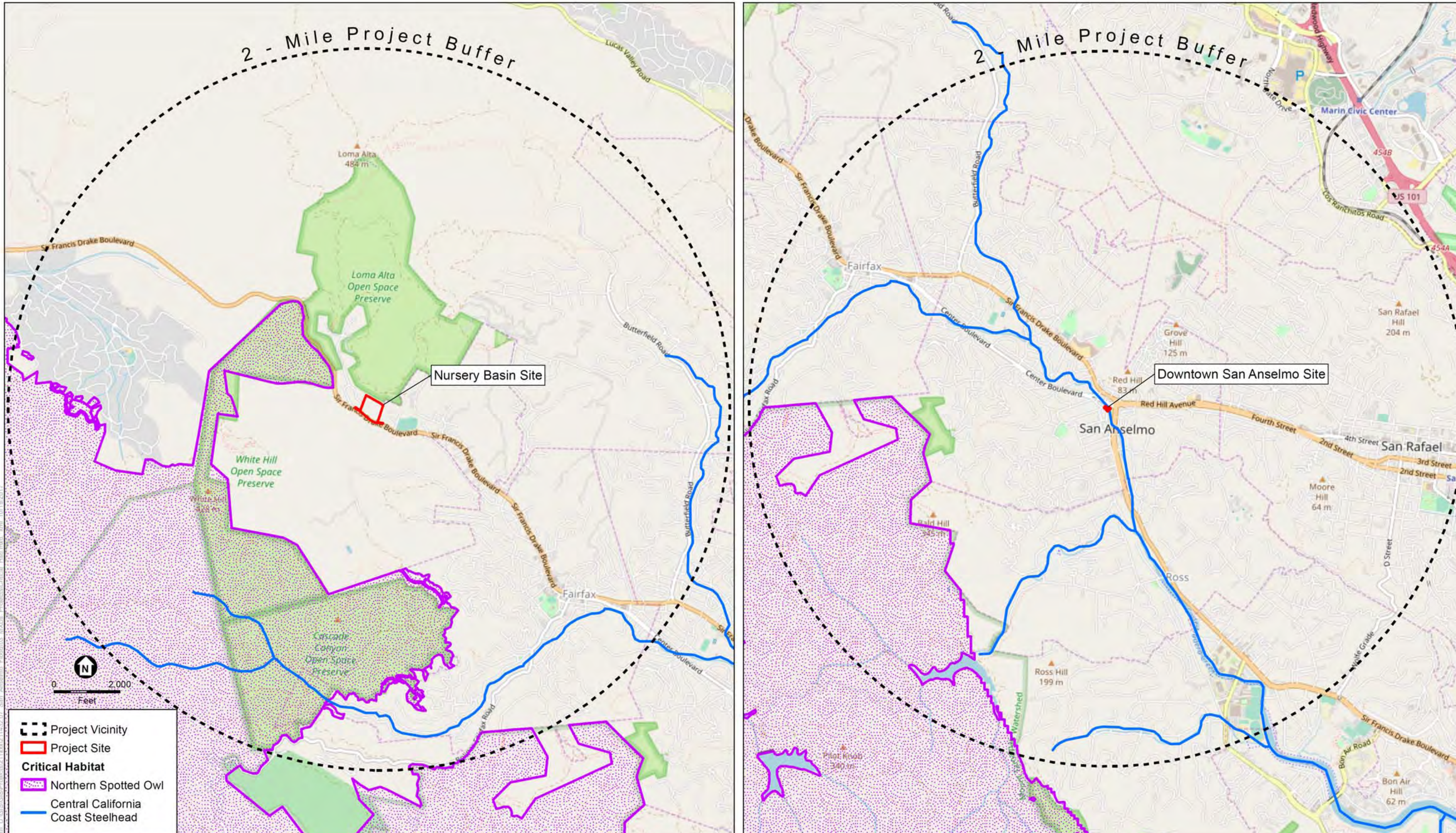


SOURCE: CDFW, 2017

San Anselmo Flood Risk Reduction Project

Figure 4.5-4
CNDDB Wildlife Occurrences within 2 Miles of the Project Sites

ESA



SOURCE: USFWS, 2017

ESA

San Anselmo Flood Risk Reduction Project

Figure 4.5-5
Critical Habitat in the Vicinity of the Project Sites

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Steelhead and Chinook salmon both have been found in the lower portion of Corte Madera Creek, and steelhead use the tributaries as well. Chinook are presumably strays from San Pablo Bay and have low potential to occur in the Project reaches. Designated critical habitat for steelhead includes Corte Madera Creek and tributaries including San Anselmo Creek and Sleepy Hollow Creek (refer to Figure 4.5-5). However, there are major barriers to passage by anadromous fish, including a poorly designed fish ladder upstream of a concrete channel in Ross, and inadequate fish ladders at Saunders Avenue in San Anselmo and at Pastori Avenue in Fairfax. In addition, there is a natural rock outcrop barrier to steelhead passage in Fairfax on Olema Road (Leidy et al., 2005). Although some steelhead are able to get past these barriers, the barriers do not meet standards for fish passage used by National Oceanic and Atmospheric Administration (NOAA) Fisheries and CDFW (Friends of Corte Madera Creek Watershed, 2005 and 2010). Thus, there is a low chance of anadromous fish occurring as far upstream as the Nursery Basin site due to a barrier restricting access into Fairfax Creek, and greater, but still low-to-moderate, chance of anadromous steelhead occurring at the downtown San Anselmo site.

California Red-legged Frog (Rana draytonii; FT)

The CRLF has been extirpated from 70 percent of its historic range and is federally threatened. Critical habitat for this species was finalized in 2010. The Project site is not within critical habitat for the CRLF; the nearest designated critical habitat is approximately 10 miles northwest. CRLF is associated with streams, freshwater pools, and ponds with stands of overhanging vegetation such as willows (*Salix* spp.), broadleaf cattail (*Typha latifolia*), tules (*Scirpus* spp.), or sedges (*Carex* sp.). Frog eggs are attached to emergent or submerged vegetation in ponds, springs, or pools. During wet periods (especially in the winter and early spring months), CRLF can move long distances (e.g., 1 mile) between aquatic habitats, often over areas that are considered to be unsuitable for frogs (e.g., roads, open fields, croplands, etc.).

CRLF have not been detected in the Corte Madera Creek Watershed, including San Anselmo Creek and its tributaries and Fairfax Creek. These creeks are not anticipated to support CRLF breeding. High winter flows, cool water temperatures, dense shading, and the presence of predatory fish species all reduce the habitat suitability of the creeks as breeding locations, but could support aquatic non-breeding habitat. CRLF have been detected elsewhere in Marin County and have low to moderate potential to disperse through the Project sites. The closest documented occurrences of CRLF to the Project site are approximately 5 miles west of the former Sunnyside Nursery Basin site (CDFW, 2017).

Western Pond Turtle (Actinemys marmorata) SSC

The WPT is found in suitable aquatic habitat throughout California. It inhabits annual and perennial aquatic habitats, including lagoons, lakes, ponds, marshes, rivers, and streams from sea level to 5,500 feet. WPT also occupies man-made habitats such as stock ponds, wastewater storage, percolation ponds, canals, and reservoirs. It requires low-flowing or stagnant freshwater aquatic habitat with suitable basking structures, including rocks, logs, algal mats, mud banks and sand. Warm, shallow, nutrient-rich waters supporting prey such as aquatic invertebrates, small fish, and vegetation are ideal. Turtles require suitable aquatic habitat for most of the year. Although upland habitat is utilized for refuging and nesting, this species preferentially utilizes aquatic and riparian corridors for movement and dispersal. WPT nests in uplands in spring and buries eggs. The hatchlings generally emerge in late fall or in early spring. WPT have been found in Phoenix Lake, upstream of Ross Creek, 1.5 miles downstream from the Downtown San Anselmo site. The turtles could disperse into the Downtown San Anselmo site on San Anselmo Creek from Ross Creek by moving upstream along the banks.

However, WPT nesting habitat requires open uplands adjacent to water, which is not found in the Downtown San Anselmo site. At the Nursery Basin site, suitable open upland habitat occurs near Fairfax Creek, but the nearest known occurrence of WPT is 3 miles south at Alpine Lake in the Lagunitas Creek watershed. WPT have a moderate potential to occur at both Project sites.

Northern Spotted Owl (Strix occidentalis caurina) FT, SSC

The Northern spotted owl (NSO) was listed as threatened by the US Fish and Wildlife Service in 1990 and by the California Department of Fish and Wildlife in 2016. Designated critical habitat is 1,000 feet west of the Nursery Basin site and 1 mile west of downtown San Anselmo (refer to Figure 4.5-5). Northern spotted owls are widely distributed in forested regions from southern British Columbia through northwestern California, with the southern edge of their breeding territory reaching into Marin County. In the southern portion of their range, suitable breeding habitat for spotted owl consists of coniferous forest, mixed evergreen forest, and oak woodland. The owls roost in dense, multi-layered canopy during the day, and forage at night. NSO is sensitive to habitat destruction and fragmentation. Large blocks of mature forest with permanent water and suitable nesting trees and snags are required for successful reproduction. The owls usually nest in tree or snag cavities, or on platforms within large trees. Prey consists primarily of small mammals, including woodrats, mice, and voles. The National Park Service, Marin Municipal Water District and Marin County Parks have monitored NSO populations in Marin since 1998 and the population appears stable, with high reproductive success and minimal impact from barred owls (NPS, 2016). The nearest spotted owl activity center is just over 0.25 mile west of the Nursery Basin site (refer to Figure 4.5-4). Both sites are too disturbed and fragmented to provide suitable nesting habitat.

Napa false indigo (Amorpha californica var. napensis) CNPS Rank 1B

Napa false indigo is a perennial deciduous shrub in the pea family (Fabaceae) that blooms from April to July, with identifiable vegetative structures remaining into early fall. It typically occurs on north-facing aspects in openings in broadleaf upland forest, chaparral, and cismontane woodland habitat at elevations ranging from 395 to 6,560 feet (CNPS, 2017). It is often found associated with California bay laurel, black oak, coast live oak, Douglas fir, tanoak, Pacific madrone, California hazelnut, ocean spray (*Holodiscus discolor*), poison oak, wood fern (*Dryopteris arguta*), bracken fern (*Pteridium aquilinum*), wood rose (*Rosa gymnocarpa*), and rein orchid (*Piperia transversa*) (CDFG, 2017). There are 18 CNDDB records of this species from Marin County; the nearest approximately 2.5 miles south of the Nursery Basin site. Woodland habitat within the Project sites is disturbed with primarily non-native species present. This species has moderate potential to occur within grassland of the Nursery Basin site but is not likely to occur at the Downtown San Anselmo site.

Congested-headed hayfield tarplant (Hemizonia congesta ssp. congesta) CNPS Rank 1B

The congested-headed hayfield tarplant (also called the white seaside tarplant) is an annual herb in the sunflower family (Asteraceae) that blooms from April to November. It typically occurs in grassy areas and fallow fields in coastal scrub, and valley and foothill grassland at elevations ranging from 65 to 1,840 feet (CDFG, 2017; CNPS, 2017). Observed associated species include coast live oak, white hyacinth (*Triteleia hyacinthina*), Italian rye grass (*Festuca perennis*), little rattlesnake grass (*Briza minor*), pennyroyal (*Mentha pulegium*), and spiny-fruited buttercup (*Ranunculus muricatus*). There are six CNDDB records in the vicinity of the Project sites (CDFG, 2017), the nearest approximately two miles west of the San Anselmo site. This species has a moderate potential to occur within grassland of the Nursery Basin site, but suitable habitat is not present at the San Anselmo site.

Thin-lobed horkelia (Horkelia tenuiloba) CNPS Rank 1B

Santa Rosa horkelia is a perennial herb in the rose family (Rosaceae) that blooms from May to July. It typically occurs in mesic openings in broadleaf upland forest, coastal scrub, chaparral, and valley and foothill grassland habitat at elevations ranging from 160 to 1,640 feet (CDFG, 2012; CNPS, 2012). Soil survey data at known locations suggest that this species is typically located on very strongly acid (pH 5.0) to slightly acid (pH 6.5) fine sandy loams to very gravelly sands derived from sandstone or serpentine rock (CDFG, 2012; CSRL, 2012). Associated species may include Douglas fir, chamise (*Adenostoma fasciculatum*), poison oak, Stanford's manzanita (*Arctostaphylos stanfordiana*), Baker's manzanita (*A. bakeri* ssp. *bakeri*), yerba santa (*Eriodictyon californicum*), Rincon Ridge manzanita (*Ceanothus confusus*), California blackberry, modesty (*Whipplea modesta*), yerba buena (*Satureja douglasii*), beard tongue (*Penstemon* spp.), purple needlegrass (*Nassella pulchra*), and California oat grass (CDFG, 2012). There are five CNDDB records in the vicinity of the Project area (CDFG, 2017), the nearest approximately two miles south of Fairfax and four miles south of the downtown San Anselmo site. This species has a moderate potential to occur within grassland of the Nursery Basin site but suitable habitat is not present at the Downtown San Anselmo site.

Other Rare Plants

Several other rare plants have been documented in the vicinity of the Project area, but have low potential to occur at the sites given the disturbed habitat within the Project sites. Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*) (Rank 1B.2), Mount Tamalpais manzanita (*Arctostaphylos montana* ssp. *montana*) (Rank 1B.3), Tamalpais lessingia (*Lessingia micradenia* var. *micradenia*) (Rank 1B.2), Marin County navarretia (*Navarretia rosulata*) (Rank 1B.2), and Mount Tamalpais bristly jewelflower (*Streptanthus glandulosus* ssp. *pulchellus*) (Rank 1B.2), may occur on serpentine slopes in chaparral and grassland areas in the vicinity of the Project area. Two-fork clover (*Trifolium amoenum*) (FE, Rank 1B.1) is also found in serpentine soils, along sunny roadsides and cliff faces. Tamalpais oak (*Quercus parvula* var. *tamalpaisensis*) (Rank 1B.3) is found on lower montane slopes, and coastal triquetrella (*Triquetrella californica*) (Rank 1B.2) is found in coastal scrub, rocky slopes, and gravel. Small groundcone (*Kopsiopsis* *hookeri*) (Rank 2B.3) is a parasitic herb found on shrubs in redwood forests. The potential for these and other rare plants to occur in the Project area are included in Table 4.5-2.

4.5.1.6 Habitat Connectivity and Wildlife Movement

Protecting and enhancing habitat connectivity and functional movement corridors between the remaining natural areas is essential to sustaining populations and allowing the continued dispersal of native plant and animal species. Natural linkages include the undeveloped baylands and shorelines, riparian corridors and drainages, undeveloped ridgelines, and corridors across valley floors where impermeable barriers such as dense urban development, exclusionary fencing, and heavily traveled roadways have not yet eliminated options for wildlife movement and plant dispersal (Marin County, 2007). In San Anselmo and Fairfax creeks, the channels provide valuable cover and movement corridors for fish and wildlife in the riparian zone and in the creekbed during the summer months when water levels are low. The Nursery Basin site may also serve as a movement corridor for terrestrial species from the creek to upland habitat on Marin County Open Space District lands.

4.5.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.5.2.1 Federal Regulations

Federal Endangered Species Act

FESA protects listed fish and wildlife species from harm or “take,” which is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Take can also include habitat modification or degradation that directly results in death or injury to a listed wildlife species. An activity can be defined as take even if it is unintentional or accidental. Listed plant species are legally protected from take under FESA if they occur on federal lands or if a project requires a federal action, such as a Clean Water Act Section 404 fill permit.

The USFWS has jurisdiction over federally listed threatened and endangered species, and the National Marine Fisheries Service (NMFS, also called NOAA Fisheries) has jurisdiction over federally listed, threatened, and endangered marine and anadromous fish such as salmon and steelhead. These two agencies also maintain lists of species proposed for listing. Species on these lists are not legally protected under the FESA, but may become listed in the near future; these agencies often include them in their review of a project. Designated critical habitats for FESA-listed species are also regulated and protected by these agencies.

Clean Water Act/Waters of the United States

Areas meeting the regulatory definition of “Waters of the United States” (Waters of the U.S.) (jurisdictional waters) are subject to the jurisdiction of the USACE under provisions of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. These waters may include all waters used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (such as, intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds), all impoundments of waters otherwise defined as Waters of the U.S., tributaries of waters otherwise defined as Waters of the U.S., the territorial seas, and wetlands (termed Special Aquatic Sites) adjacent to Waters of the U.S. (33 Code of Federal Regulations [CFR] Section 328.3). Wetlands on non-agricultural lands are identified using the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987).

Impacts to jurisdictional Waters of the U.S. are regulated under Section 404 of the Clean Water Act, for which the USACE and the U.S. Environmental Protection Agency (USEPA) have enforcement responsibility. The water quality-related aspects of the Clean Water Act have been delegated to the California Water Resources Control Board and the Regional Water Quality Control Boards (RWQCBs) under it; those regulations and agencies are discussed below.

Federal Migratory Bird Treaty Act

The federal MBTA (16 United States Code [U.S.C.] § 703) prohibits the pursuit, hunting, take, capture, or killing of migratory birds in the United States, including nests and eggs of migratory birds during the breeding season. The current U.S. Department of the Interior interpretation of the MBTA (memorandum M-37050 in December 2017) does not prohibit or penalize take of migratory birds that results from incidental take during operations. Taking of nests from construction activity remains prohibited under MBTA.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) is the primary law governing marine fisheries management in U.S. federal waters. One objective of the act is to conserve Essential Fish Habitat. A consultation with NMFS is required whenever a federal agency permits, funds, or implements a project that could affect essential fish habitat. Corte Madera Creek and its upstream tributaries, including San Anselmo Creek and Fairfax Creek, are designated as Essential Fish Habitat for several species of salmonids. Thus, consultation with NMFS, concurrent with its FESA consultation, is likely to be required.

4.5.2.2 State and Regional Regulations and Agencies

California Endangered Species Act and Other Special-Status Species Regulations

CESA prohibits the take of any plant or animal listed or proposed for listing as rare (plants only), threatened, or endangered. The CESA definition of take differs from the FESA definition. Under CESA, take is defined as hunting, pursuing, catching, capturing, or killing, or attempting to do any of those things; lesser forms of disturbance (e.g., harassing) are not included as take in the CESA but are in the FESA. There is also no state-level equivalent of critical habitat for listed species.

In accordance with the CESA, the CDFW has jurisdiction over state-listed species (Fish and Game Code §2070). CDFW also maintains lists of Species of Special Concern that are defined as species that appear to be vulnerable to extinction because of declining populations, limited ranges, and/or continuing threats. CDFW also regulates Fully Protected Animals, a classification which was the state's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Most, but not all, Fully Protected Animals also have been listed as threatened or endangered species under the more recent state and federal endangered species laws and regulations. CDFW can authorize take of listed species, except Fully Protected Animals, under CESA Sections 2080.1 and 2081 and 2089.2-2098.26, which allow CDFW to issue Consistency Determinations, Incidental Take Permits (ITPs), and Save Harbor Agreements, respectively.

Habitats potentially under the regulatory jurisdiction of CDFW are described under Division 2, Chapter 6, Sections 1600–1616 of the Fish and Game Code of California. Other sections of the Fish and Game Code of California protect various groups of wildlife species, including fish, crustaceans, mollusks, birds, mammals, reptiles, and amphibians. CDFW implements many sections of the Fish and Game Code through the use of the Section 1602 Lake and Streambed Alteration Agreement process, under which it regulates changes in non-tidal aquatic habitats and the riparian corridors that often surround them. The Fish and Game Code section 1602 requires an entity to notify CDFW prior to commencing any activity that may (1) substantially divert or obstruct the natural flow of any river, stream or lake; (2) substantially change or use any material from the bed, channel or bank of any river, stream, or lake; or (3) deposit debris, waste or other materials that could pass into any river, stream or lake (CDFW 2018). A Lake and Streambed Alteration Agreement (LSAA) covers activities that would result in the modification of the bed, bank, or channel of a stream, river, or lake, including water diversion and damming and removal of vegetation from the floodplain to the landward extent of the riparian zone. It governs both activities that modify the physical characteristics of the stream and activities that may affect fish and wildlife resources that use the stream and surrounding habitat (i.e., the riparian vegetation or wetlands). A Section 1602 LSAA will often require mitigation, such as revegetation or replanting of riparian trees or other compensatory mitigation. for impacts to these resources.

Clean Water Action Section 401/San Francisco Bay Regional Water Quality Control Board

The San Francisco Bay RWQCB has primary authority for implementing Section 401 of the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act, which pertains to waters of the State of California. These statutes regulate water quality conditions by establishing processes for developing and implementing planning, permitting, and enforcement authority for waste discharges to land and water. The San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan) establishes beneficial uses for surface and groundwater resources and sets regulatory water quality objectives that are designed to protect those beneficial uses (RWQCB, 2011).

Under the current Basin Plan, designated beneficial uses for Corte Madera Creek include commercial and sport fishing, navigation, contact and noncontact recreation; warm freshwater fish habitat; cold freshwater fish habitat; wildlife habitat; preservation of rare and endangered species; migration of aquatic organisms; and spawning, reproduction, and/or early development of fish. Designated beneficial uses for Fairfax Creek include contact and noncontact recreation; warm freshwater fish habitat; cold freshwater fish habitat; wildlife habitat; and spawning, reproduction, and/or early development of fish. The Basin Plan provides a program of actions designed to preserve and enhance water quality and to protect beneficial uses. It meets the requirements of the USEPA and establishes conditions related to discharges that must be met at all times. The implementation portion of the Basin Plan includes descriptions of specific actions to be taken by local public entities and industries to comply with the Basin Plan's policies and objectives. These actions include measures for urban runoff management and wetland protection.

California Native Plant Society/California Rare Plant Rank

The California Native Plant Society (CNPS) is a statewide, non-governmental conservation organization working with CDFW and other organizations that has developed a ranking of plant species of concern in California. This list is the California Rare Plant Rank (CRPR). Vascular plants included on CNPS' CRPR list are defined as follows:

1. CRPR 1A: Plants considered extinct in California.
2. CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere.
3. CRPR 2: Plants rare, threatened, or endangered in California but more common elsewhere.
4. CRPR 3: Plants about which more information is needed; these are on the CNPS review list.
5. CRPR 4: Plants of limited distribution; these are on the CNPS watch list.

CNPS is not a regulatory agency and plants on the ranking have no regulatory protection under the FESA or CESA. However, adverse impacts to plants appearing as CRPR 1B or CRPR 2 are generally considered significant pursuant to the California Environmental Quality Act (CEQA) State CEQA *Guidelines*, Section 15380.

4.5.2.3 Local Regulations

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan are relevant to the Project.

Biological Resources

Goal BIO-1: Enhanced Native Habitat and Biodiversity. Effectively manage and enhance native habitat, maintain viable native plant and animal populations, and provide for improved biodiversity throughout the County.

Policy BIO-1.1: Protect Wetlands, Habitat for Special-Status Species, Sensitive Natural Communities, and Important Wildlife Nursery Areas and Movement Corridors. Protect sensitive biological resources, wetlands, migratory species of the Pacific flyway, and wildlife movement corridors through careful environmental review of proposed development applications, including consideration of cumulative impacts, participation in comprehensive habitat management programs with other local agencies and resource management agencies, and continued acquisition and management of open space lands that provide for permanent protection of important natural habitats.

Policy BIO-1.3: Protect Woodlands, Forests, and Tree Resources. Protect large native trees, trees with historical importance; oak woodlands; healthy and safe eucalyptus groves that support colonies of monarch butterflies, colonial nesting birds, or known raptor sites; and forest habitats. Prevent the untimely removal of trees through implementation of standards in the Development Code and the Native Tree Preservation and Protection Ordinance. Encourage other local agencies to adopt tree preservation ordinances to protect native trees and woodlands, regardless of whether they are located in urban or undeveloped areas.

Policy BIO-1.6: Control Spread of Invasive Exotic Plants. Prohibit use of invasive species in required landscaping as part of the discretionary review of proposed development. Work with landowners, landscapers, the Marin County Open Space District, nurseries, and the multi-agency Weed Management Area to remove and prevent the spread of highly invasive and noxious weeds. Invasive plants are those plants listed in the State's Noxious Weed List, the California Invasive Plant Council's list of Exotic Pest Plants of Greatest Ecological Concern in California, and other priority species identified by the agricultural commissioner and California Department of Agriculture.

Goal BIO-2: Protection of Sensitive Biological Resources. Require identification of sensitive biological resources and commitment to adequate protection and mitigation, and monitor development trends and resource preservation efforts.

Policy BIO-2.1: Include Resource Preservation in Environmental Review. Require environmental review pursuant to CEQA of development applications to assess the impact of proposed development on native species and habitat diversity, particularly special-status species, sensitive natural communities, wetlands, and important wildlife nursery areas and movement corridors. Require adequate mitigation measures for ensuring the protection of any sensitive resources and achieving "no net loss" of sensitive habitat acreage, values, and function.

Policy BIO-2.3: Preserve Ecotones. Condition or modify development permits to ensure that ecotones, or natural transitions between habitat types, are preserved and enhanced because of their importance to wildlife. Ecotones of particular concern include those along the margins of riparian corridors, baylands and marshlands, vernal pools, and woodlands and forests where they transition to grasslands and other habitat types

Policy BIO-2.4: Protect Wildlife Nursery Areas and Movement Corridors. Ensure that important corridors for wildlife movement and dispersal are protected as a condition of discretionary permits, including consideration of cumulative impacts. Features of particular importance to wildlife for movement may include riparian corridors, shorelines of the coast and bay, and ridgelines. Linkages and corridors shall be provided that connect sensitive habitat areas such as woodlands, forests, wetlands, and essential habitat for special-status species, including an assessment of cumulative impacts

Policy BIO-2.5: Restrict Disturbance in Sensitive Habitat During Nesting Season. Limit construction and other sources of potential disturbance in sensitive riparian corridors, wetlands, and baylands to protect bird nesting activities. Disturbance should generally be set back from sensitive habitat during the nesting season from March 1 through August 1 to protect bird nesting, rearing, and fledging activities. Preconstruction surveys should be conducted by a qualified professional when development is proposed in sensitive habitat areas during the nesting season, and appropriate restrictions should be defined to protect nests in active use and ensure that any young have fledged before construction proceeds.

Policy BIO-2.8: Coordinate with Trustee Agencies. Consult with trustee agencies (the CDFW, USFWS, NOAA Fisheries, USACE, USEPA, RWCQB, and BCDC) during environmental review when special-status species, sensitive natural communities, or wetlands may be adversely affected.

Goal BIO-3: Wetland Conservation. Require all feasible measures to avoid and minimize potential adverse impacts on existing wetlands and to encourage programs for restoration and enhancement of degraded wetlands.

Policy BIO-3.1: Protect Wetlands. Require development to avoid wetland areas so that the existing wetlands and upland buffers are preserved and opportunities for enhancement are retained (areas within setbacks may contain significant resource values similar to those within wetlands and also provide a transitional protection zone).

Goal BIO-4: Riparian Conservation. Protect and, where possible, restore the natural structure and function of riparian systems.

Policy BIO-4.4: Promote Natural Stream Channel Function. Retain and, where possible, restore the hydraulic capacity and natural functions of stream channels in SCAs. Discourage alteration of the bed or banks of the stream, including filling, grading, excavating, and installation of storm drains and culverts. When feasible, replace impervious surfaces with pervious surfaces. Protect and enhance fish habitat, including through retention of large woody debris, except where removal is essential to protect against property damage or prevent safety hazards. In no case shall alterations that create barriers to fish migration be allowed on streams mapped as historically supporting salmonids. Alteration of natural channels within SCAs for flood control should be designed and constructed in a manner that retains and protects the riparian vegetation, allows sufficient capacity and natural channel migration, and allows reestablishment of woody trees and shrubs without compromising the flood flow capacity where avoidance of existing riparian vegetation is not possible. (Details in setbacks and other aspects of stream corridors are in Section 2.4 of the Marin Countywide Plan.)

Policy BIO-4.5: Restore and Stabilize Stream Channels. Pursue stream restoration and appropriate channel redesign where sufficient right-of-way exists that includes the following: a hydraulic design, a channel plan form, a composite channel cross-section that incorporates low flow and bankfull channels, removal and control of invasive exotic plant species, and biotechnical bank stabilization methods to promote quick establishment of riparian trees and other native vegetation.

Policy BIO-4.6: Control Exotic Vegetation. Remove and replace invasive exotic plants with native plants as part of stream restoration projects and as a condition of site-specific development approval in a SCA, and include monitoring to prevent reestablishment.

Policy BIO-4.7: Protect Riparian Vegetation. Retain riparian vegetation for: stabilization of streambanks and floodplains, moderating water temperatures, trapping and filtering sediments and other water pollutants, providing wildlife habitat, and aesthetic reasons.

Policy BIO-4.8: Reclaim Damaged Portions of SCAs. Restore damaged portions of SCAs to their natural state wherever possible, and reestablish as quickly as possible any herbaceous and woody vegetation that must be removed within an SCA, replicating the structure and species composition of indigenous native riparian vegetation.

Policy BIO-4.9: Restore Culverted Streams. Replace storm drains and culverts in SCAs with natural drainage and flood control channels wherever feasible. Reopening and restoring culverted reaches of natural drainages should be considered part of review of development applications on parcels containing historic natural drainages where sufficient land area is available to accommodate both the reopened drainage and project objectives. Detailed hydrologic analysis may be required to address possible erosion and flooding implications of reopening the culverted reach, and to make appropriate design recommendations. Incentives should be provided to landowners in restoring culverted, channelized, or degraded stream segments. Where culverts interfere with fish migration but replacement is not possible, modify culverts to allow unobstructed fish passage.

Policy BIO-4.15: Reduce Wet Weather Impacts. Ensure that development work adjacent to and potentially affecting SCAs is not done during the wet weather or when water is flowing through streams, except for emergency repairs, and that disturbed soils are stabilized and replanted, and areas where woody vegetation has been removed are replanted with suitable species before the beginning of the rainy season.

Policy BIO-4.16: Regulate Channel and Flow Alteration. Allow alteration of stream channels or reduction in flow volumes only after completion of environmental review, commitment to appropriate mitigation measures, and issuance of appropriate permits by jurisdictional agencies based on determination of adequate flows necessary to protect fish habitats, water quality, riparian vegetation, natural dynamics of stream functions, groundwater recharge areas, and downstream users.

Policy BIO-4.19: Maintain Channel Stability. Applicants for development projects may be required to prepare a hydraulic and/or geomorphic assessment of onsite and downstream drainage ways that are affected by project area runoff. This assessment should be required where evidence that significant current or impending channel instability is present, such as documented channel bed incision, lateral erosion of banks (e.g., sloughing or landsliding), tree collapse due to streambank undermining and/or soil loss, or severe in-channel sedimentation, as determined by the County. (More details are available in Section 2.4 of the Marin Countywide Plan.)

Policy BIO-4.20: Minimize Runoff. In order to decrease stormwater runoff, the feasibility of developing a peak stormwater management program shall be evaluated to provide mitigation opportunities such as removal of impervious surface or increased stormwater detention in the watershed.

Water Resources

Goal WR-1: Healthy Watersheds. Achieve and maintain proper ecological functioning of watersheds, including sediment transport, groundwater recharge and filtration, biological processes, and natural flood mitigation, while ensuring high-quality water.

Policy WR-1.1: Protect Watersheds and Aquifer Recharge. Give high priority to the protection of watersheds, aquifer-recharge areas, and natural drainage systems in any consideration of land use.

Policy WR-1.2: Restore and Enhance Watersheds. Support watershed restoration efforts, coordinate County watershed activities with efforts by other groups, and simplify permit acquisition for watershed restoration and enhancement projects.

Goal WR-2: Clean Water. Ensure that surface and groundwater supplies are sufficiently unpolluted to support local natural communities, the health of the human population, and the viability of agriculture and other commercial uses.

Policy WR-2.3: Avoid Erosion and Sedimentation. Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and water bodies. Continue to require grading plans that address avoidance of soil erosion and onsite sediment retention. Require developments to include onsite facilities for the retention of sediments and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.

Marin County Development Code

Tree Removal Permit

The Flood Control District is exempt from Marin County regulations. However, because the practice of the Flood Control District is to be consistent with Marin County regulations and policies whenever practicable, the Marin County Development Code are discussed here. Section 4.5.3, Impacts and Mitigation Measures, below, includes a discussion of how the Flood Control District will address impacts related to tree removal especially within riparian areas subject to State and Federal jurisdiction (as summarized in Section 4.5.2.4 above).

Under the Marin County Development Code, a Tree Removal Permit is required for removal of a “Heritage Tree” or more than two “Protected Trees” from a developed lot in a 12-month period, or any removal of “Protected Trees” on a vacant lot. Trees which are in poor health due to disease, damage, or age; infected by a pathogen or insects, as determined by an arborist report or other qualified professional; a potential public health and safety hazard due to the risk of its falling; a public nuisance by causing damage to structures or public utilities; or a fire hazard, as identified by a Fire inspector, or are removed by a public agency; are exempt from permit requirements. On a developed lot, up to two Protected Trees may be removed within a one-year timeframe, as long as neither is a Heritage Tree nor located within a Stream Conservation Area or a Wetland Conservation Area. Heritage and Protected Tree sizes differ by species of tree (Marin County, 2011).

An application for a Tree Removal Permit must include a landscaping/vegetation management plan that identifies the trees proposed for removal, and proposed replacement trees. Permit requirements may include:

1. Replacement of trees at a ratio of three new, appropriately sized and installed trees for each tree designated to be removed;
2. For large properties, a management plan which designates areas of the property for preservation of stands of trees or saplings and replacement plantings as required;
3. Removal of invasive exotic species.

If tree planting on the site is not feasible or appropriate, payment of $500.00 per replacement tree may be deposited into the Tree Preservation Fund managed by the Marin County Parks and Open Space District for planting, maintenance, and management of trees and other vegetation.

Town of Fairfax

The following goals, objectives, and policies relevant to biological resources are in the Town of Fairfax's 2010 General Plan. A number of more detailed programs support each of these policies; they are described fully in the Conservation (CON) Element of the General Plan. Although neither Project site is within Fairfax's town limits and therefore the Town's General Plan and Tree Removal Ordinance do not apply, the close proximity of the Town to the former Sunnyside Nursery property and the interaction of Fairfax Creek and its riparian corridor make the consideration of the Town of Fairfax's goals, objectives, and policies relevant here.

Goal CON-3: Watershed and Stream Management.

Objective CON-3.1: To preserve and restore creeks and waterways to their natural condition and preserve natural habitats and their connectivity.

Policy CON-3.1.1: Maintain floodwater capacity and promote creek restoration.

Policy CON-3.1.2: The Town of Fairfax shall protect and restore riparian habitat and ensure natural channel process in the San Anselmo Creek and Fairfax Creek watersheds.

Policy CON-3.1.3: Creeks that are channelized shall be restored and/or daylighted to improve aquatic habitat. Creeks in a natural state shall not be channelized where possible.

Goal CON-5: Soils and Vegetation.

Objective CON-5.2: Protect and maintain high quality vegetation communities within the Town of Fairfax Planning Area.

Policy CON-5.2.1: Maintain and restore native vegetation where appropriate for habitat value, aesthetics, reference habitat, and riparian cover.

Goal CON-6: Wildlife Conservation.

Objective CON-6.1: Protect special-status species, resident and migrant wildlife, and their associated habitats.

Policy CON-6.1.1: Identify special-status species, resident and migrant wildlife, and their habitats, within the Town of Fairfax Planning Area.

Policy CON-6.1.2: Protect special-status species, resident and migrant wildlife, and their habitats, within the Town of Fairfax Planning Area.

Objective CON-6.2: Restore critical habitats for special-status species.

Policy CON-6.2.1: Restore habitats for anadromous fish.

Tree Removal Ordinance

Ordinance No. 387 in the Town of Fairfax requires a Tree Permit is required for removal or significant trimming of any tree, pursuant to Town Code Chapter 8.36 'Trees.' The Tree Advisory Committee reviews tree removal/alteration applications at a public hearing, and makes a recommendation to the Director of Planning and Building Services to grant or deny a permit (Town of Fairfax, 1973).

Town of San Anselmo

The following goals relevant to biological resources are in the Town of San Anselmo's General Plan, portions of which have been updated at different times since its inception in 1988.

Conservation Goals:

a. Minimize environmental harm and the disruption of natural features, particularly in hillside and unstable soil areas.

b. Protect creeks from pollution and against any unnecessary disturbance of the natural contours and vegetation of the banks.

c. Preserve and protect significant habitats for fish, wildlife, and flora.

Conservation Policy Guidelines:

3. Activities causing damage to hydrological and biological processes shall be discouraged.

4. Streams shall be maintained in or restored to their natural state. A flood channel maintaining the natural settings on San Anselmo Creek and Sleepy Hollow Creek shall be of adequate width and properly maintained to allow passage of flood waters and preservation of riparian vegetation and habitat. Removal of vegetation on the hillsides should be closely controlled in order to minimize erosion, siltation of watercourses, and runoff.

6. A diversity and abundance of wildlife and waterlife shall be maintained or encouraged where it does not now exist. Vegetation and animal habitats shall be preserved wherever possible.

Tree Removal Permit

The Flood Control District is exempt from ordinances of towns or cities within Marin County, but the Town of San Anselmo's tree removal permitting process is provided for informational purposes. Section 4.5.3.3, below, includes a discussion of how the Flood Control District would address impacts related to tree removal. A permit is required to remove or significantly prune any heritage tree, any tree on undeveloped property and any street tree. A heritage tree is defined as a tree with a diameter at breast height (diameter breast height = 4.5 feet above grade) of 22 inches or more. A permit is required to remove any tree on undeveloped property with diameter breast height of 7 inches or more. Pruning is defined as removal of less than 25 percent of the tree's foliage. An arborist's report and photograph of the tree(s) and the context are required for the permit application. Acacia, eucalyptus, plum, privet and Monterey pine trees are considered nuisance trees and do not require a permit to remove (Town of San Anselmo, 2001).

Marin County Flood Control and Water Conservation District

The Marin County Public Works Department maintains the public infrastructure of Marin County, including its roads, bridges, flood channels, and natural creeks. Within the Public Works Department, the Marin County Flood Control and Water Conservation District (Flood Control District) works to reduce the risk of flooding for the protection of life and property while utilizing sustainable practices. The Flood Control District aims to meet this mission through effective, transparent, and responsive planning, design, construction, operation, and maintenance of facilities; such as stormwater pump stations, flood diversion and storage basins, bypass drains, creeks, ditches, and levees. All Project elements would be designed to comply with the Flood Control District's own policies and to obtain and comply with any necessary permits.

4.5.2.4 Permits Required

As discussed in Chapter 3, Project Description, the following permits/approvals may be required from the agencies indicated:

1. Clean Water Act Section 404 Permit (USACE)
2. Clean Water Act Section 401 Water Quality Certification (RWQCB)
3. Endangered Species Act Section 7 Consultation (USFWS)
4. Endangered Species Act Section 7/ Magnuson-Stevens Act Consultation (NMFS/NOAA Fisheries)
5. California Endangered Species Act take approval (CDFW)
6. California Fish and Game Code Section 1602 Lake and Streambed Alteration Agreement (CDFW)

4.5.3 Impacts and Mitigation Measures

This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section. Mitigation measures are recommended, as necessary, to reduce significant impacts.

4.5.3.1 Significance Criteria

Consistent with the State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:

a) Have a substantial adverse effect (including a reduction in the number or range of a species or a drop in population below self-sustaining levels), either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS;

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors such that a barrier to the species' migration, dispersal, or movement would result, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

g) Introduce a new non-native or invasive species of plant or animal into an area.

Criteria Not Analyzed

For the reasons described below, due to the nature and location of the Project, there would be no impact on biological resources related to the following significance criterion; therefore, this criterion is not discussed further.

Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other Adopted Local, Regional, or State Habitat Conservation Plan. There are no adopted habitat conservation plans, natural community conservation plans, or other approved plans that apply to the Project sites. Thus, this criterion is not applicable to construction or operation of the Project and is not discussed further in this environmental impact report.

4.5.3.2 Approach to Analysis

The following approach was used to inform the analysis of potential Project impacts on biological resources. The potential for regulated biological resources (e.g., special-status species, protected habitats, jurisdictional waters, etc.) to occur in or near one of the two Project sites was first assessed. Next, the Project actions were considered to evaluate whether direct or indirect impacts on these resources were likely. Finally, the magnitude of any of those impacts was weighed against the significance criteria. More detail on these steps is presented in the following paragraphs.

Potential to Occur

The potential distribution of special-status species, as defined in Section 4.5.1.5, occurring in the Project sites were determined from assessment of results of searches of the CNDDB, CNPS, and USFWS databases and applicable scientific literature pertaining to the Project area. No focused (i.e., protocol-level) biological surveys were conducted for this environmental impact report; however, a reconnaissance-level survey of the Project sites was conducted to refine and clarify the results of those preliminary database searches and reviews of other literature and reports.

Types of Impacts

Direct impacts occur through direct interaction of the resource with a component of the project. Direct impacts on plant and wildlife species are caused by loss of habitat in these communities at the time of ground disturbance. Site excavation, grading, filling, infrastructure construction, or other changes to habitat can also result in direct impacts from death, injury, or disturbance to individuals to such an extent that the species cannot continue inhabiting or foraging in the area.

Direct impacts on natural communities include removal of these communities and replacement with other land uses. Direct impacts on habitat may be temporary, for example, if they disturb a habitat that is subsequently restored or displace individuals of a given species that later return to the site, or they may be permanent if the habitat is converted to some other type.

Indirect impacts result from a project, but are not a direct result of that project. They may occur later in time, at a different location, or as the result of a sequence of related interactions (State CEQA *Guidelines* Section 15064(d)(2) and (3)). Indirect impacts on species may occur when remaining fragments of undeveloped habitat are isolated from larger areas of contiguous habitat, and individuals of a species suffer reductions in fitness or reproductive capability in these smaller fragments. Indirect impacts may occur concurrent with Project implementation or at a later time due to degraded water quality; changes in hydrology; noise or dust, disturbance from human activities and domestic animals; increased predation or competition; invasive species spread; and other factors.

Significance Thresholds

The threshold for significance for special-status plants and wildlife would be any measurable decrease in population. For listed wildlife and fully protected species, any loss of individuals would be a significant impact. For habitat modification, a significant impact is any measurable alteration of the habitat that would result in a drop in the population of special-status species--such as changes in food supply, reduction in elements needed for breeding habitat, or changes that limit opportunities for cover and movement.

The threshold for significance for adverse effects on natural communities would be any reduction in extent of the community compared with baseline, or a change that could threaten the long-term existence of the community itself. The threshold of significance for wetlands is no-net-loss of extent. The threshold of significance for local ordinances is a violation of any such ordinances.

4.5.3.3 Impacts and Mitigation Measures

This section discusses five numbered potential impacts, several of which require mitigation measures to reduce the potential impacts to levels that would be less than significant.

Impact 4.5-1: Project implementation could have substantial adverse effects on special-status aquatic species or habitats. (*Less than Significant with Mitigation*)

Direct Effects

Mortality or Injury

Direct effects on individuals of a special-status aquatic species could arise from construction within the creek channel or along its banks. Construction activities can injure or kill individual fish by inadvertently bringing construction equipment into contact with them, by trapping or stranding them in a dewatering area, or otherwise directly physically damaging them. To avoid these significant impacts, the Project would implement standard construction best management practices, impact avoidance work windows (**Mitigation Measure 4.5-1a**), careful dewatering and fish relocation using approved techniques and qualified personnel (**Mitigation Measure 4.5-1b**), and conduct contractor environmental awareness training (**Mitigation Measure 4.5-1c**). With implementation of these mitigation measures, potential mortality or injury to special-status aquatic species would be less than significant.

Habitat Modification or Loss

The Project would construct features within the channel and riparian corridor of Fairfax Creek at the Nursery Basin site, including a diversion structure and a side-weir to direct flows into the Nursery Basin, bank stabilization including rock riprap, the basin drainage outlet, and a floodwall at the top of the bank along Sir Francis Drake Boulevard. These features would together result in approximately 0.04 acre of permanent aquatic and wetland habitat loss in the creek channel and approximately 0.59 acre of permanent riparian habitat loss, as shown in **Table 4.5-3**. Construction of the Project features would result in approximately 0.02 acre of temporary aquatic and wetland impacts and approximately 0.42 acre of riparian habitat impacts. However, permanent loss of in-stream and riparian habitat from the Project elements at the Nursery Basin site is not expected to result in a measurable change in populations of the special-status aquatic species in the Fairfax Creek area. Therefore, impacts on aquatic species habitat are considered less than significant. Impacts to jurisdictional wetlands and other waters are discussed in detail in Impact 4.5-8.

TABLE 4.5-3
PROPOSED PROJECT IMPACTS TO HABITAT

Existing Habitats	Impact by Type (acres)[1]		Totals
	Permanent	Temporary	
Nursery Basin Site			
Aquatic	0.03	0.01	**0.04**
Wetland	0.01	0.01	**0.02**
Riparian	0.59	0.42	**1.01**
Oak Woodland	0.43	0.37	**0.81**
Annual Grassland	1.32	2.11	**3.43**
Developed	0.03	0.04	**0.07**
Totals	**2.42**	**2.96**	**5.71**
Downtown San Anselmo Site			
Aquatic	0.01	0.01	**0.02**
Riparian	0.00	0.10	**0.10**
Ornamental / Developed	0.00	0.05	**0.05**
Totals	**0.01**	**0.16**	**0.17**

NOTES:
1 These habitat areas reflect approximate estimates based on aerial photo mapping and have not been field surveyed or verified.
2 This category represents planted vegetation, including the lawn in Creek Park.

The proposed Nursery Basin, if not designed properly, could directly result in adverse modifications to channel flows, changes to vegetation and hydrological changes, such that aquatic habitat functions could be degraded. To avoid these potential adverse effects, the proposed diversion structure and opening(s) within it would allow for a permanently open low-flow channel to enable movements of fish and wildlife within the creek channel. Further, the bank stabilization designs would include native tree plantings between rock riprap and as a result, limited riparian habitat functions would be restored within the bank stabilization areas over time.

Maintenance activities within the Fairfax Creek channel also have potential to directly affect aquatic species and habitats. A sediment transport analysis of the Project suggests that sediments may deposit in the creek behind the diversion structure (CH2MHill, 2018c). To maintain the intended design capacity of the flood diversion and storage system, deposited sediment in the Fairfax Creek channel would need to be removed on a routine basis. As described in Chapter 3, *Project Description*, sediment removal would typically be conducted once annually during the summer dry season and possibly a second time in the winter season, if necessary, to restore channel capacity between large storm events and retain the functionality of the diversion structure and basin. Sediment removal would be conducted with excavators and/or backhoes working from the side-weir (between the creek channel and the basin) and a small bulldozer working in the channel. Temporary channel dewatering may be necessary to conduct winter sediment removal. The excavated sediment would be off-hauled and disposed at a local landfill. In-channel sediment removal activities in Fairfax Creek would temporarily increase turbidity and would also risk directly injuring individual fish or amphibians if water is present during maintenance activities. However, given the low frequency of sediment removal needs during the winter season (approximately once every 5 years on average), the short duration of in-channel ground-disturbance (approximately 6 days of work), and limited stream length in which this action would occur (approximately 400 feet between the diversion structure and the access bridge into the basin site) plus an additional length upstream of the access bridge, the magnitude of these effects would be reduced by implementation of impact avoidance work windows (**Mitigation Measure 4.5-1a**), careful dewatering and fish relocation using approved techniques and qualified personnel (**Mitigation Measure 4.5-1b**), and conduct contractor environmental awareness training (**Mitigation Measure 4.5-1c**).

At the Downtown San Anselmo site, approximately 0.14 acre of channel and creek bed habitat would be restored, which would benefit special-status aquatic species. This includes approximately 0.10 acre of in-stream habitat and 0.04 acre of riparian habitat. No new or increased ground-disturbing maintenance activities are anticipated to be necessary at the Downtown San Anselmo site. There would be no significant impacts on special-status aquatic species or habitat at the Downtown San Anselmo site.

Water Quality Effects

Direct effects to special-status aquatic species and habitat in the Project area could arise during in-stream construction activities or other changes, including alteration of flow or water quality, that make habitat inhospitable for survival or reproduction. In creeks, construction and flow diversion associated with construction and operation activities has the potential to result in short-term disturbance and resuspension of sediments which can increase turbidity in the water column. Sediment resuspension may also increase the concentrations in the water column of chemicals sequestered in the sediment with potential toxicity to salmonids, other special-status fish, and other aquatic species, and result in adverse water quality and biological effects. At high levels, turbidity and suspended solids in the water column can lower levels of dissolved oxygen. However, after the initial spike in turbidity levels, sediments would disperse and background levels would likely be restored within hours of disturbance. Persistent elevated levels of turbidity would constitute a significant impact on aquatic species and habitat. However, implementation of **Mitigation Measure 4.5-1a** and compliance with a set of regulations described in full in Section 4.9, Hydrology and Water Quality, would address this potential effect.

Indirect Effects

During construction, downstream areas could experience increased turbidity, siltation, or other water quality conditions, including decreased dissolved oxygen levels, due to mobilization of sediment from construction activities. Following construction, increased turbidity and depressed oxygen levels would abate. Degraded water quality conditions indirectly caused by the Project would significantly impact aquatic habitat. However, implementation of **Mitigation Measure 4.5-1a** and compliance with a set of regulations described in full in Section 4.9, Hydrology and Water Quality, would address this potential effect.

Removal of trees and other vegetation in the riparian corridor could also adversely affect perennial stream habitat by reducing overstory shade at the Project site, which may reduce habitat quality in downstream areas by increasing water temperatures, increasing algal growth and lowering dissolved oxygen levels. Substantially depressed oxygen levels may cause respiratory stress to aquatic life, and when levels are depressed enough, may cause mortality. Persistent high water temperatures, algal growth, or low dissolved oxygen levels would constitute a significant impact on aquatic species and habitat. However, changes in overstory shading and subsequent indirect water quality effects would not substantially affect populations of special-status aquatic species. Following implementation of the Project, the channel at both sites would be wider with increased habitat diversity, such as slower flow pools, that would improve habitat conditions for juvenile salmonids and amphibians. The anticipated reduction in flood frequency would reduce runoff and siltation in creek waters, which would have a beneficial impact on water quality and aquatic habitat. Ultimately, indirect impacts of the Project are anticipated to have a neutral to beneficial impact on aquatic species.

Mitigation Measure 4.5-1a: Seasonal Avoidance of Sensitive Aquatic Species.

In-water construction work, including activities on the banks that are expected to create turbidity or disturb the streambed, shall be conducted within resource agency-approved work windows intended to reduce potential impacts on salmonids (generally limiting work to the period between June 15 and October 15) with resource agency concurrence for the following exceptions:

1) Removal of debris, foundations, large amounts of trash or other manmade materials from the creek bed may continue year-round, in areas of the stream which are dry and where such activity shall not create turbidity.

2) Tree removal and invasive species removal may take place year-round, providing the area is free of nesting birds and roosting bats as provided under **Mitigation Measure 4.5-4**.

3) Revegetation activities may occur year-round.

Mitigation Measure 4.5-1b: Relocation of Special-Status Fish.

If in-channel work requires dewatering, including for sediment removal maintenance activities, fish shall be captured and relocated downstream of the Project areas to avoid injury and mortality and minimize disturbance. The Flood Control District shall implement the measures below, or whatever more stringent species preservation and avoidance measures are imposed by resource agencies, including NMFS and CDFW, with jurisdiction over aquatic special-status species.

1) The name(s) and credentials of qualified biologist(s) to act as construction monitors shall be submitted to CDFW and NMFS for approval at least 15 days before construction work begins.

2) Prior to and during the initiation of construction activities, qualified fisheries biologist (i.e., approved by CDFW and/or NMFS) shall be present during installation and removal of creek diversion structures.

3) For sites that require flow diversion and exclusion, the work area shall be blocked by placing fine-meshed nets or screens above and below the work area to prevent salmonids from re-entering the work area. To minimize the potential for re-entry, mesh diameter shall not exceed 1/8 inch. The bottom edge of the net or screen shall be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening shall be placed in low velocity areas to minimize fish impingement against the mesh. Screens shall be checked periodically and cleaned of debris to permit free flow of water.

4) Before removal and relocation on individual fish begins, a qualified fisheries biologist shall identify the most appropriate release location(s). In general, release locations should have water temperatures similar to (<3.6°F difference) the capture location and offer ample habitat (e.g., depth, velocity, cover, connectivity) for released fish, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on exclusion nets or screens.

5) The means of capture shall depend on the nature of the work site, and shall be selected by a qualified fisheries biologist as authorized by CDFW and NMFS. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, fish and other aquatic species may be captured by pumping down the pool and then seining or dip netting. Electrofishing, if necessary, shall be conducted only by properly trained personnel holding current permits from CDFW and NMFS and following the most recent NMFS electrofishing guidelines (NMFS, 2000).

6) Initial fish relocation efforts shall be performed several days prior to the scheduled start of construction. Flow diversions and species relocation shall be performed during morning periods. The fisheries biologist shall survey the exclusion screening throughout the diversion effort to verify that no special-status fish, amphibians, or aquatic invertebrates are present. Afternoon pumping activities shall be limited and pumping shall be suspended when water temperatures exceed 18 degrees Celsius (64.5° F). Water temperatures shall be measured periodically, and flow diversion and species relocation shall be suspended if temperatures exceed the 18-degree limit under NMFS guidelines. Handling of fish shall be minimized. When handling is necessary, personnel shall wet hands or nets before touching them.

7) Prior to translocation, fish that are collected during surveys shall be temporarily held in cool, aerated, shaded water using a five-gallon container with a lid. Overcrowding in containers shall be avoided; at least two containers shall be used and no more than 25 fish shall be kept in each bucket. Aeration shall be provided with a battery-powered external bubbler. Fish shall be protected from jostling and noise, and shall not be removed from the container until the time of release. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature. Special-status fish shall not be held more than 30 minutes. If water temperature reaches or exceeds 18 degrees Celsius (USFWS 2012), the fish shall be released and relocation operations shall cease.

8) If fish are abundant, capture shall cease periodically to allow release and minimize the time fish spend in holding containers.

9) Fish shall not be anesthetized or measured. However, they shall be visually identified to species level, and year classes shall be estimated and recorded.

10) Reports on fish relocation activities shall be submitted to CDFW and NMFS in within one week.

Mitigation Measure 4.5-1c: Contractor Environmental Awareness Training and Site Protection.

All construction personnel that are working in areas of potential endangered species habitat shall attend an environmental education program delivered by a qualified biologist prior to working on either Project site. The training shall include an explanation as how to best avoid the accidental take of special-status species, including salmonids and other fish species, western pond turtle, California red-legged frog, and listed birds.

The training session shall be mandatory for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of maps showing areas where minimization and avoidance measures are being implemented. The program shall include an explanation of appropriate federal and state laws protecting endangered species.

The contractor shall provide closed garbage containers for the disposal of all trash items (e.g., wrappers, cans, bottles, food scraps). Work sites shall be cleaned of litter before closure each day, and placed in wildlife-proof garbage receptacles. Construction personnel shall not feed or otherwise attract any wildlife. No pets, excluding service animals, shall be allowed in construction areas.

Significance after Mitigation: Mitigation Measure 4.5-1a would restrict most work to seasons when creek flows are low and aquatic wildlife less likely to be present, thus reducing the direct and indirect effects of turbidity and other water quality-related impacts from in water work on aquatic wildlife. Mitigation Measure 4.5-1b would provide for the safe relocation of fish and other aquatic wildlife species, by resource agency-approved biologists and in accordance with approved resource agency methods, before in-water construction work could proceed. This would remove individuals of special-status aquatic species from the construction area. Mitigation Measure 4.5-1c would train the construction contractors on proper environmental practices and the requirements of issued regulatory permits, the relevant mitigation measures identified in this EIR, and the construction plans and specifications. In doing so, it would reduce the risk to special-status aquatic species and other wildlife species and habitats, as addressed in subsequent impacts. With implementation of these measures, this impact would be *less than significant*.

Impact 4.5-2: Project implementation could have substantial adverse effects on special-status plants. (*Less than Significant with Mitigation*)

Construction activities could affect special-status plants, if present, by trampling or removing them, or altering habitat to be inhospitable to plants, e.g., by removing shade or diverting water. These effects could occur in upland areas of Fairfax at the Nursery Basin site, and riparian areas of Fairfax Creek and San Anselmo Creek. However, because of the disturbed nature due to past development activities at the Project sites, it is unlikely that rare plants are present. However, should rare plants be present, their unauthorized destruction or removal or loss of their habitat during Project construction would be a significant impact. Implementation of **Mitigation Measure 4.5-2** would address this potential impact.

Mitigation Measure 4.5-2: Avoid Impacts to Rare Plants.

A qualified biologist shall conduct a pre-construction survey of each Project site for special-status plant species with the potential to occur within the area of disturbance. The survey shall be floristic in nature and shall follow the procedures outlined in the CDFW Publication *Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Commu*nities (CDFW, 2009). The survey shall be conducted between April and July in conjunction with the blooming seasons of those rare plants with moderate potential to occur in the Project area.

If no special-status plants are observed during appropriately timed surveys by a qualified botanist, it is assumed the construction activity will have no impact on special-status plants and no further action is required.

If special-status plants are identified within the Project area, the individuals or populations shall be mapped and quantified and reported to the CNDDB, and the project manager shall be notified so that potential impacts to these known occurrences shall be avoided, when feasible. Coordination with CDFW and/or USFWS staff shall be conducted to establish appropriate avoidance and minimization measures if the species is federally or State listed. Avoidance and minimization measures may include:

1) No-disturbance buffers.
2) Work windows for low impact activities that are compatible with the dormant phase of a special-status plant life cycle but that may kill living plants or severely alter their ability to reproduce.
3) Silt fencing or construction fencing to prevent vehicles, equipment, and personnel from accessing the occupied habitat.

4) Erosion control BMPs such as straw wattles made of rice straw, erosion control blankets, or hydroseeding with a native plant seed mix to prevent sedimentation from upslope construction activities.

5) Before the construction activity commences, special-status plant occurrences shall be marked with pin flags in the field, and all maintenance personnel shall be instructed as to the location and extent of the special-status plants or populations and the importance of avoiding impacts to the species and its habitat.

6) If needed a qualified biologist shall be present or on-call during construction activities to provide guidance on avoiding special-status plants, ensure that other avoidance measures (buffers, fencing, etc.) are observed, and to document the total impact of the maintenance activity, particularly if it is greater or less than anticipated.

7) In consultation with, and as authorized by, CDFW or USFWS, a qualified botanist may collect and spread seeds or relocate plants to appropriate locations.

Significance after Mitigation: Implementation of Mitigation Measure 4.5-2 would reduce this impact to less than significant by requiring pre-construction surveys and implementation of avoidance and minimization measures if rare plants are located within the Project site. This would reduce this impact to a *less-than-significant* level.

Impact 4.5-3: Project implementation could have substantial adverse effects on special-status amphibians. (*Less than Significant with Mitigation*)

Construction activities at Fairfax and San Anselmo Creeks could directly affect special-status amphibians, such as CRLF, WPT, and other special-status amphibians with low potential to occur such as foothill yellow-legged frog, if present (see Table 4.5-2). Although special-status amphibian species are not likely to breed in the Project sites, they may be present during foraging or dispersal movements and individuals could be subject to injury or mortality or to habitat loss from construction traffic, vegetation removal, earth movement, water diversion, noise or light or human traffic. Mortality or injury to special-status amphibians, or destruction of substantial habitat, would be a significant impact. Disturbance of non-breeding habitat (i.e., foraging and dispersal habitat) is considered significant if movements of substantial numbers of individuals for an extended period of time results from the disturbance. These impacts would be addressed by **Mitigation Measure 4.5-3a** and **Mitigation Measure 4.5-3b**, as well as by the Mitigation Measure 4-5-1c and the various requirements to reduce increased turbidity and other water quality effects, discussed in Section 4.9 Hydrology and Water Quality.

Mitigation Measure 4.5-3a: Install Wildlife Exclusion Fencing.

The Flood Control District shall implement the measures below, or whatever more stringent California red-legged frogs (CRLF) and western pond turtle (WPT) preservation and avoidance measures are imposed by resource agencies with primary jurisdiction over special-status wildlife species, including USFWS and CDFW.

1) Before ground-disturbing activity occurs, the contractor shall install temporary exclusion/silt barrier fencing around the perimeter of the construction site. Fencing

shall be installed to the extent necessary to exclude CRLF from the construction area (in areas with habitat), and minimize impacts to natural habitat. Fencing material shall provide for wildlife exclusion as well as maintenance of water quality. Construction personnel and construction activity shall avoid areas outside the fencing. The need for and exact location of the fencing shall be determined by a qualified biologist, with the goal of protecting sensitive biological habitat and water quality. The fencing shall be checked at regular intervals (e.g., weekly) and maintained until construction is complete at individual work sites. The fence shall contain exit funnels to allow any wildlife within the construction area to leave without human intervention while preventing entry into the construction zone. Exit funnels shall be placed at ground level no more than 100 feet apart along the fence, or as modified by a qualified biologist or as directed by resource agencies with primary jurisdiction over special-status wildlife species.

2) The fencing shall be monitored as prescribed in Mitigation Measure 4.5-3b.

Mitigation Measure 4.5-3b: Avoid Impacts to California Red-legged Frog and Western Pond Turtle.

The name(s) and credentials of the qualified biologist(s) to act as construction monitors shall be submitted to the USFWS for approval at least 15 days before construction work begins.

Prior to commencing work, an approved biologist shall survey the entire construction footprint for California red-legged frog and other special-status species with potential to be present, such as western pond turtle.

At the beginning of each workday that includes initial ground disturbance, including grading, excavation, and vegetation-removal activities, an approved biologist shall conduct on-site monitoring for the presence of these species in the area where ground disturbance or vegetation removal is planned. If required by the USFWS or CDFW, perimeter fences shall be inspected to ensure they do not have any tears or holes, that the bottoms of the fences are still buried, and that no individuals have been trapped in the fence.

All excavated or deep-walled holes or trenches greater than 2 feet deep shall be covered at the end of each workday using plywood, steel plates, or similar materials, or escape ramps shall be constructed of earth fill or wooden planks to allow animals to exit. Before such holes are filled, they shall be thoroughly inspected for trapped animals.

If a special-status species is present within the exclusion fence area during construction, work shall cease in the vicinity of the animal, and the animal shall be allowed to relocate of its own volition unless relocation is permitted by state and/or federal regulatory agencies.

The contractor shall maintain the temporary fencing—both exclusion fencing and protective fencing (if installed)—until all construction activities are completed. No construction activities, parking, or staging shall occur beyond the fenced exclusion areas.

Significance after Mitigation: Implementation of Mitigation Measure 4.5-3a would requires installation of wildlife exclusion fencing to keep these special-status species out of the work areas and avoid adverse direct effects. Implementation of Mitigation Measure 4.5-3b would require daily construction monitoring and maintenance of exclusion fencing as necessary to avoid impacts to CRLF and WPT. Mitigation Measure 4.5-1c and the various requirements to reduce increased turbidity and other water quality effects, discussed in Section 4.9 Hydrology and Water Quality, together would reduce this impact to a *less-than-significant* level.

Impact 4.5-4: Project implementation could have substantial adverse effects on nesting birds. (*Less than Significant with Mitigation*)

As discussed in the Environmental Setting, habitat for nesting birds is present throughout the Project sites. Songbirds and raptors protected under the federal MBTA and California Fish and Game Code may nest in grassland, woodland, riparian and forest habitat. During construction, tree and shrub pruning or removal, and grading could directly impact nesting birds by damaging or destroying nests, causing adults to abandon nests, or directly killing or injuring nesting birds. Additionally, construction and maintenance activities may cause elevated sound levels and vibrations from heavy construction equipment that could cause adult birds to abandon nests, especially larger bird species or birds that are accustomed to relatively low ambient noise levels. Thus, construction activities could result in significant direct impacts to nesting special-status and migratory birds. These impacts would be addressed by **Mitigation Measure 4.5-4.**

Mitigation Measure 4.5-4: Avoid Impacts to Special-status and Nesting Birds, including Raptors and Northern Spotted Owls.

Tree removal activities shall be avoided during the nesting season (February 1 to August 31). Prior to any tree removal or construction in nesting season, a qualified biologist shall conduct a spotted owl and general nesting bird survey in each Project site and areas within 1/2-mile. Any identified spotted owl nesting areas or activity centers shall be flagged and avoided with a buffer of 1/4-mile throughout the active nesting season. Other nesting birds with active nests in the vicinity of the construction area shall be avoided by a buffer of 50 feet, or as determined in coordination with USFWS and CDFW. Construction work may continue outside of the no-work buffer. Northern spotted owl nesting surveys shall be conducted in coordination with Marin County Parks and Point Blue Conservation Science (Point Blue, 2017).

Significance after Mitigation: Implementation of Mitigation Measure 4.5-4 would reduce impacts on nesting birds by limiting tree removal to the non-nesting season, require pre-construction surveys and no-work buffers, which would reduce direct and indirect effects on these species to levels that are *less than significant*.

Impact 4.5-5: Project implementation could have substantial adverse effects on Northern spotted owls. (*Less than Significant with Mitigation*)

Northern spotted owls are not likely to nest within the Project sites due to adjacent lack of habitat, proximity to high-travel roadways, and fragmented forest. However, at least five spotted owl territories are present in close proximity (as close as just over ¼-mile away) to the Project sites (see Figure 4.5-4). Spotted owl activity centers include their nest territory and nearby foraging habitat, during nesting season (February 1 to August 31). Nearby nesting owls may be disturbed by tree removal or trimming or exposure to a substantial increase in noise or human presence during Project activities. The proposed construction window would overlap with the Northern spotted owl nesting season, and construction and maintenance activities that cannot be avoided within 1/4-mile of spotted owl activity centers may result in take of nesting owls. Owl foraging activities within the Project area are not likely to be affected because construction and maintenance activities would occur only during daylight hours. While the potential for disturbance of nesting owls is low, it cannot be discounted, and such disturbance would be a potentially significant impact. However, implementation of **Mitigation Measure 4.5-4** would address this impact.

> **Significant after Mitigation:** Implementation of Mitigation Measure 4.5-4 would reduce impacts on Northern spotted owls by limiting tree removal to the non-nesting season, require pre-construction surveys and no-work buffers, which would reduce direct and indirect effects on these species to levels that are *less than significant*.

Impact 4.5-6: Project implementation could have substantial adverse effects on special-status bats. (*Less than Significant with Mitigation*)

Habitats within the Project sites have the potential to support roosting special-status bat species, including pallid bat and hoary bat. Construction activities such as tree and shrub removal, and grading could directly kill or injure roosting special-status bats, and elevated sound levels from construction and maintenance equipment could cause adult bats to abandon maternity roosts. Project construction activities could thus result in significant impacts to special-status bats. Implementation of **Mitigation Measure 4.5-6** would address this impact.

> **Mitigation Measure 4.5-6: Avoid Impacts to Special-status Bats.**
>
> Prior to any construction, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in trees to be removed or pruned and structures to be demolished. If no roosting bats are found, no further action is required. If a bat roost is found, the following measures shall be implemented to avoid impacts on roosting bats.
>
> If active maternity roosts are found in trees or structures that shall be removed or demolished as part of construction, tree removal or demolition of that structure shall commence before maternity colonies form (generally before March 1) or after young are flying (generally by July 31). Active maternal roosts shall not be disturbed.
>
> If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist and with approval from CDFW. Removal of the tree or demolition of the structure should occur no sooner than two nights after the initial minor site modification (to alter airflow), under guidance of the qualified bat biologist. The modifications shall alter the bat habitat, causing bats to seek shelter elsewhere after they emerge for the night. On the following day, the tree or structure may be removed, in presence of the bat biologist. If any bat habitat is not removed, departure of bats from the construction area shall be confirmed with a follow-up survey prior to start of construction.

Significant after Mitigation: Implementation of Mitigation Measure 4.5-6 would reduce this impact to less than significant by requiring pre-construction surveys to identify roosting bats and requiring actions to protect roosting bats, if present. The impact would be *less than significant*.

Impact 4.5-7: Project implementation could adversely affect sensitive natural communities. (*Less than Significant with Mitigation*)

This discussion focuses on the riparian corridor and oak woodland sensitive natural communities Impact 4.5-8 addresses wetlands and other waters of the U.S. and waters of the State. The current distribution of existing habitat and vegetation communities at the two Project sites is presented in Table 4.5-1. Potential temporary and permanent impacts to existing habitat are presented in Table 4.5-3. Riparian habitat represents a relatively small percentage of total land cover across the regional landscape and is of high conservation value.

Nursery Basin

Approximately 1.02 acres of riparian habitat is present at the Nursery Basin site. To avoid and minimize impacts on sensitive natural communities, the geographic extent of adverse effects on vegetation related to Project construction are limited to the construction footprint and the immediate vicinity of the Project. However, as shown in Table 4.5-3, Project activities at the Nursery Basin site would result in permanent removal of approximately 0.59 acre of riparian habitat and approximately 0.42 acre of temporary impacts to existing riparian habitat. Although temporary impacts on riparian habitat would be restored through revegetation efforts as part of the Project, there would be permanent loss of riparian habitat at the Nursery Basin site. Implementation of **Mitigation Measure 4.5-7a**, and **Mitigation Measure 4.5-7b** would address these potential impacts.

Approximately 0.81 acre of coast oak woodland habitat is present at the Nursery Basin site. Approximately 0.43 acre of oak woodland habitat would be permanently impacted by the Project and 0.37 acre would be temporarily impacted by the Project. Impacts to special-status species whom utilize oak woodland habitat are discussed in Impacts 4.5-2, 4.5-3, 4.5-4, 4.5-5, 4.5-6, and 4.5-9. Impacts to removal of trees at the Nursery Basin site are discussed in Impact 4.5-10. Mitigation measures identified in the referenced impact discussions would also address impacts to oak woodland habitat.

Downtown San Anselmo

Approximately 0.14 acre of riparian habitat is present at the Downtown San Anselmo site. Project activities at the Downtown San Anselmo site would result in approximately 0.10 acre of temporary impacts and no permanent impacts to existing riparian habitat. The removal of the building at 634-636 San Anselmo Avenue and the regrading of the banks to restore native riparian vegetation communities would result in approximately 0.04 acre of restored riparian habitat and approximately 0.10 acre of restored aquatic habitat. Project impacts on sensitive natural communities at the Downtown San Anselmo site would be neutral or beneficial.

Indirect Effects

Indirect effects of Project construction at both sites could create a favorable environment for invasive non-native plant species that are highly competitive in disturbed environments. Unintentional introduction of non-native plant or animal species is also possible. Project activities would involve clearing, grubbing, and excavation and grading using heavy equipment that could carry invasive non-native plants or plant pathogens from outside sources to the Project sites. Replanting native vegetation and monitoring the replanting effort would reduce the possibility of non-native species establishing in disturbed areas. However, the revegetation effort may adversely affect the habitat surrounding the Project sites by introducing non-native vegetation and/or plant pathogens on vehicle equipment or site restoration materials that do not currently occur within the watershed, which would be a potentially significant impact on sensitive natural communities. Implementation of **Mitigation Measure 4.5-7c** would address these potential impacts, as discussed below.

Mitigation Measure 4.5-7a: Vegetation Protection for Sensitive Natural Communities.

Prior to start of construction of any Project element, the extent of sensitive natural communities within the work area shall be identified by a qualified biologist experienced in the definition and recognition of these communities. The area of impact in sensitive natural communities shall be minimized by siting construction staging and access areas outside the limits of riparian and oak woodland vegetation (as determined during pre-construction surveys) and by utilizing previously-disturbed areas. Before construction begins, the Project engineer and a qualified biologist shall identify locations for equipment and personnel access and materials staging that will minimize riparian vegetation disturbance. When heavy equipment is required, unintentional soil compaction shall be minimized by using equipment with a greater reach, or using low-pressure equipment. Temporary impacts on sensitive natural communities shall be mitigated by revegetation with native species, as required by Mitigation Measure 4.5-7b.

Mitigation Measure 4.5-7b: Habitat Restoration and Monitoring Plan.

The Flood Control District shall prepare a Habitat Restoration and Monitoring Plan for restoration following construction activities at both Project sites. The plan shall describe required salvage and replanting protocols prior to and after construction is complete and shall thereby reduce the long-term amount of losses of these natural communities. This plan shall include, but not be limited to, protocols for replanting of vegetation removed prior to or during construction, and management and monitoring of the plants to ensure replanting success pursuant to Marin County's Countywide Plan, Marin County Code, or Code requirements of the Town of San Anselmo, or by any more stringent requirements included in other permits issued for the Project.

The plan shall specify monitoring and performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits from the various resource agencies with regulatory purview over the Project. Revegetated areas shall be monitored for a five-year period to track progress toward performance criteria.

Native riparian vegetation within the Project sites shall be salvaged prior to construction and replanted after construction is completed. Areas impacted by construction-related activity shall be replanted or reseeded with native trees, shrubs, and herbaceous perennials and annuals from the watershed under guidance from a qualified biologist. Local plant materials shall be used for revegetation of the disturbed area. The plant materials shall include local cuttings from the local watershed or from adjacent watersheds. This shall ensure that the seeds can be collected during the appropriate season and the container plants shall be of an appropriate size for out-planting. Using local cuttings can reduce the length of this phase.

The Habitat Restoration and Monitoring Plan shall also address restoration of jurisdictional wetlands and waters. Temporary impacts to wetlands shall be restored onsite with native wetland species under guidance from a qualified biologist. Permanent impacts to jurisdictional wetlands shall be mitigated for by replacement on- or off-site at an equal ratio or whatever more stringent requirements are included in the permits to be issued for the Project.

The monitoring plan shall include annual monitoring of restored areas for at least 5 years. The plan shall contain vegetation management protocols, protocols for monitoring replanting success, and an adaptive management plan if success criteria are not being met. The adaptive management plan would include interim thresholds for replanting success and alternative management approaches, such as weed control or additional replanting, to undertake if thresholds are not met.

Mitigation Measure 4.5-7c: Avoid Spread of Invasive Species and Pathogens.

All vehicles and equipment entering each Project site shall be clean of noxious weeds. Noxious weeds could spread between sites as well as from outside the Project sites. All construction equipment shall be washed thoroughly to remove all dirt, plant, and other foreign material prior to entering the Project sites. Particular attention shall be shown to the under-carriage and any surface where soil containing exotic seeds may exist. Arrangements shall be made for inspections of each piece of equipment before entering each Project site to ensure all equipment has been properly washed. Equipment found operating on the Project that has not been i.e., properly washed shall be shut down and may be subject to citation.

1) Certified weed-free permanent and temporary erosion control measures shall be implemented to minimize erosion and sedimentation during and after construction.

2) The contractor shall conform to applicable federal, state, and local seed and noxious weed laws.

3) Nursery operations where plants are stored, propagated, or purchased must certify implementation of best management practices to reduce pest and pathogen contamination within their nursery.

4) Disturbed and decompacted areas outside the restoration area shall be revegetated with locally native vegetation. Revegetated areas shall be protected and tended, including watering when needed, until restoration criteria specified by regulatory agency-issued permits is complete.

5) All tree removal and pruning activities shall include measures to avoid the spread of the Sudden Oak Death (SOD) pathogen. Such measures may include, but are not limited to the following:

i. As a precaution against spreading the pathogen, clean and disinfect pruning tools after use on confirmed or suspected infested trees or in known infested areas. Sanitize tools before pruning healthy trees or working in pathogen-free areas. Clean chippers and other vehicles of mud, dirt, leaves, organic material, and woody debris before leaving a site known to have SOD and before entering a site with susceptible hosts.

ii. Inform crews about the arboricultural implications of SOD and sanitation practices when they are working in infested areas.

iii. Provide crews with sanitation kits containing chlorine bleach, scrub brush, metal scraper, boot brush, and plastic gloves.

iv. Sanitize shoes, pruning gear, and other equipment before working in an area with susceptible species.

v. When possible, work on SOD-infected and susceptible species during the dry season (June-October). When working in wet conditions, keep equipment on paved, graveled, or dry surfaces and avoid mud. Work in disease-free areas before proceeding to infested areas.

vi. If possible, do not collect soil or plant material (wood, brush, leaves, and litter) from host trees in the quarantine area. Within the quarantine area, host material (e.g., wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic host plants should remain onsite to minimize pathogen spread.

vii. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a SOD infested site. Scrape, brush, and/or hose off accumulated soil and mud from clothing, gloves, boots, and shoes. Remove mud and plant debris by blowing out or power washing chipper trucks, chippers, bucket trucks, fertilization and soil aeration equipment, cranes, and other vehicles. Restrict the movement of soil and leaf litter under and around infected trees as spores may be found there.

viii. Tools used in tree removal/pruning may become contaminated and should be disinfected with alcohol or chlorine bleach.

Significance after Mitigation: Mitigation Measure 4.5-7a would reduce potential impacts on the riparian corridor and oak woodlands by limiting the impacts to designated Project construction limits and reduce or avoid impacts on the surrounding areas. Mitigation Measure 4.5-7b requires development and implementation of a habitat restoration and monitoring plan to restore, replace, and revegetate areas of impacted riparian and oak woodland habitat and specifies nature and requirements of that restoration, revegetation effort and its long-term monitoring. Mitigation Measure 4.5-7c would help protect these sensitive communities by specifying practices to clean construction equipment prior to entering the site and thus avoid spreading invasive species and pathogens. With implementation of these mitigation measures, as well as other compensatory mitigation measures expected from various permit conditions, this impact would be *less than significant*.

Impact 4.5-8: Project activities could adversely affect wetlands and other waters. (*Less than Significant with Mitigation*)

Project activities to build the Nursery Basin could affect any existing wetlands and other (non-wetland) waters in Fairfax Creek as a result of construction in the creek bed and along the lower banks of the creek channels including placement of the diversion structure, basin outfall installation, bank stabilization, grading for channel widening or deepening, and other activities including sediment removal maintenance activities. These effects are less likely at the Downtown San Anselmo site, where there would be work in the creek channel and along the banks, but the activities there would involve removing fill and restoring or enhancing the natural creek channel. There would be no permanent wetland losses at the Downtown San Anselmo site; only short-term disturbance. Table 4.5-3 presents the acreages of habitat effects at each Project site.

At the Nursery Basin site, the diversion structure, the basin outfall pipes, and the placement of bank stabilization would lead to permanent loss of approximately 0.01 acre of wetlands and approximately 0.03 acre of other waters. The Project would also temporarily impact approximately 0.01 acre of wetlands and 0.01 acre of other waters. The Project would not substantially change the existing ecological functions of the creek channel. However, unpermitted permanent loss of wetlands would be a potentially significant impact. In addition, Project elements that would place fill in jurisdictional waters of the U.S. and of the state (e.g., the diversion structure, slope transition structures, and scour protection) would require a Clean Water Act Section 404 permit from the USACE and a Section 401 water quality certification from the RWQCB. The Project cannot be constructed without these agency approvals.

Additionally, a seasonal channel and associated wetland area would be constructed at the Nursery Basin site using storm water flows from the adjacent neighborhood directed into the proposed Nursery Basin. These Project elements would provide enhanced aquatic and upland habitat compared to the grasses and ruderal vegetation currently present at this former nursery site.

At the Downtown San Anselmo site, the removal of existing fill (concrete foundations and other debris) from the San Anselmo Creek channels and the restoration of banks and adjacent riparian habitats would be an improvement to aquatic habitat in the larger Corte Madera Creek watershed over the long term.

At either site, indirect adverse effects on wetlands or other waters could result from increased turbidity or other impacts related to water quality during construction. However, these water-quality-related indirect effects to waters would be minimized by implementation of the SWPPP as required under the National Pollutant Discharge Elimination System permit program for construction activities (discussed further in Section 4.9, Hydrology and Water Quality). The SWPPP would identify specific best management practices for reducing construction water quality impacts, such as erosion and sediment control measures. Project elements that discharge fill to waters of the state (the diversion structure, slope transition structures, and scour protection) would also require acquisition of a Clean Water Act Section 401 water quality certification from the RWQCB. As part of the Section 401 certification, the Project would be reviewed to verify that it would not violate State water quality standards. Project construction and annual sediment removal maintenance activities would temporarily disturb any existing riverine wetlands and vegetation present within the creek bed and along the creek edges. Instream riverine wetlands are generally transient and seasonal, and vegetation would regenerate within one to two growing seasons when disturbed. These temporary impacts would be less than significant.

> **Significance after Mitigation:** Impacts to wetlands and other waters would be minimized by implementation of **Mitigation Measures 4.5-7a** and **4.5-7b**, described above. **Mitigation Measure 4.5-7a** would minimize the area of sensitive natural communities, including wetlands and waters, impacted by construction. **Mitigation Measure 4.5-7b** requires development and implementation of a Habitat Restoration and Monitoring Plan for the site for replanting and maintenance of restored riparian areas as well as compensatory mitigation for wetlands permanently impacted by the Project. The plan applies restoration success criteria for maintenance of replanted or restored vegetation, pursuant to Marin County ordinances or any more stringent requirements of other permits issued for the Project. Implementation of **Mitigation Measures 4.5-7a** and **4.5-7b** would reduce the potential impact of the Project on wetlands and other waters of the U.S. to a *less-than-significant* level.

Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors. (*Less than Significant with Mitigation*)

Riparian corridors are important for wildlife movement because they allow for cover, foraging, nesting, and shelter relatively protected from human disturbance and concealed from predators. In densely developed neighborhoods of Fairfax and San Anselmo, the creek banks and creek bed (in the dry season) provide critical movement corridors for special-status and general fish wildlife (discussed throughout this section) that retain populations in this area. Construction in the creek channel would temporarily disturb cover for and impede use of the creek as a potential wildlife movement corridor. During construction, impacts from the Project on wildlife movement corridors would be potentially significant.

The Nursery Basin site is adjacent to open space that provides valuable wildlife habitat. Approximately 0.21 acre of annual grassland upland habitat would be restored at the Nursery Basin, which would benefit terrestrial species. The Project would also place a diversion structure across the Fairfax Creek channel. However, the design for this structure include permanently open section(s) to enable movements of fish and wildlife within the creek channel and its surrounding riparian corridor. In the long term, Project activities at the Downtown San Anselmo site would restore and enhance the riparian corridor and potentially enhance water flow and wildlife forage and shelter opportunities. Upon Project completion, impacts on wildlife movement corridors would be less than significant.

> **Significance after Mitigation:** Implementation of **Mitigation Measures 4.5-1a** described above, would restrict work activities to the months when sensitive aquatic species are less likely to be present. In addition, **Mitigation Measures 4.5-3b**, **4.5-4**, and **4.5-6** would require pre-construction surveys and implementation of measures to protect special-status species with the potential to occur at the Project sites. With implementation of these measures, impacts on riparian wildlife corridors would be reduced to a *less-than-significant* level.

Impact 4.5-10: Project construction would require tree removal. (*Less than Significant with Mitigation*)

A tree survey conducted in July 2017 identified all tress within the Nursery Basin site by species, size and conditions (Urban Forestry, 2017). Most trees on the site are aging bay trees, many of which are infested with rot. Many coast live oaks on the property are infested with Sudden Oak Death (SOD). The preliminary Project designs estimated that 156 of these were in the planned construction area and would be removed (see Figure 3-16 in *Chapter 3, Project Description*). Of the trees identified for removal as a part of the designs, 10 are Heritage Trees according to Marin County (5 bay trees, three redwoods, and two coast live oaks). An additional 95 trees are Protected Trees, of which 78 are bay trees, 8 are coast live oaks, 6 are California buckeye, 2 are big-leaf maple, and 1 is a redwood. An additional 13 trees of unknown species and size would be removed. Subsequent to the tree survey, the District removed 16 trees due to poor condition and imminent hazard to neighboring residences. Of these, 8 were eucalyptus, 4 were bay trees, two were Monterey cypress, and the remaining two were small shrubs (Moritz, 2018). The remaining total number of trees slated to be removed during Nursery Basin construction activities is 142.

At the Downtown San Anselmo site, eight trees would be removed, all of which are greater than 7 inches diameter at breast height. Two of these are redwood tress (*Sequoia sempervirens*) and six are white alders (*Alnus rhombifolia*). There are no heritage trees greater than 22 inches diameter at breast height.

The removal of heritage trees or riparian trees at either site would be a potentially significant impact. Implementation of **Mitigation Measure 4.5-10** would address this impact.

Mitigation Measure 4.5-10: Mitigation for Removal of Heritage or Protected Trees.

During construction, as much understory brush and as many native trees as possible shall be retained, to maintain shade-producing and bank-stabilizing vegetation for the creeks. All trees to remain during construction within the grading area shall be protected and trimmed if necessary to ensure their trunks and/or limbs are not disturbed during construction.

To mitigate for tree removal: For each tree to be removed, the Flood Control District shall plant a replacement tree of the same species or a suitable native species substitute, at a rate of one planting per tree removed or such other mitigation ratio requirements included in the LSAA to be obtained from CDFW (for riparian trees) or any applicable County and/or town recommendations (for heritage trees), and ensure that replacement trees are planted within or in the vicinity of the Project sites to the maximum extent practicable, as follows:

1) Trees shall be replaced within the first year after the completion of construction or as soon as possible after construction is completed.

2) Selection of replacement sites and installation of replacement plantings shall be supervised by an arborist or biologist with experience in restoration. Irrigation of tree plantings during the initial establishment period shall be provided as deemed necessary by an arborist or biologist, consistent with the site Habitat Restoration and Monitoring Plan (**Mitigation Measure 4.5-7b**).

Significance after Mitigation: Mitigation Measure 4.5-10 would mitigate for tree removal by requiring replacement of heritage trees and riparian trees at a ratio of 1:1 or greater if required by regulatory agency permits. In doing so, this measure would reduce this impact to a *less-than-significant* level.

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4.6 Cultural Resources

This section presents and discusses the cultural resources associated with the San Anselmo Flood Risk Reduction Project (Project) construction, implementation, and operation. Also discussed are the environmental setting and regulatory framework, the significance criteria used for determining environmental impacts, and potential impacts associated with the Project. Cultural resources include architectural resources, prehistoric and historic-era archaeological resources, human remains, and tribal cultural resources. Paleontological resources are covered in Section 4.6, Geology, Seismicity, Soils, and Paleontological Resources.

4.6.1 Physical Setting

This section describes the regional context for the Project area, including the natural environment and resource setting and the local setting, which includes records searches and background research.

4.6.1.1 Regional Setting

Marin County's location places it between the Pacific Ocean and San Francisco Bay. Between these two bodies of water, a section of California's Coast Ranges includes a wide range of elevations, microclimates, and natural habitats. Elevations range from sea level up to Mount Tamalpais's summit at over 2,500 feet elevation. Approximately 50 percent of the land area in Marin County is under public management as parks, open space, conservation easements, and public watershed lands. Most development is in the eastern side of the county, between the San Francisco Bay and Mount Tamalpais. The remainder is generally in private ownership as grazing land and woodlands in the northern part of the county. Natural community types in the county include mixed evergreen forest, oak woodland, pine forest, Douglas fir/redwood forest, grassland, coastal beach dune, northern coastal scrub, chaparral, coastal salt marsh, riparian, and freshwater marsh. These communities support a wide range of plant and animal species, including many special-status species (Marin County, 2007a).

The highly varied topography of Marin County's portion of the Coast Ranges has created a complex set of steep and variable watersheds. Marin County does not have a single river system that dominates its hydrology. Rather, a large number of creeks and streams drain a complex set of major watersheds. The watersheds vary widely in terms of their drainage areas, slopes, and stream lengths, providing a range of aquatic habitats for fish and other species that use aquatic habitats.

Human modification of the natural landscape in Marin County has changed the composition of the plant communities, habitats, and wildlife that use them. The most prominent activities were agriculture, livestock grazing, timber operations, road building, and urban and suburban development, all of which began in the nineteenth century. Native perennial grasslands have been largely replaced by non-native annual grasslands, and a number of highly invasive species now threaten the remaining grasslands. Some of these land uses persist into the present day, including some grazing and urban/suburban development. Urban and suburban development have contributed to considerable fragmentation of the remaining natural areas associated with the system of local parks and open space lands along stream corridors and ridgelines throughout the more developed areas in the eastern side of the county.

Prehistoric Context

Categorizing the prehistoric period into cultural stages allows researchers to describe a broad range of archaeological resources with similar cultural patterns and components during a given timeframe; thereby, creating a regional chronology. Milliken et al. (2007) provide a framework for the interpretation of the San Francisco Bay Area (Bay Area) and have divided human history of the region into four periods: the *Paleoindian Period* (11,500 to 8000 B.C.), the *Early Period* (8000 to 500 B.C.), the *Middle Period* (500 B.C. to A.D. 1050), and the *Late Period* (A.D. 1050 to 1550). Economic patterns, stylistic aspects, and regional phases further subdivide cultural patterns into shorter phases. This scheme uses economic and technological types, socio-politics, trade networks, population density, and variations of artifact types to differentiate between cultural periods.

The *Paleoindian Period* (11,500 to 8000 B.C.) was characterized by big-game hunters occupying broad geographic areas. Evidence of human habitation during the *Paleoindian Period* has not yet been discovered in the Bay Area. During the *Early Period* (*Lower Archaic*; 8000 to 3500 B.C.), geographic mobility continued from the *Paleoindian Period* and is characterized by the millingslab and handstone as well as large wide-stemmed and leaf-shaped projectile points. The first cut-shell beads and the mortar and pestle are documented in burials during the *Early Period* (3500 to 500 B.C.), indicating the beginning of a shift to sedentism. During the *Middle Period*, which includes the *Lower Middle Period* (500 B.C. to A.D. 430), and *Upper Middle Period* (A.D. 430 to 1050), geographic mobility may have continued, although groups began to establish longer-term base camps in localities from which a more diverse range of resources could be exploited. The first rich midden sites are recorded from this period. The addition of milling tools, obsidian and chert concave-base projectile points, and the occurrence of sites in a wider range of environments suggest that the economic base was more diverse. By the *Upper Middle Period*, highly mobile hunter-gatherers were increasingly settling down into numerous small villages. Around A.D. 430 a dramatic cultural disruption occurred as evidenced by the sudden collapse of the *Olivella* saucer-bead trade network. During the *Initial Late Period* (A.D. 1050 to 1550), social complexity developed toward lifeways of large, central villages with resident political leaders and specialized activity sites. Artifacts associated with the period include the bow and arrow, small corner-notched projectile points, and a diversity of beads and ornaments.

Previous Archaeological Studies

Many of the original surveys of archaeological sites in the Bay Area were conducted by N.C. Nelson of the University of California, Berkeley between 1906 and 1908. These surveys yielded the initial documentation of nearly 425 earth mounds and shell heaps along the coast from the Russian River in Sonoma County to Half Moon Bay in San Mateo County and along San Francisco Bay's shoreline (Nelson, 1909). From these beginnings, the most notable sites in the Bay Area excavated scientifically included the Emeryville shell mound (designated as CA-ALA-309), the Ellis Landing Site (CA-CCO-295) in Richmond, and the Fernandez Site (CA-CCO-259) in Rodeo Valley (Moratto, 1984). These dense midden sites are vast accumulations of domestic debris and date back to over 2,000 years ago. For example, the Emeryville shell mound is dated at approximately 2,310 years old (±220 years).

A framework for the North San Francisco Bay Area has been suggested using data from sites along Marin County's bay shoreline as well as locales further north in the Santa Rosa plain and the Sonoma and Napa valleys (Milliken et al., 2007:104, Figure 8.4). One of the earliest San Francisco Bay sites is CA-MRN-17, located on De Silva Island in Marin County. While the upper midden yielded Late Period materials, the 6-meter-deep deposits yielded a radiocarbon date of approximately 3430 B.C. and contained handstones and heat-affected chert (Breschini in Stewart and Praetzellis, 2003:115). Another early North Bay site is CA-SON-20 located east of Santa Rosa where the Spring Lake aspect of the Borax Lake pattern (6500 B.C. to 3500 B.C.) has been defined. Large wide-stemmed projectile points, many of which are made from Borax Lake obsidian from Lake County, have been uncovered and the site is thought to represent a mobile forager economic pattern from the Lower Archaic Period (Fredrickson, 1973). Data from the Santa Rosa plain also indicates that this forager pattern developed into more localized foraging of the Mendocino Pattern (3500 B.C. to A.D. 100), which included the chert-using Black Hills aspect. Fredrickson (1974), and later Jones and Hayes (1993), suggested overlapping use of the area by collectors using semi-permanent villages sometime between 1500 B.C. to A.D. 1000.

Subsistence-based studies (Bennyhoff in Moratto, 1984:262) have been conducted using data from North Bay sites concluding a shift from oyster to mussel harvesting during the break between the Lower and Upper Middle periods (cal A.D. 430) and then a second shift to clam digging during the Late Upper Middle Period (cal A.D. 800). The shifts may reflect oyster overexploitation and environmental factors (Jones, 1991:4). During the Terminal Late Period, beginning around A.D. 1550, numerous new technologies and patterns appeared, first in the North Bay. These include the toggle harpoon, hopper mortar, corner-notched arrow-sized projectile point, clamshell disk beads, magnesite tube beads, and secondary cremation. The shift may be due to one or many factors including population expansion or movements, as well as the spread of European-introduced epidemics north from Mexico (Milliken et al., 2007:118).

Geoarchaeological Context

The California coast has undergone dramatic landscape changes since humans began to inhabit the region more than 10,000 years ago. Rising sea levels and increased sedimentation into streams and rivers are among some of the changes (Helley et al., 1979). In many places, the interface between older land surfaces and Holocene-age landforms are marked by a well-developed buried soil profile, or a paleosol. Paleosols preserve the composition and character of the earth's surface prior to subsequent sediment deposition and thus have the potential to preserve archeological resources if the area was occupied or settled by humans (Meyer and Rosenthal, 2007). Because human populations have grown since the arrival of the area's first inhabitants, younger paleosols (late Holocene) are more likely to yield archeological resources than older paleosols (early Holocene or Pleistocene). Other criteria used to measure the archaeological sensitivity of a given area include the following:

1. Archaeological sites tend to be near perennial water sources.

2. Archaeological deposits from successive time periods are more common because the density of human populations increased over time.

3. The longer a landform remained at the surface, the greater the likelihood that any one spot on that landform was occupied (Meyer in Ruby, 2010).

As indicated by geologic maps, both the former Sunnyside Nursery site and the Downtown San Anselmo site are in a Holocene-age alluvial deposit associated with Fairfax and San Anselmo Creeks (Witter et al., 2006). Soils are classified as Urban Land, including engineered native soils and imported fill, and sandy clay loams of the Xerorthents complex (Natural Resources Conservation Service, 2017). This geologic formation has the potential to contain archaeological sites buried by natural alluvial processes (Meyer and Rosenthal, 2007). Despite the general sensitivity for deeply buried archaeological sites in Holocene-age alluvium, few sites in this context have been uncovered in Marin County.

Ethnographic Context

The Project is within the ethnographic territory of the Coast Miwok (Barrett, 1908; Kelly, 1978; Kroeber, 1925). The Coast Miwok language, a member of the Miwok subfamily of the Penutian family, is divided into two dialects: Western (or Bodega) and Southern (or Marin) which in turn is subdivided into valley and coast. Miwok refers to the entire language family that was spoken by Coast Miwok, as well as Lake, Valley, and Sierra Miwok. Coast Miwok territory encompassed all present-day Marin County and parts of Sonoma County, from Duncan’s Point on the coast to between the Sonoma and Napa rivers. Each large village had a tribal leader, but there does not appear to have been any defined broader-scale organization (Kelly, 1978:414).

Much of the information about post-contact Coast Miwok material culture and lifestyles was gathered from two informants, Tom Smith (Bodega dialect) and María Copa (Marin dialect) (based on Kelly’s field notes from 1931 to 1932). Settlements focused on bays and estuaries, or along perennial interior watercourses. The economy was based on fishing, hunting, and gathering, and revolved around a seasonal cycle during which people traveled throughout their territory to make use of resources as they became available. Marine foods, including kelp, clams, crabs, and especially fish, were a year-round staple. Acorns were gathered in season and stored for use throughout the year. Tobacco was used by most men (Kelly, 1978:417).

By the mid-1800s Spanish missionization, diseases, raids by Mexican slave traders, and dense immigrant settlement had disrupted Coast Miwok culture, dramatically reducing the population and displacing the native people from their villages and land-based resources. By the time of California’s initial integration into the United States in the late 1840s, the Coast Miwok population had dwindled from approximately 2,000 individuals to one-eighth of its size before European contact (Kelly, 1978:414).

In 1920, the Bureau of Indian Affairs purchased a 15.45-acre tract of land in Graton for the Marshall, Bodega, Tomales, and Sebastopol Indians. This land was put into a federal trust and these neighboring peoples, that included both Coast Miwok and Southern Pomo, were consolidated into one recognized group: the Graton Rancheria. In 1958 the U.S. government enacted the Rancheria Act of 1958, transferring tribal property into private ownership. Forty-four Rancherias in California were affected, including the Graton Rancheria.

Since then, tribal members have continued to protect their cultural heritage and identity despite being essentially landless. On December 27, 2000 President Clinton signed into law legislation restoring federal recognition to the Federated Indians of Graton Rancheria. The tribe currently has approximately 1,100 members. The tribe employs a Tribal Historic Preservation Officer[1] and is engaged in the protection and interpretation of their tribal cultural resources.

Historic Background

The name Marin County is purportedly derived from a famous Lacatuit Chief, whose people originally occupied this northern San Francisco Bay territory (Goerke, 2007). Following the alleged arrival of Sir Francis Drake, Sebastian Rodriguez Cermeño anchored off the Coast of Marin County in 1595. A Portuguese explorer sailing for Spain, Cermeño was ordered to explore more of the coast of California and it was during this trip that his ship, the San Agustín, was shipwrecked at Drakes Bay. While his crew built a new vessel, Cermeño explored the Marin County area. A permanent Hispanic settlement in Marin County was eventually achieved in 1817 when the Mission San Rafael was established by Padres Amaroso and Cijos (Hoover et al., 2002).

During the Mexican Period (1821 to 1848), the land within Marin County was divided into several ranchos. The Project area is within the Rancho Cañada de Herrera for which Domingo Sais, a soldier from the Presidio in San Francisco, was granted 6,658 acres in 1839. The discovery of gold in 1848 led to a huge population boom in California, with settlers establishing themselves on Sais' land grant. The 1851 California Land Claims Act required Mexican landowners in California to prove the validity of their claim on land held under Mexican titles. Sais' grant was patented in 1853 (Rawls and Bean, 2002). When he died a few months later, James Black and George W. Cozzens purchased a portion of the land grant from Sais' widow.

The Town of San Anselmo is on the north end of the Ross Valley. Prior to 1875, the valley and its communities predominantly centered on the primary waterways spanning the valley that allowed access to San Francisco. The region was densely forested and overland travel via carriage was difficult. Western Marin focused on access to the Pacific Ocean, and Eastern Marin on Petaluma Creek. The Town of San Anselmo, known as "The Hub of Marin" was the epicenter of a collection of roads extending to Bolinas, Lagunitas, San Rafael, and the San Francisco Bay (San Anselmo Historical Society, No Date).

The 1875 opening of the North Pacific Coast Railroad greatly improved regional travel. The railroad company connected Sausalito to San Rafael, then west through the Town of San Anselmo (then "Junction") and on to Tomales Bay and the Russian River. The railroad provided easy access to the redwood stands desired by the booming timber industry. The North Pacific Coast became the North Shore Railroad in 1902, and then part of the Northwestern Pacific Railroad in 1907. Southern portions of the line were standard gauged and electrified for suburban

[1] Section 101(d)(2) of the NHPA allows tribes to assume any or all the functions of a State Historic Preservation Officer (SHPO) with respect to tribal land.

passenger service in the early 1900s, though tracks north of Point Reyes Station remained narrow gauge until that line's abandonment in the 1930s (San Anselmo Historical Society, No Date).

In the 1880s, Junction was renamed San Anselmo (from Cooper's original land grant), and in 1892 the San Francisco Theological Seminary was built, which provided impetus for the Town to grow. The railroad provided access for both students and summer vacationers, and after the 1906 earthquake summer residents seeking to escape San Francisco purchased land and built permanent homes. In 1907 the Town incorporated, and the 1937 completion of the Golden Gate Bridge brought another boom of new residents. Passenger train service to San Anselmo ended in 1941, and freight service the next year (San Anselmo Historical Society, No Date). In the post-war period, the downtown shopping district of the Town of San Anselmo, including San Anselmo Avenue, underwent a partial renewal, with buildings from the 1920s and 1930s renovated with updated storefronts and facades reflecting a more modern aesthetic.

Flooding in San Anselmo

The San Anselmo Historical Society website includes an article on the history of flooding in the area, and begins with the explanation that:

> "San Anselmo Creek actually changed its course during a severe rainstorm long before the town was situated here. The original creek channel ran along Laurel Avenue winding in a southerly direction crossing San Rafael, Tamalpais, Magnolia, Tunstead (at mid-block), and Pine Street, but a debris or log jam in the late 1860s caused the creek to bend to the other side of today's Center Boulevard and carve its present course through our downtown. In 1875, the North Pacific Coast Railroad completed its line through San Anselmo west to Tomales. The railroad, built a berm four to five feet above the valley floor on which the tracks west from San Anselmo were laid. The berm, upon which Center Boulevard runs today, narrowed the flood plain and caused the new creek channel to become more deeply incised."

Major floods resulted from strong storms in 1921, 1925, 1931, 1940, 1943, 1953, 1969, 1982-3, 1986, and 2005, and water overflowed the creek bank onto the streets, including San Anselmo Avenue. The resulting damage to property and goods was at times exacerbated through the construction of buildings immediately adjacent to the creek. During the 1940 storm, the service station at 634 San Anselmo Avenue was blamed for considerable flooding damage. The *San Anselmo Herald* reported on February 29, 1940:

> "A phenomenal rainfall brought San Anselmo Creek up to its highest since 1925 Monday evening with a high tide in sight... At midnight the waters of the creek rose so high that they went above the lower level of the service station on San Anselmo Avenue opposite the corner of Tamalpais and San Anselmo. Things moved rapidly after that. The waters began careening off the service station foundations into San Anselmo Avenue. They rapidly filled up San Anselmo Avenue from curb to curb. They crept towards the doors of business houses, where in most instances they were stopped by the sandbags. But not everywhere…But fortunately the loss was confined to one block on San Anselmo Avenue, as the water took a swirl around the corner east on Tunstead and back into the creek.
>
> The San Anselmo Public Library had to be pumped out by firemen. There was three feet of water in the basement, but the damage was small.

> Many citizens claim that the oil station on San Anselmo Avenue at Tamalpais was allowed to sink its concrete foundations too low. The station entirely spans the creek."

4.6.1.2 Project Area Setting

Northwest Information Center Database Search

The California Office of Historic Preservation is an information repository for historical resources in California. The Office of Historic Preservation administers the California Historical Resources Information System (CHRIS). CHRIS information is disseminated primarily through records searches and reviews of historical resource data files for specific geographic areas.

ESA cultural resources staff conducted a records search at the Northwest Information Center of the CHRIS on May 9, 2017 (File No. 16-1784) (NWIC, 2017). The records search included a review of archaeological sites in the Project area and a one-half mile radius around proposed elements and a review of architectural resource (i.e., buildings and structures) within and immediately adjacent to proposed elements (records search radius). The Historic Property Data File for Marin County also was reviewed, which contains information on sites of recognized historical significance—including those evaluated for listing in the National Register of Historic Places (National Register), the California Register of Historical Resources (California Register), the California Inventory of Historical Resources, California Historical Landmarks, and California Points of Historical Interest. The purposes of these reviews were to: (1) determine whether known architectural or archaeological resources have been recorded within the records search radius; (2) assess the likelihood of unrecorded cultural resources based on historical references and the distribution of nearby sites; and (3) develop a context for the identification of historical themes. **Table 4.6-1** provides the results of the records search.

Based on the Northwest Information Center records search there are no previously recorded archaeological resources in the Project area. There are three previously recorded archaeological resources within the records search radius (one-half mile radius) of the Downtown San Anselmo site. There are no previously recorded archaeological resources in the records search radius of the former Sunnyside Nursery site.

There are no previously recorded architectural resources in the records search radius (within, adjacent to, and across from) of the former Sunnyside Nursery site. There are four previously recorded architectural resources in the records search radius of the Downtown San Anselmo site, including one of the two buildings in the Project area.

Numerous buildings in downtown San Anselmo have been recorded as part of several historic building surveys, including documentation in 1987 by the San Anselmo Historical Commission. Many buildings are listed on the Historic Property Data File as individual properties that are eligible for local listing or designation (5S2), including 630 San Anselmo Avenue, which is in the Downtown San Anselmo site.

TABLE 4.6-1
CULTURAL RESOURCES IN THE RECORDS SEARCH RADIUS

Primary	Trinomial	Name	Resource Type	Date Recorded	Distance from Project
Archaeological Resources					
P-21-000104	CA-MRN-74	Nelson No. 74	AP04 (Bedrock milling feature); AP09 (Burials); AP15 (Habitation debris)	1907 (N.C. Nelson, University of California, Berkeley); 2002 (Stephen Bryne, Garcia and Associates)	Northwest of downtown San Anselmo
P-21-000294	CA-MRN-311	Nelson No. 74A	AP15 (Habitation debris)	1911 (N.C. Nelson); 1992 (Sunshine Psota, Anthropological Studies Center); 1993 (College of Marin Students, College of Marin)	Southeast of downtown San Anselmo
P-21-002621	--	112 Madrone Avenue	AP09 (Burials); AP16 (Other) - associated burial artifacts	2006 (Stephen Bryne, Kruger Frank, Caltrans District 4)	Northwest of downtown San Anselmo
Architectural Resources					
P-21-001567	--	Paper Ships (630 San Anselmo Avenue)	HP6. 1-3 story commercial building – Rated 5S2 (Individual property that is eligible for local listing or designation)	1987 (San Anselmo Historical Commission)	Within downtown San Anselmo site
P-21-001568	--	Heartthrobs / Hildas (637 San Anselmo Avenue)	HP6. 1-3 story commercial building – Rated 5S2 (Individual property that is eligible for local listing or designation)	1987 (San Anselmo Historical Commission)	Across from downtown San Anselmo site
P-21-001569	--	Whalen Building	HP6. 1-3 story commercial building – Rated 7N (Needs to be reevaluated)	1987 (San Anselmo Historical Commission)	Across from downtown San Anselmo site
P-21-001570	--	--	HP6. 1-3 story commercial building – Rated 5S2 (Individual property that is eligible for local listing or designation)	1987 (San Anselmo Historical Commission)	Across from downtown San Anselmo site

SOURCE: NWIC, 2017

Native American Consultation and Tribal Cultural Resources

On April 10, 2017, the Marin County Flood Control and Water Conservation District (Flood Control District) sent letters to the Federated Indians of Graton Rancheria and the Ione Band of Miwoks, the federally recognized tribe in Marin County. The letter included a brief description of the Project and a map.

Architectural Survey and Evaluation

ESA architectural historian Katherine Anderson conducted a site visit on May 30, 2017. Four buildings are in the Project area that will be demolished as part of the Project: 630 San Anselmo Avenue and 634–636 San Anselmo Avenue in the Downtown San Anselmo site, and 3000 Sir Francis Drake Boulevard (two buildings) in the former Sunnyside Nursery site. The buildings were recorded on Department of Parks and Recreation 523 forms.

3000 Sir Francis Drake Boulevard

The former Sunnyside Nursery site is occupied by two buildings, a residence and an art studio. Several sheds and other remnant structures related to the former nursery have already been removed. The residence and art studio are near the northwest quadrant of the parcel, in an area surrounded by mature trees. Building 1 is a one-story residence that is rectangular in plan. It is clad in board and batten and horizontal wood siding. It is capped by a flat roof with deep eaves. The building is partially obscured by climbing plants and large, flowering shrubs. Building 2 is a modified Quonset hut that houses an art studio.

The parcel is at the foot of White Hill in the Town of Fairfax and west of the Oak Manor neighborhood, which was developed as a residential subdivision in the early 1950s. The parcel was formerly the growing grounds for the Sunnyside Nursery, which was located at 130 Sir Francis Drake Boulevard in nearby San Anselmo (extant) and operated from 1940 until 2015. The growing grounds, formerly a dairy ranch, were purchased in 1948 by Donald C. Perry (1901–1987), the original owner of Sunnyside Nursery, and operations began that year. In 1958, the nursery produced 50,000 plants and 200 varieties, and a newspaper article published on April 23, 1960 described the nursery as "probably the most continuously productive eight acres in all of Marin County." For more than 55 years, the growing grounds opened to the public twice each year for special sales events.

Beginning in the late 1970s, Perry's grandsons, brothers Tom (b. 1953) and Ross Perry (b. 1956), managed the business and property. In 2001, Sunnyside Nursery was selected Business of the Year by the San Anselmo Chamber of Commerce and was honored at the County of Marin's annual Spirit of Marin ceremony. In 2015, the County Board of Supervisors adopted a resolution commending Sunnyside Nursery and the Perry Family for 75 years of service to the community. Tom and Ross Perry and their brother James Warren Perry (b. 1958) co-owned the parcel and the growing grounds ceased operations in November 2014.

ESA architectural historians evaluated the buildings at 3000 Sir Francis Drake Boulevard for their potential historical significance under California Register criteria 1 through 4. The two buildings at 3000 Sir Francis Drake Boulevard do not meet any of the California Register criteria, and they retain a low-to-moderate degree of integrity. ESA recommends the buildings at 3000 Sir Francis Drake Boulevard are not eligible for listing in the California Register.

630 San Anselmo Avenue and 634–636 San Anselmo Avenue

The Downtown San Anselmo site is occupied by two buildings separated by a paved parking area and a segment of the south bank of San Anselmo Creek. A wooded park with a paved walkway is on the north side of the parcel. The building at 634–636 San Anselmo Avenue is a one-story commercial building that is irregular in plan and is capped by a series of flat roof forms. The building is elevated over San Anselmo Creek, which is visible on the northwest and southeast sides of the building. The building at 630 San Anselmo Avenue is a small, one-story commercial building that is irregular in plan. It is constructed of concrete masonry units and is capped by a hipped roof clad in composition shingles. Note that this building is not included in the updated Project construction footprint for this Project and would not be removed or affected by the work, but this text includes the results of the desktop research and field survey for it for context and completeness.

The buildings have been occupied by a variety of businesses since they were constructed in 1938. At the address 634 San Anselmo Avenue, these businesses include the C.W. Caletti Service Station (1938), Henrietta Style Shop (1940), Rio Grande Service Station (1941), Wollman Tire Co. and Packard Taxi (1945), Larkspur Pet Shop a.k.a. Griff's Rod & Dog Shop (1951), Lee's Tune-Up Service and Chevron Service Station (1953–1961, owned by Licinio Busolo), Prishman Auto Repair (1967–1972), and Ted Smith Realtors and coffee shop (1972–1977 or possibly later). The earliest newspaper mention of the address 636 San Anselmo Avenue was in 1974 when The Arbor Restaurant opened "in the Ted Smith Realtors building." A 1965 newspaper article describes the history of 630 San Anselmo Avenue: "San Anselmo's tiniest downtown commercial building…was built shortly after World War II as a taxi stand and since then has served variously as a real estate office, beauty salon, hat store, artist's studio—and probably in a number of other categories." The building at 634–636 San Anselmo Avenue is currently occupied by The Ranch Salon, San Anselmo Optometry, Coldwell Banker, and L'Appart Resto. The building at 630 San Anselmo Avenue is occupied by the Michael Feldman Gallery.

According to the Marin County Historic Property Data File managed by the California Office of Historic Preservation, many of the commercial and residential buildings in downtown San Anselmo have been surveyed at various times, and many were rated as individual properties eligible for local listing or designation (5S2). This includes documentation of several properties in 1987 by the San Anselmo Historical Commission. The building at 630 San Anselmo Avenue was recorded at that time and provided the designation of 5S2, although no evaluation documentation was discovered. The building at 634–636 San Anselmo Avenue has not been previously surveyed or evaluated.

ESA architectural historians evaluated the buildings at 630 and 634–636 San Anselmo Avenue for their potential historical significance under California Register criteria 1 through 4. The buildings at 630 and 634–636 San Anselmo Avenue have functioned as commercial buildings that housed several different businesses during the mid- and late-20th century. In summary, the buildings at 630 and 634–636 San Anselmo Avenue do not meet any of the California Register criteria and retain a low degree of integrity. ESA recommends the buildings at 630 and 634–636 San Anselmo Avenue not eligible for listing in the California Register.

The building at 630 San Anselmo Avenue was included as part of the 1987 historic building inventory conducted by the San Anselmo Historical Commission. However, this earlier evaluation does not meet contemporary professional standards for evaluation, and as such the building was re-evaluated for its eligibility for listing in the California Registers and found ineligible as noted above. The Town of San Anselmo does not maintain a formal list of historical landmarks, nor a historic preservation ordinance or list of criteria for potential local significance. In spite of the Historic Property Data File designation, without formal significance criteria or a historic preservation ordinance, there are no criteria to provide criteria or an ordinance by which to evaluate the building for local eligibility.

Archaeological Surface and Subsurface Survey

An ESA archaeologist completed a surface survey of the Project area on May 23 and 30, 2017. All areas of proposed ground disturbance were walked in narrow transects to provide an overall assessment of existing conditions.

Visibility at the former Sunnyside Nursery site varied from dense vegetation to bare areas with clear visibility. Soil was a light brown silty sand with some artificially graveled areas. The former Sunnyside Nursery site has been highly disturbed from the previous constructions and operations. No archaeological resources or other evidence of past human use or occupation—such as midden soil, shell, and lithic fragments or historic-era artifact concentrations of glass, ceramic, or metal—were identified during the survey at the former Sunnyside Nursery site.

Visibility at the Downtown San Anselmo site also varied from obscured due to existing buildings and infrastructure to clear visibility along the creek banks. Soil, when visible, was a dark brown silty loam. The creek banks are relatively steep and highly disturbed from existing buildings and infrastructure as well as previous flooding events. No archaeological resources or other evidence of past human use or occupation—such as midden soil, shell, and lithic fragments or historic-era artifact concentrations of glass, ceramic, or metal—were identified during the survey at the Downtown San Anselmo site.

On September 15, 2017, ESA archaeologists completed a subsurface survey of the former Sunnyside Nursery site to identify the presence or absence of subsurface prehistoric archaeological resources. This was accomplished by excavating 10 trenches using a mechanical backhoe with a flat-bladed bucket. The trenches were 3 feet (0.9 meter) wide, up to 13 feet (4 meters) long, and up to 12 feet (3.7 meters) deep. The depth of the trenches varied based on the results of adjacent trenches, the soil stratigraphy, and distance from Fairfax Creek. Each trench location was given a unique field designation and was plotted using ArcGIS Collector. Sample buckets of soil from approximately 12-inch (30-cm) layers were dry-screened through a one-quarter- inch (0.6-cm) mesh screen and examined for cultural materials. The trenches were backfilled with the spoils. The Flood Control District provided the backhoe and operator. Underground utilities had been previously designated and marked by the Flood Control District, and trenches were only placed only in areas that have been cleared of utilities.

In summary, no cultural materials or other evidence of past human use or occupation was identified in any of the trenches. **Table 4.6-2** summarizes the results of the subsurface survey.

TABLE 4.6-2
SUBSURFACE SURVEY RESULTS

Trench No.	Length (in feet)	Width (in feet)	Depth (in feet)	Notes / Summary
TR-01	12	3	9	Layered gravel channel – fill to depth
TR-02	13	3	6.5	Interbedded gravels, sandy silt layers, distinct stratigraphic change to silt layers at 6 feet
TR-03	12	3	11	Potential buried A horizon at 9 feet
TR-04	12	3	10	Clayey silt, coarse sand at 8 feet
TR-05	12	3	5	Gravels with clayey silt, trace charcoal
TR-06	12	3	5	Clayey silt, trace charcoal
TR-07	12	3	12	Gravels with sand/silt, Approximate water table at 8 feet, wet sandy clay mottled with trace charcoal
TR-08	12	3	4	Gravels with sand/silt, clayey silt with sand
TR-09	12	3	4	Gravels with sand/silt, clayey silt with sand
TR-10	12	3	4	Clayey silt with gravels, gravels

4.6.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.6.2.1 Federal Regulations

National Historic Preservation Act of 1966, as amended

Effects of federal undertakings on historical and archaeological resources are considered through the National Historic Preservation Act (NHPA) of 1966, as amended (54 United States Code [U.S.C.] 306108), and its implementing regulations. Before an undertaking (e.g., federal funding or issuance of a federal permit) is implemented, Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties (i.e., properties listed in or eligible for listing in the National Register) and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing in the National Register. Under the NHPA, a property is considered significant if it meets the National Register listing criteria A through D, at 36 Code of Federal Regulations 60.4, as follows:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:
>
> a) Are associated with events that have made a significant contribution to the broad patterns of our history, or
>
> b) Are associated with the lives of persons significant in our past, or

c) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or

d) Have yielded, or may be likely to yield, information important in prehistory or history

For a resource to be eligible for the National Register, it must also retain enough integrity to be recognizable as a historical resource and to convey its significance. Resources that are less than 50 years old are generally not considered eligible for the National Register.

Federal review of the effects of undertakings on significant cultural resources is carried out under Section 106 of the NHPA and is often referred to as the Section 106 review. This process is the responsibility of the federal lead agency. The Section 106 review typically involves a four-step procedure, which is described in detail in the implementing regulations of the NHPA:

1. Define the Area of Potential Effects in which an undertaking could directly or indirectly affect historic properties.
2. Identify historic properties in consultation with the State Historic Preservation Officer (SHPO) and interested parties.
3. Assess the significance of effects of the undertaking on historic properties.
4. Consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation and proceed with the project according to the conditions of the agreement.

4.6.2.2 State Regulations

The State of California consults on implementation of the NHPA of 1966, as amended, and also oversees statewide comprehensive cultural resource surveys and preservation programs. The California Office of Historic Preservation, as an office of the California Department of Parks and Recreation, implements the policies of the NHPA statewide. The Office of Historic Preservation also maintains the California Historical Resources Inventory. The SHPO is an appointed official who implements historic preservation programs within the state's jurisdictions.

California Environmental Quality Act

The California Environmental Quality Act (CEQA), as codified in Public Resources Code (PRC) Section 21000 et seq., is the principal statute governing the environmental review of projects in the state. CEQA requires lead agencies to determine if a project would have a significant effect on historical resources, including archaeological resources. The State CEQA *Guidelines* define a historical resource as: (1) a resource in the California Register; (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); or (3) any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

CEQA requires lead agencies to determine if a project would have a significant effect on important archaeological resources, either historical resources or unique archaeological resources. If a lead agency determines that an archaeological site is a historical resource, the provisions of Public Resources Code Section 21084.1 would apply and State CEQA *Guidelines* Sections 15064.5(c) and 15126.4 and the limits in Public Resources Code Section 21083.2 would not apply. If a lead agency determines that an archaeological site is an historical resource, the provisions of PRC Section 21084.1 and State CEQA *Guidelines* Section 15064.5 would apply. If an archaeological site does not meet the State CEQA *Guidelines* criteria for a historical resource, then the site may meet the threshold of PRC Section 21083.2 regarding unique archaeological resources. A unique archaeological resource is "an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria.

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person" (PRC Section 21083.2 [g]).

The State CEQA *Guidelines* note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of the Project on that resource shall not be considered a significant effect on the environment (CEQA *Guidelines* Section 15064.5[c][4]).

Assembly Bill 52

In September 2014, the California Legislature passed Assembly Bill (AB) 52, which added provisions to the PRC regarding the evaluation of impacts on tribal cultural resources under CEQA, and consultation requirements with California Native American tribes. In particular, Assembly Bill 52 now requires lead agencies to analyze project impacts on tribal cultural resources separately from archaeological resources (PRC Section 21074; 21083.09). The Bill defines tribal cultural resources in a new section of the PRC (Section 21074). Assembly Bill 52 also requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (PRC Section 21080.3.1, 21080.3.2, 21082.3).

Specifically, PRC Section 21084.3 states:

a) Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource.

b) If the lead agency determines that a project may cause a substantial adverse change to a tribal cultural resource, and measures are not otherwise identified in the consultation process provided in Section 21080.3.2, the following are examples of mitigation measures that, if feasible, may be considered to avoid or minimize the significant adverse impacts:

   1) Avoidance and preservation of the resources in place, including, but not limited to, planning and construction to avoid the resources and protect the cultural and natural

context, or planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

2) Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

   A. Protecting the cultural character and integrity of the resource.

   B. Protecting the traditional use of the resource.

   C. Protecting the confidentiality of the resource.

3) Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

4) Protecting the resource.

In addition, the Office of Planning and Research updated Appendix G of the State CEQA *Guidelines* to provide sample questions regarding impacts on tribal cultural resources (PRC Section 21083.09).

California Register of Historical Resources

The California Register is "an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Section 5024.1[a]). The criteria for eligibility are based on National Register criteria (PRC Section 5024.1[b]). Certain resources are determined by the statute to be automatically included in the California Register, including California properties formally determined eligible for or listed in the National Register.

To be eligible for the California Register, an historical resource must be significant at the local, state, and/or federal level under one or more of the following criteria.

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

2. Is associated with the lives of persons important in our past.

3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

4. Has yielded, or may be likely to yield, information important in prehistory or history (PRC Section 5024.1[c]).

For a resource to be eligible for the California Register, it must also retain enough integrity to be recognizable as a historical resource and to convey its significance. A resource that does not retain sufficient integrity to meet the National Register criteria may still be eligible for listing in the California Register.

California Public Resources Code and Health and Safety Code

Several sections of the PRC protect cultural resources. Under PRC Section 5097.5, no person shall knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site (including fossilized footprints), inscriptions made by human agency, rock art, or any other archaeological, paleontological, or historical feature situated on public lands, except with the express permission of the public agency that has jurisdiction over the lands. Violation of this section is a misdemeanor. Section 5097.98 states that if Native American remains are identified within a project area, the lead agency must work with the appropriate Native Americans as identified by the Native American Heritage Commission (NAHC) and develop a plan for the treatment or disposition of, with appropriate dignity, the human remains and any items associated with Native American burials. These procedures are also addressed in Section 15064.5 of the State CEQA *Guidelines*. California Health and Safety Code Section 7050.5 prohibits disinterring, disturbing, or removing human remains from a location other than a dedicated cemetery. Section 30244 of the PRC requires reasonable mitigation for impacts on paleontological and archaeological resources that occur as a result of development on public lands.

Title 14, Sections 4307 and 4308 of the California Code of Regulations also prohibit any person from removing, inuring, defacing, or destroying any object of paleontological, archaeological, or historical interest or value.

4.6.2.3 Local Regulations

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan (Marin County, 2007b) are relevant to the Project:

> ***HAR-1.1*****:** Preserve Historical and Archaeological Resources. Identify archaeological and historical resource sites.
>
> ***HAR-1.2*****:** Document Historical Information. Provide documents, photographs, and other historical information whenever possible to be catalogued in the Anne T. Kent California Room in the Marin County Free Library.
>
> ***HAR-1.3*****:** Avoid Impacts to Historical and Archaeological Resources. Ensure that human activity avoids damaging cultural resources, where feasible.
>
> ***HAR-2.i*****:** Implement Senate Bill 18 Tribal Consultation Requirements. In accordance with the new State Law Senate Bill 18, requires tribal consultation prior to adopting or amending any general plan, community plan, or specific plan.
>
> Send proposal information to the NAHC and request contact information for tribes with traditional lands or places within the geographic areas affected by the proposed changes.
>
> a) Contact each tribe identified by NAHC in writing and provide them the opportunity to consult about the project.
>
> b) Organize a consultation with tribes that respond to the written notice within 90 days.

c) Refer proposals to adopt or amend the Countywide Plan, community plan, or specific plans to each tribe included on the NAHC list at least 45 days prior to the proposed action.

d) Provide notice of a public hearing at least 10 days in advance to tribes and any other persons who have requested that such notice be provided.

Marin County Development Code

Marin County has the following code to ensure that the construction of new development and the establishment of new and modified uses contribute to the maintenance of a stable and healthy environment, that new development is harmonious in character with existing and future development and that the use and enjoyment of neighboring properties are protected, as established in the Countywide Plan.

> ***22.20.040*****:** Archaeological and Historic Resources. In the event that archaeological or historic resources are discovered during any construction, construction activities shall cease, and the Agency shall be notified so that the extent and location of discovered materials may be recorded by a qualified archaeologist, and disposition of artifacts may occur in compliance with State and Federal law. The disturbance of an Indian midden may require the issuance of an Excavation Permit by the Department of Public Works, in compliance with Chapter 5.32 (Excavating Indian Middens) of the County Code.

Town of Fairfax

The Conservation Element of the General Plan for the Town of Fairfax (2010) contains the following policies relevant to the Project:

> ***Policy CON-8.2.1*****:** Protect, maintain, rehabilitate, and enhance historical and cultural resources within the Town of Fairfax Planning Area.

> ***Policy CON-8.2.3*****:** Ensure that development respects and complements the patterns, character, and scale of the Town's traditional communities and natural landscape.

> ***Program CON-8.2.3.2*****:** Ensure that impacts to locally significant historic and cultural resources are evaluated and mitigated.

Town of San Anselmo

The Town of San Anselmo's General Plan contains Conservation and Environmental Policy Guidelines and includes the flowing policy relevant to the Project:

> ***Policy B.5*****:** Unique geological, ecological, and historic sites shall be protected.

4.6.3 Impacts and Mitigation Measures

This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section. Mitigation measures are recommended, as necessary, to reduce significant impacts.

4.6.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist), and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:

a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5;

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5;

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;

d) Disturb any human remains, including those interred outside of formal cemeteries

e) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

   i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or,

   ii. Determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe;

   f) Have the potential to cause a physical change which would adversely affect unique ethnic cultural value or religious or sacred uses within the Project area or affects a landmark of local cultural/historical importance.

4.6.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in cultural resources or other cultural resource impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. Mitigation measures are identified, as necessary, to reduce significant impacts.

Architectural Resources

Potential impacts on architectural resources are assessed by identifying any activities (either during construction or operations) that could affect resources identified as historical resources for the purposes of CEQA. Once a resource has been identified as a CEQA historical resource, it then must be determined whether the impacts of the Project would "cause a substantial adverse change in the significance" of the resource (State CEQA *Guidelines* Section 15064.5[b]). A substantial adverse change in the significance of a historical resource means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historic resource would be materially impaired" (State CEQA *Guidelines* Section 15064.5[b][1]). A historical resource is materially impaired through the demolition or alteration of the resource's physical characteristics that convey its historical significance and that justify its inclusion in the California Register (State CEQA *Guidelines* Section 15064.5[b][2][A]).

Archaeological Resources

Archaeological resources can include historical resources according to State CEQA *Guidelines* Section 15064.5 as well as unique archaeological resources as defined in PRC Section 21083.2(g). The significance of most prehistoric and historical archaeological sites is usually assessed under National Register and California Register Criteria D/4. These criteria stress the importance of the information potential contained within the site, rather than its significance as a surviving example of a type or its association with an important person or event. Although it is less common, archaeological resources also may be assessed under California Register Criteria 1, 2, and/or 3. Archaeological resources also may be assessed under CEQA as unique archaeological resources, defined as archaeological artifacts, objects, or sites that contain information needed to answer important scientific research questions.

Impacts on unique archaeological resources or archaeological resources that qualify as historical resources are assessed pursuant to PRC Section 21083.2 which states that the lead agency shall determine whether the Project may have a significant effect on archaeological resources. As with architectural resources above, whether the impacts of the Project would "cause a substantial adverse change in the significance" of the resource must be determined (State CEQA *Guidelines* Section 15064.5[b]).

Human Remains

Human remains, including those buried outside of formal cemeteries, are protected under several state laws, including Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5. These laws are identified above in Section 4.6.2, Regulatory Framework. This analysis considers impacts on human remains including intentional disturbance, mutilation, or removal of interred human remains.

Tribal Cultural Resources

Tribal cultural resources are defined as a site feature, place, cultural landscape, sacred place or object, which is of cultural value to a tribe that is either on or eligible for the California Register or a local historic register, or the lead agency, at its discretion, chooses to treat the resource as a tribal cultural resource. Impacts on tribal cultural resources are assessed in consultation with the affiliated Native American tribe in accordance with PRC Section 21080.3. This analysis considers whether the Project would cause damaging effects to any tribal cultural resource, including archaeological resources and human remains.

4.6.3.3 Impacts and Mitigation Measures

Most impacts on cultural resources occur during the construction of a project and there is very little potential for operations to affect such resources; therefore, consideration of construction and operational impacts are combined in this analysis.

Impact 4.6-1: The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance. (*No Impact*)

The following discussion focuses on architectural and structural resources. Archaeological resources, including archaeological resources that are potentially historical resources according to State CEQA *Guidelines* Section 15064.5, are addressed under Impact 4.6-2.

Based on the results of the background research, survey, and evaluation provided above, there are no historical resources eligible for listing in the California Register in the Project area. ESA staff evaluated the four buildings in the Project area and recommended that none of them meet the California Register criteria and are not historical resources for the purposes of CEQA. Because there are no historical resources in the Project area, there would be no impact on historical resources and no mitigation is required.

Mitigation: None required.

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Impact 4.6-2: The Project would not cause a substantial adverse change in the significance of an archaeological resource. (*Less than Significant*)

This section discusses archaeological resources that are potentially historical resources according to State CEQA *Guidelines* Section 15064.5 as well as unique archaeological resources defined in Section 21083.2(g).

Based on the results of the background research, surface survey, and subsurface survey, there are no archaeological resources in the Project area. However, despite the effort to identify archaeological resources, the inadvertent discovery of unknown archaeological resources cannot be entirely discounted. Impacts on previously unknown archaeological resources during construction from ground-disturbing activities would be potentially significant. In the event that archaeological resources are uncovered during Project-related ground disturbing activities, compliance with Marin Development Code Section 22.20.040 (D) (outlined above in Section 4.6.2.3 Local Regulations) would reduce those impacts to a less-than-significant level and no mitigation is required.

Mitigation: None required.

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Impact 4.6-3: The Project would not disturb human remains, including those interred outside of dedicated cemeteries. (*Less than Significant*)

Prehistoric archaeological resources may contain human burials. Based on the background research, surface survey, and subsurface survey there is no indication that the Project area has been used for human burial purposes. However, the possibility of encountering human remains, including those interred outside of dedicated cemeteries, during Project-related ground disturbing activities such as excavation into native or undisturbed soils, cannot be entirely discounted. This impact would be considered significant. However, compliance with Marin Development Code Section 22.20.040 (D), Public Resources Code Section 5097.98, and Health and Safety Code Section 7050.5 (outlined above in Section 4.6.2.3 Local Regulations), this impact would be reduced to a level that would be less than significant and no mitigation is required.

Mitigation: None required.

Impact 4.6-4: The Project would not cause a substantial adverse change in the significance of a tribal cultural resource. (*Less than Significant)*

The Flood Control District sent letters to the Federated Indians of Graton Rancheria the Ione Band of Miwoks, the federally recognized tribes in Marin County, on April 10, 2017. Based on the background research, there are no tribal cultural resources in the Project area and therefore the Project would have no impact on tribal cultural resources and no mitigation measure would be necessary. If archaeological resources or human remains are documented during construction activities, impacts to tribal cultural resources could be potentially significant. Compliance with Marin Development Code Section 22.20.040 (D), Public Resources Code Section 5097.98, and Health and Safety Code Section 7050.5 (outlined above in Section 4.6.2.3 Local Regulations), as described above, would apply to archaeological resources and human remains that are considered tribal cultural resources and the impact would be less than significant.

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4.7 Geology, Seismicity, Soils, and Paleontological Resources

This section evaluates the potential for the San Anselmo Flood Risk Reduction Project (Project) to result in adverse impacts related to geologic, seismic, and soils hazards. The analysis is based on review of available geologic and geotechnical reports and maps of the Project area and vicinity, including site-specific investigations conducted for the Project, the relevant regulations, and a discussion of the methodology and thresholds used to determine whether the Project would result in significant impacts.

4.7.1 Environmental Setting

4.7.1.1 Topography and Drainage

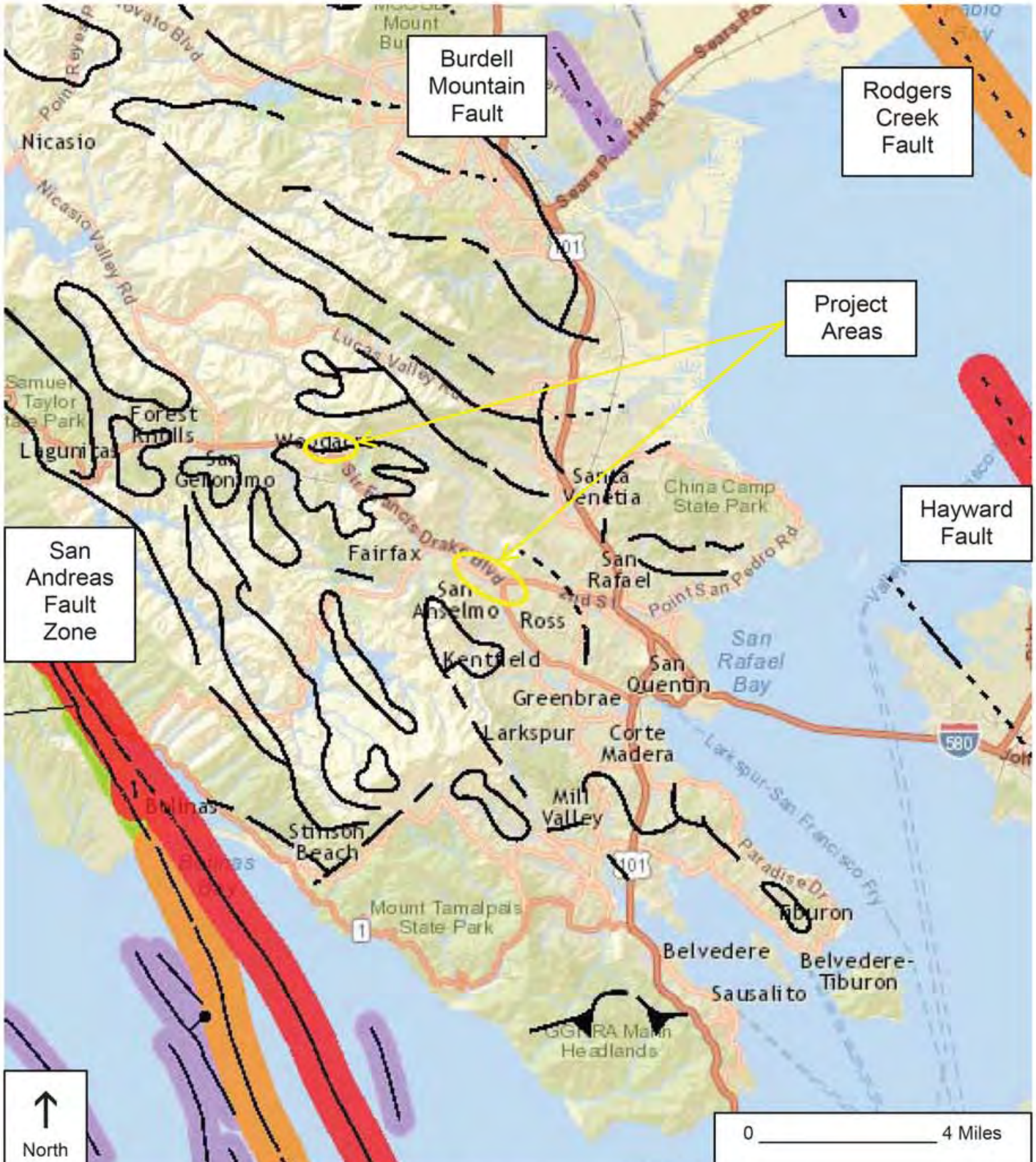
The proposed flood diversion and storage (FDS) basin at the former Sunnyside Nursery site (Nursery Basin) is located along the northern side of Fairfax Creek, as shown on Figure 3-9 (in Chapter 3, *Project Description*). The ground surface elevations within the basin site range from about 238 feet NAVD88[1] on the western edge to about 230 feet NAVD88 on the eastern side (CH2M, 2018). Fairfax Creek drains to the southeast, joins San Anselmo Creek downstream of this site, and then continues southeast through the Town of San Anselmo. The creek capacity improvements would occur within and over San Anselmo Creek in downtown San Anselmo, along San Anselmo Avenue between Bridge and Tunstead Avenues (Downtown San Anselmo site). The upper and lower elevations across the creek where the proposed improvements in Downtown San Anselmo would take place would range from about 50 to 32 feet NAVD88. San Anselmo Creek then continues flowing south and east to San Francisco Bay.

4.7.1.2 Regional and Local Geology

Regional Geology

The Project sites are within the geologically complex region of California referred to as the Coast Ranges Geomorphic Province (California Geological Survey [CGS], 2002; GEI, 2017c).[2] The Coast Ranges province lies between the Pacific Ocean and the Great Valley Geomorphic Province (Sacramento and San Joaquin Valleys) and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. This province is marked by northwest-trending elongated ranges and narrow valleys that roughly parallel the coast and the San Andreas Fault Zone. Much of the Coast Ranges province is composed of marine sedimentary deposits, metamorphic rocks, and volcanic rocks. The tectonics of the San Andreas Fault Zone and other major faults in the western part of California have played a major role in the geologic history of the area. Faults in the local region are shown on **Figure 4.7-1**. Many of the drainages in Marin County are strongly influenced by tectonic-related faults and folds that typically trend parallel to the coast, although some drainages run perpendicular to the coast.

1 North American Vertical Datum 1988, a common elevation datum that relates to sea level.
2 A geomorphic province is a regional area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces.



Timing of Fault Movement

- Historic (within last 200 years)
- Holocene (within last 11,000 years)
- Pre-Quaternary (older than 1.6 million years)
- Late Quaternary (11,000 to 700,000 years)
- Quaternary (11,000 to 1.6 million years)

SOURCE: CGS 2010

Figure 4.7-1
Regional Faults

Local Geology

The geologic units underlying the Project sites consist of Holocene[3] alluvium underlain by the Jurassic-Cretaceous[4] Franciscan Formation units as shown on **Figure 4.7-2** (Blake et al., 2000; GEI, 2017b and 2017c). Both Project sites are on Holocene Alluvium, which consists of loose to soft and friable[5] combinations of sand, gravel, silt, and clay. The alluvium extends as deep as 74 feet below the ground surface.

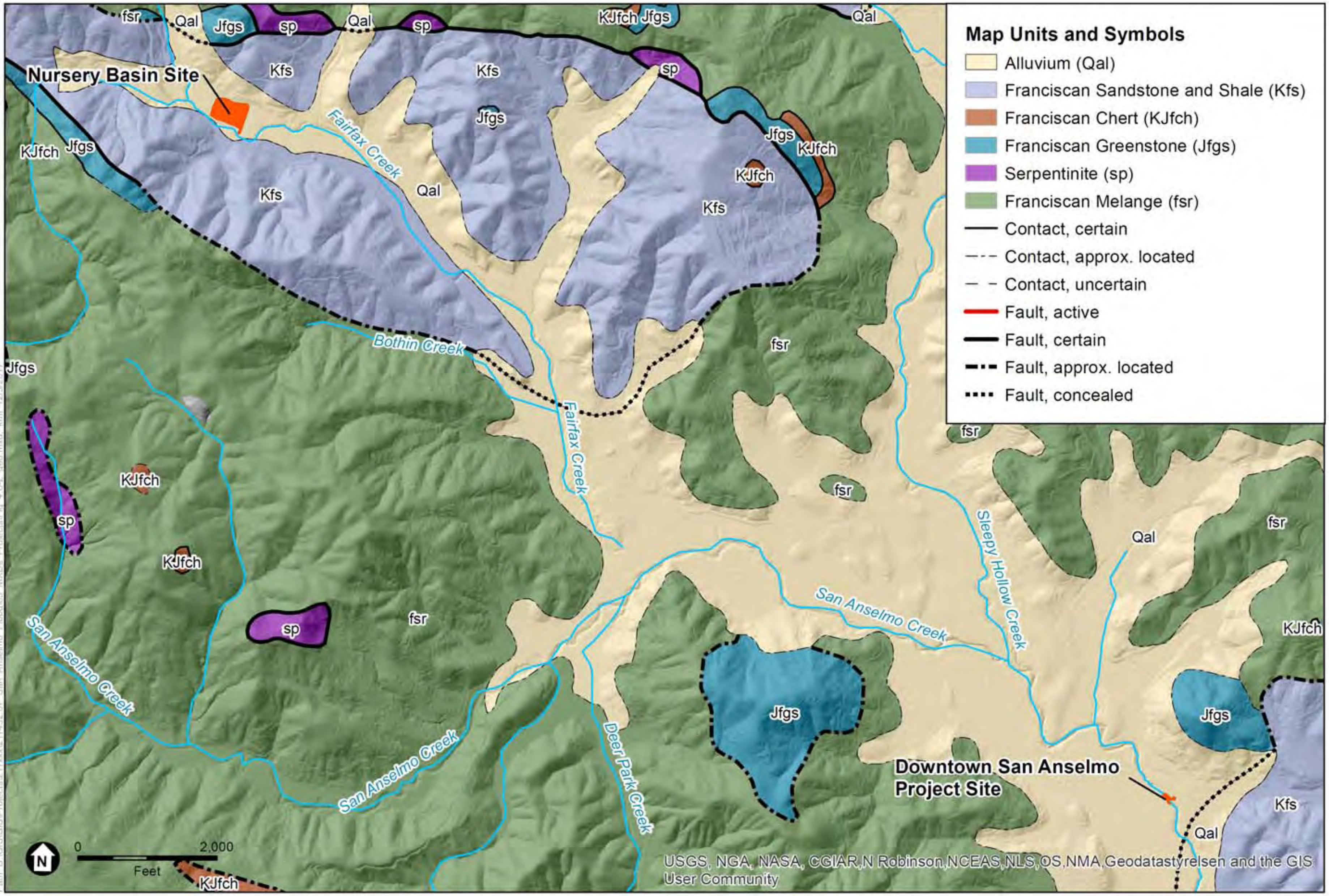
Both sites are close to and underlain by greywacke[6] and interbedded shale with minor conglomerate of the Franciscan Formation. The bedrock units are locally severely sheared or broken up due to tectonic activity. Rocks of this unit typically form resistant topography, and many ridges are composed of this unit. Older Franciscan Formation greenstone underlies the younger greywacke but crops out as small, discrete masses as long as about a mile. In southern Marin County and parts of San Francisco, the unit crops out as well-bedded pillow lavas and minor intrusive diabase[7]. Smaller masses are hard and relatively unfractured, but larger masses typically are closely fractured or sheared, are softened by weathering, and bear distinctive red soil. One such metamorphosed body forms a hill just north of the Downtown San Anselmo site.

Groundwater levels have been monitored at the Nursery Basin site since November 2016, when data-logging transducers were installed in monitoring wells to measure and record foundation pore pressures at one hour intervals (GEI, 2017c). Groundwater levels at the site had a relatively constant base elevation ranging between 224 to 226 feet NAVD88 for much of the 2016/2017 rainy season, but with significant spikes in groundwater measurements during precipitation events. Groundwater levels at the site began to steadily drop in mid-May 2017.

Local Soils

The local soils in the area of the Project sites consist mostly of the previously described alluvium or imported urban fill materials. The Natural Resources Conservation Service has not mapped soil units in the Project areas since much of the area is urban land with little in the way of undisturbed soils. Stetson Engineers conducted a geomorphic assessment of the Corte Madera Creek Watershed that included an evaluation of the creek channels within the watershed (Stetson, 2000). Stetson describes the regional landscape as "typified by small watersheds draining steep, thinly mantled, forested and grassland slopes. Steep upland channels collect and flow through relatively steep, narrow, clayey and gravelly valley flats resting in deep folds in the terrain, and finally into broad salt marsh estuaries. The landscape is underlain by a highly deformed accumulation of pre-Cretaceous Continental margin deposits (primarily marine sedimentary sandstones and shales) of the Franciscan Formation. Watersheds in this geologic province typically produce sediment yields among the highest in North America." This means that the regional deposits are subject to strong erosional forces and generate large amounts of sediment. Stetson continues concluding that "narrow, fixed gravel bars dominate the channel bed. Unnaturally high, coarse

3 Holocene time is from the present to 11,000 years ago.
4 Jurassic time is from 144 to 208 million years ago; Cretaceous time is from 65 to 144 million years ago.
5 Friable materials are easily crumbled.
6 Greywacke is sandstone with silt and clay in the matrix.
7 Diabase is an igneous rock equivalent to volcanic basalt but with more visible crystals in its matrix.



SOURCE: Blake et al., 2000

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 4.7-2
Geologic Map

ESA

grained gravel bars throughout the alluvial portion of Fairfax Creek and San Anselmo Creek appear to have been deposited during deep, confined flood flows. These elevated, coarse, well-drained gravel deposits enabled riparian trees to establish and mature within the channel. Reinforcement by mature tree root systems prevented significant erosion during recent, larger floods; the reinforced 'flood bars' act as resistant inset channel banks, further reducing active channel width and further preventing inset floodplain and pool-riffle development as well as increasing flooding potential."

In addition to published data, ESA conducted trenching to a maximum depth of 12 feet at the Nursery Basin site to explore for cultural resources, as discussed in the Archaeological Surface and Subsurface Survey subsection in Section 4.6, Cultural Resources. The geological materials encountered included gravel, sandy silt, silt, clayey silt, silty sandy gravel, sandy clay, and fill, consistent with the typical alluvium in the area. GEI drilled borings through the Nursery Basin site as part of their geotechnical investigation (GEI, 2017a; 2017b; 2017c). The subsurface conditions within the Nursery Basin site consist of interbedded layers of gravel, sand, silt, and clay sediments extending beyond the depths explored in the central portion of the site, but overlying bedrock near the flanks of the valley. Claystone bedrock and clay with relic rock structure was encountered in the site investigations near the flanks of the valley. Standard penetration tests attempted in the claystone found it to be very hard (50 blows over a 4-inch drive and 50 blows over a 2-inch drive). Although not encountered in the site investigations, it is likely that unconsolidated alluvial deposits are present in the Fairfax Creek channel. These deposits could range from clay to gravel, depending on the source material and depositional history.

4.7.1.3 Seismicity and Faults

This section characterizes the region's existing faults, describes historical earthquakes, estimates the likelihood of future earthquakes, and describes probable groundshaking effects.

Earthquake Terminology and Concepts

Earthquake Mechanisms and Fault Activity

Faults are planar features within the earth's crust that have formed to release strain caused by the dynamic movements of the earth's major tectonic plates. An earthquake on a fault is produced when these strains overcome the inherent strength of the earth's crust, and the rock ruptures. The rupture causes seismic waves that propagate through the earth's crust, producing the groundshaking effect known as an earthquake. The rupture also causes variable amounts of slip along the fault, which may or may cause displacement at the earth's surface.

Geologists commonly use the age of offset rocks as evidence of fault activity—the younger the displaced rocks, the more recently earthquakes have occurred. To evaluate the likelihood that a fault would produce an earthquake, geologists examine the magnitude and frequency of recorded earthquakes and evidence of past displacement along a fault. The California Geological Survey (CGS) defines an active fault as one that has had surface displacement within Holocene time (within the last 11,000 years; the U.S. Geological Survey (USGS) uses within the last 15,000 years). A Quaternary fault is defined as a fault that has shown evidence of surface displacement during the Quaternary period (the last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not mean that a fault lacking evidence of surface displacement is necessarily inactive. The term “sufficiently active” is also used to describe a fault if there is some evidence that Holocene displacement has occurred on one or more of its segments or branches (CGS, 2007).

For the purpose of delineating fault rupture zones, the CGS historically sought to zone faults defined as potentially active, which are faults that have shown evidence of surface displacement during the Quaternary period. In late 1975, the State Geologist made a policy decision to zone only those faults that had a relatively high potential for ground rupture, determining that a fault should be considered for zoning only if it was sufficiently active and “well defined.” Blind faults are faults that do not show surface evidence of past displacement, even if they occurred in the recent past. Faults that are confined to pre-Quaternary rocks are considered inactive and incapable of generating an earthquake.

Earthquake Magnitude

When an earthquake occurs along a fault, its size can be determined by measuring the energy released during the event. A network of seismographs records the amplitude and frequency of the seismic waves that an earthquake generates. The Richter magnitude (M_L) of an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole-number step, representing a tenfold increase in the amplitude of the recorded seismic waves and 32 times the amount of energy released. While Richter magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude (Mw) as the preferred way to express the size of an earthquake. The Mw scale is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. Although the formulae of the scales are different, they both contain a similar continuum of magnitude values, except that Mw can reliably measure larger earthquakes and do so from greater distances.

Peak Ground Acceleration

A common measure of ground motion at any particular site during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile acceleration, one “g” of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. For comparison purposes, the maximum peak acceleration value recorded during the Loma Prieta earthquake was in the vicinity of the epicenter, near Santa Cruz, at 0.64 g. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills)

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale assigns an intensity value based on the observed effects of groundshaking produced by an earthquake. Unlike measures of earthquake magnitude and PGA, the Modified Mercalli Intensity Scale is qualitative in nature in that it is based on actual observed effects rather than measured values. Similar to PGA, Modified Mercalli values for an earthquake at any one place can vary depending on the earthquake's magnitude, the distance from its epicenter, the focus of its energy, and the type of geologic material. The Modified Mercalli values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. Because the Modified Mercalli scale is a measure of groundshaking effects, intensity values can be correlated to a range of average PGA values, as shown in **Table 4.7-1**.

Faults and Probable Earthquake Activity

The Project area is in a seismically active region of California. The San Francisco Bay Area contains both active (Holocene age, or within the last 11,000 years) and potentially active (Quaternary age, or within the last 1.6 million years) faults and throughout the area, there is the potential for damage resulting from movement along any one of a number of the active faults. The Working Group on California Earthquake Probabilities, comprised of the USGS, the CGS, and the Southern California Earthquake Center, evaluates the probability of one or more earthquakes of Mw 6.7 or higher occurring in the state of California over the next 30 years. It is estimated that the San Francisco Bay Area region as a whole has a 72 percent chance of experiencing an earthquake of Mw 6.7 or higher over the next 30 years; among the various active faults in the region, the San Andreas and the Hayward-Rogers Creek Faults are the most likely to cause such an event in the vicinity of the Project (WGCEP, 2015a; PBS&J, 2010). The Nursery Basin site and the Downtown San Anselmo site are in between the San Andreas and Hayward-Rodgers Creek Fault Zones, discussed below. The locations of these faults and their geographic relationship to the Project area are shown on Figure 4.7-1.

San Andreas Fault Zone

The San Andreas Fault Zone is a major structural feature in the region and forms a boundary between the North American and Pacific tectonic plates (Bryant and Lundberg, 2002). The San Andreas Fault is a major northwest-trending, right-lateral, strike-slip fault that extends for about 600 miles from the Gulf of California in the south to Cape Mendocino in the north. The San Andreas is not a single fault trace but rather a system of active faults that diverges from the main fault south of the city of San Jose, California. The San Andreas Fault has produced numerous large earthquakes, including the 1906 San Francisco earthquake. That event had an estimated ML 8.3 or Mw 7.8 (WGCEP, 2008a; 2008b) and was associated with up to 21 feet of displacement and widespread ground failure (Lawson, 1908). The Nursery Basin site and the Downtown San Anselmo sites are about 6.7 and 7.8 miles, respectively, from the San Andreas Fault Zone. Relative to these locations, the San Andreas Fault Zone has a 5.46 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 Mw over the next 30 years (WGCEP, 2015b).

TABLE 4.7-1
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt	< 0.0017 g
II	Felt by people sitting or on upper floors of buildings	0.0017 to 0.014 g
III	Felt by almost all indoors. Hanging objects swing. Vibration like passing of light trucks. May not be recognized as an earthquake.	0.0017 to 0.014 g
IV	Vibration felt like passing of heavy trucks. Stopped cars rock. Hanging objects swing. Windows, dishes, doors rattle. Glasses clink. In the upper range of IV, wooden walls and frames creak.	0.014 to 0.039 g
V (Light)	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.	0.035 to 0.092 g
VI (Moderate)	Felt by all. People walk unsteadily. Many frightened. Windows crack. Dishes, glassware, knickknacks, and books fall off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster, adobe buildings, and some poorly built masonry buildings cracked. Trees and bushes shake visibly.	0.092 to 0.18 g
VII (Strong)	Difficult to stand or walk. Noticed by drivers of cars. Furniture broken. Damage to poorly built masonry buildings. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices, unbraced parapets and porches. Some cracks in better masonry buildings. Waves on ponds.	0.18 to 0.34 g
VIII (Very Strong)	Steering of cars affected. Extensive damage to unreinforced masonry buildings, including partial collapse. Fall of some masonry walls. Twisting, falling of chimneys and monuments. Wood-frame houses moved on foundations if not bolted; loose partition walls thrown out. Tree branches broken.	0.34 to 0.65 g
IX (Violent)	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood-frame structures rack, and, if not bolted, shifted off foundations. Underground pipes broken.	0.65 to 1.24 g
X (Very Violent)	Poorly built structures destroyed with their foundations. Even some well-built wooden structures and bridges heavily damaged and needing replacement. Water thrown on banks of canals, rivers, lakes, etc.	> 1.24 g
XI (Very Violent)	Few, if any, masonry structures remain standing. Bridges destroyed. Rails bent greatly. Underground pipelines completely out of service.	> 1.24 g
XII (Very Violent)	Damage nearly total. Practically all works of construction are damaged greatly or destroyed. Large rock masses displaced. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown into the air.	> 1.24 g

NOTES:
[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCES: Association of Bay Area Governments (ABAG), Adapted from Modified Mercalli Intensity Scale (MMI), 2016. Available online at http://resilience.abag.ca.gov/shaking/mmi/. Accessed on April 8, 2016; Wood, Nathan and Juliette Ratliff, *Population and Business Exposure to Twenty Scenario Earthquakes in the State of Washington,* US Geological Survey Open File Report 2011-1016, 2011.

Hayward-Rodgers Creek Fault Zone

The Hayward-Rodgers Creek Fault Zone is approximately 118 miles in length, located mostly along the base of the hills along the east side of San Francisco Bay and running parallel to the San Andreas Fault Zone. Similar to the San Andreas, it is composed of a system of active faults. The Hayward-Rogers Creek Fault has also produced numerous large earthquakes, including the 1868 earthquake with an estimated magnitude of about 7.0. The Nursery Basin site and the Downtown San Anselmo site are about 11.3 and 9.9 miles, respectively, from the Hayward-Rodgers Creek Fault Zone. The Hayward-Rodgers Creek Fault has a 13.3 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 Mw over the next 30 years (WGCEP, 2015b).

4.7.1.4 Geologic Hazards

Based on the geologic data reviewed during preparation of this environmental impact report, the potential geologic hazards at the Project sites include erosion, subsidence, and expansive soil. These geologic hazards are discussed below. Liquefaction, lateral spreading, and landslides, while possible without seismic shaking, are more commonly triggered by a seismic event, as discussed further below in seismic hazards.

Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of water and wind. Excessive soil erosion can eventually damage infrastructure such as pipelines, wellheads, building foundations, and roadways. In general, granular soils with relatively low cohesion and soils located on steep topography have a higher potential for erosion. As previously discussed, the geomorphic study indicates that the Project is located in drainages that are susceptible to high rates of erosion (Stetson, 2000).

Subsidence

Subsidence of the overlying land surface can occur when groundwater is extracted from the subsurface and is usually associated with severe, long-term withdrawal in excess of recharge that eventually leads to overdraft of the aquifer. As groundwater is pumped out, water is removed from the soil pore spaces leading to a reduction in soil strength. The subsurface conditions more conducive to subsidence include clay or organic-rich soils. Sand- and gravel-rich soils are less prone to subsidence because the larger grains comprise a skeleton less dependent on water pressure for support. The subsidence can result in damage to infrastructure such as buildings or pipelines, or can result in a decrease in the volume of available aquifer storage. Given the local geologic conditions that consist mostly of bedrock, groundwater is not a major water supply source and extensive aquifers are not present beneath the Project sites.

Expansive Soils

Expansive soils are subject to volume changes from changes in moisture content: swelling with increases in moisture; shrinkage with decreases in moisture. Clayey soils are more susceptible than sandy or gravelly soils, especially if the clays are more plastic. In general, the geologic materials at the Project sites are relatively thin and coarse-grained sediment underlain by bedrock, suggesting a low expansion potential. The National Resources Conservation Service classified soils adjacent to the former Sunnyside Nursery site as having a low potential for expansive soils (NRCS, 2016). The geotechnical investigation included soil classification of soil from borings; no plastic clays were observed (GEI, 2017c). The Downtown San Anselmo site is underlain by bedrock with little to no overlying soil, and thus no potential for expansive soils.

4.7.1.5 Seismic Hazards

Seismic hazards are generally classified into two categories: primary seismic hazards (surface fault rupture and groundshaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Although future earthquakes could occur anywhere along the length of an active fault, only regional strike slip earthquakes of magnitude 6.0 or greater are likely to be associated with significant surface fault rupture and offset (CDMG and USGS, 1996). It is also important to note that unmapped subsurface fault traces could experience unexpected and unpredictable earthquake activity and fault rupture. The highest potential for surface faulting is along existing fault traces that have had Holocene displacement. As previously discussed, the active San Andreas and Hayward-Rodgers Creek Fault Zones are at least 6.7 miles or more away from the Project sites, as shown on Figure 4.7-1.

Seismic Groundshaking

As discussed above, it is estimated that a major earthquake has a 72 percent chance of affecting the San Francisco Bay Area in the next 30 years and would produce strong groundshaking throughout the region. Earthquakes on active or potentially active faults, depending on magnitude and distance from the Project area, could produce a range of groundshaking intensities at the Project area, and cause strong groundshaking and damage. Disregarding local variations in ground conditions, the intensity of shaking at different locations within the area can generally be expected to decrease with distance from an earthquake source.

The primary tool that seismologists use to describe groundshaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources (including such worst-case scenarios as those described above for particular faults) and estimates their characteristic magnitudes to generate a probability of a certain level of groundshaking at a given location. The PSHA provides an estimated PGA value that has a 10 percent probability of being exceeded in 50 years (i.e., a 1 in 475 chance of occurring each year). Use of this probability level allows engineers to design structures to withstand ground motions that have at least a 10 percent chance of occurring in the next 50-year interval, thus making buildings safer than if they were designed only for the ground motions that are expected within the next 50 years.

The CGS' PHSA Ground Motion Interpolator estimates a PGA of 0.761g (CGS, 2008b). According to Table 4.7-1, this would correlate to a Modified Mercalli ground shaking intensity of level IX, violent shaking. The geotechnical investigation used state Division of Safety of Dams criteria and concluded the site-specific PGA would be 0.63g, which would still be a Modified Mercalli ground shaking intensity of level VIII, very strong shaking (GEI, 2017c).

Liquefaction and Lateral Spreading

Liquefaction is the rapid loss of shear strength experienced in saturated, predominantly granular soils below the groundwater level during strong earthquake groundshaking and occurs due to an increase in pore water pressure. Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake (VT, 2013). The occurrence of this phenomenon is dependent on many complex factors, including the intensity and duration of groundshaking, particle-size distribution, and density of the soil. The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on buried pipelines that can lead to leaks or pipe failure (VT, 2013).

The geotechnical investigation evaluated the relative liquefaction or lateral spreading hazard potential at the former Sunnyside Nursery site (GEI, 2017c). The investigation concluded that deeper soil that would remain after basin excavation would be susceptible to some liquefaction.

The susceptibility of the Downtown San Anselmo site to liquefaction is minimal due to lack of soils within the creek bed.

Earthquake Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials, particularly loose, uncompacted, and variable sandy sediments. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill. The geotechnical investigation for the former Sunnyside Nursery site concluded that the soil materials have a negligible potential for settlement (GEI, 2017b and 2017c).

The creek bed at the Downtown San Anselmo site is mostly bedrock with negligible soil and no potential for settlement. The creek banks along the sides of the creek bed have some soil but are likely already compacted due to the placement of structures along the banks.

Landslides and Ground Cracking

Earthquake motions can induce substantial stresses on slopes and can cause earthquake induced landslides or ground cracking if the slope fails. Earthquake induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. Landslides can also be non-seismically induced. Non-seismically induced landslide can be caused by the force of gravity on steep unstable slopes, by construction activities that disturb soil conditions and create unstable slopes, and by water leaks or breaks in pipelines or pumps. Landslides are ground failures that can occur in areas with steep slopes. The failures can occur quickly as mass failures or as slower incremental creep or flow failures.

The Nursery Basin site is in a relatively flat area with relatively thin soils that would not be highly susceptible to landslides. The geotechnical investigation assessed the site for landslide potential (GEI, 2017b). The mapping and site reconnaissance observed some evidence of slope creep on the hillslope bordering the northern side of the property, which is within areas underlain by Franciscan bedrock. The movement could be due to either debris flow or surface creep, but large-scale rotational block landslides were not apparent. Although small-scale headscarps were noted adjacent to the access road, no significant cracking was observed during reconnaissance of the site.

The Downtown San Anselmo site is in the incised San Anselmo Creek with steep sides to the creek channel in places. The Downtown San Anselmo site is in a highly developed area where much of the ground surface is covered with hardscape (concrete and asphalt). Although not in a location that would be highly susceptible to landslides in the larger mass wasting sense, the sides of the channel are steep enough to be susceptible to slumps and block failures.

4.7.1.6 Paleontological Resources

Paleontological resources are the fossilized remains or impressions of plants and animals, including vertebrates (animals with backbones; mammals, birds, fish, etc.), invertebrates (animals without backbones; starfish, clams, coral, etc.), and microscopic plants and animals (microfossils). They are nonrenewable, scientific resources that may be valuable in documenting the existence of extinct life forms and reconstructing the environments in which they lived. Fossils can be used to determine the relative ages of the depositional layers in which they occur and of the geologic events that created those deposits. The age, abundance, and distribution of fossils depend on the geologic formation in which they occur and the topography of the area in which they are exposed. The geologic environments within which the plants or animals became fossilized usually were quite different from the present environments in which the geologic formations now exist.

The Conformable Impact Mitigation Guidelines Committee of the Society of Vertebrate Paleontology published Standard Guidelines in response to a recognized need to establish procedures for the investigation, collection, preservation, and cataloguing of fossil bearing sites (SVP, 2010). The Standard Guidelines are widely accepted among paleontologists, followed by most investigators, and identify the two key phases of paleontological resource protection: (1) assessment and (2) mitigation. Assessment involves identifying the potential for a project site or area to contain significant nonrenewable paleontological resources that could be damaged or destroyed by project excavation or construction. Mitigation involves formulating and applying measures to reduce such adverse effects, including pre-project survey and salvage, monitoring and screen washing during excavation to salvage fossils, conservation and inventory, and final reports and specimen curation. The Society of Vertebrate Paleontology defines the level of potential as one of four sensitivity categories for sedimentary rocks: high, undetermined, low, and no potential as listed below.

1. **High Potential** – Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephras), and some low grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine grained fluvial sandstones, argillaceous and carbonate rich paleosols, cross bedded point bar sandstones, fine grained marine sandstones, etc.). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

2. **Undetermined Potential** – Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

3. **Low Potential** – Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections or, based on general scientific consensus, only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g., basalt flows or Recent (i.e., Holocene) colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

4. **No Potential** – This designation is assigned to geologic formations that are entirely plutonic (volcanic rocks formed beneath the earth's surface) in origin and therefore have no potential for producing fossil remains.

In the context of California Environmental Quality Act (CEQA), fossils of land dwelling and marine vertebrates, their environment, and associated geological, stratigraphical, taphonomical, and geographical data are considered important (i.e., significant) paleontological resources. Such fossils typically are found in river, lake, and bog deposits, although they may occur in nearly any type of sedimentary sequence.

As previously discussed, both Project sites are located in Holocene alluvium. Because it consists of recently deposited sediments, surficial exposures of alluvium are considered to have low potential for paleontological resources, and the paleontological potential increases with depth below the ground surface, because age generally increases with depth. A search of the University of California Museum of Paleontology collections database indicated one invertebrate fossil has been recovered from the Franciscan Formation (bedrock) in Corte Madera (PBS&J, 2010). However, this location is not within the Project area and Franciscan Formation bedrock is not known to contain vertebrate fossils. Based on a review of readily available published documents, PBS&J concluded that there are no other reported fossil occurrences in the study area covered in that document. Finally, based on aerial photography, the Nursery Basin site has been repeatedly plowed as a part of the historical nursery operations; therefore, fossils in the uppermost layers of the soil, in the unlikely event that any were ever present, would have been destroyed long ago.

4.7.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.7.2.1 Federal Regulations

Although there are a number of federal laws, statutes, and regulations that would generally apply to the Project, the federal government and its agencies have delegated the authority to implement and satisfy those requirements relevant to geology, seismicity, soils, and paleontological resources to the state of California and its agencies, as discussed below.

4.7.2.2 State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to protect structures for human occupancy from the hazard of surface faulting. In accordance with the Alquist-Priolo Earthquake Fault Zoning Act, the State Geologist has established regulatory zones—called earthquake fault zones—around the surface traces of active faults, and has published maps showing these zones. However, the Alquist-Priolo Earthquake Fault Zoning Act would not apply to the Project because the Project sites are not within an Alquist-Priolo Earthquake Fault Zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This Act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones (CGS, 2008a). The CGS is in the process of producing official maps based on USGS topographic quadrangles. To date, the CGS has not prepared delineations for the USGS quadrangles in which Project elements are proposed, and the sites are not within a designated seismic hazard zone. Therefore, the Project is not subject to the Seismic Hazards Mapping Act.

California Building Code

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The 2016 edition of the CBC is based on the 2015 International Building Code published by the International Code Council, which replaced the Uniform Building Code. The code is updated triennially, and the 2016 edition of the CBC was published by the California Building Standards Commission on July 1, 2016, and took effect starting January 1, 2017. The 2016 CBC contains Appendix J Grading, which would apply to the Project as summarized below.

Section J101.2 requires that work in flood hazard area requires the preparation of an engineering analysis prepared by a registered design professional that demonstrates the work will not result in any increase in the level of the base flood.

Section J104.3 requires the preparation of a geotechnical report prepared by a registered design professional that shall describe the nature and distribution of existing soils; conclusions and recommendations for grading procedures; soil design criteria for any structures or embankments required to accomplish the proposed grading; and slope stability studies, where necessary.

Section J110.1 requires the faces of cut and fill slopes shall be prepared and maintained to control erosion. The control shall be permitted to consist of effective planting.

The County of Marin and the Towns of Fairfax and San Anselmo have adopted the CBC Appendix J grading requirements, which would make the proposed action consistent with the CBC.

National Pollutant Discharge Elimination System Construction General Permit

Construction associated with the Project would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The Project would therefore be subject to the *National Pollutant Discharge Elimination System* (NPDES*) General Permit for*

Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to the following requirements:

1. Effluent standards
2. Good site management “housekeeping”
3. Non-stormwater management
4. Erosion and sediment controls
5. Run-on and runoff controls
6. Inspection, maintenance, and repair
7. Monitoring and reporting requirements

The Construction General Permit also requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific construction best management practices (BMPs) designed to prevent sediment and pollutants from contacting stormwater from moving offsite into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. As noted in Section 4.9 Hydrology and Water Quality, San Anselmo Creek and Fairfax Creek are not listed on the 303(d) list.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the Project area. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In the Project area, the Construction General Permit is implemented and enforced by the San Francisco Bay Regional Water Quality Control Board, which administers the stormwater permitting program. Dischargers are required to electronically submit a notice of intent and permit registration documents in order to obtain coverage under this Construction General Permit. Dischargers are responsible for notifying the Regional Water Quality Control Board of violations or incidents of non-compliance, as well as for submitting annual reports identifying deficiencies of the BMPs and how the deficiencies were corrected. The risk assessment and SWPPP must be prepared by a state Qualified SWPPP Developer and implementation of the SWPPP must be overseen by a state Qualified SWPPP Practitioner. A Legally Responsible Person, who is legally authorized to sign and certify permit registration documents, is responsible for obtaining coverage under the permit.

4.7.2.3 Local Regulations

Marin Countywide Plan

The Marin Countywide Plan would apply to the Nursery Basin site since the basin is in the County just northwest of the Town of Fairfax. The following goals and policies are relevant to geology, seismicity, and soils:

Water Resources

Goal WR-1: Healthy Watersheds. Achieve and maintain proper ecological functioning of watersheds, including sediment transport, groundwater recharge and filtration, biological processes, and natural flood mitigation, while ensuring high-quality water.

Policy WR-1.3: Improve Infiltration. Enhance water infiltration throughout watersheds to decrease accelerated runoff rates and enhance groundwater recharge. Whenever possible, maintain or increase a site’s predevelopment infiltration to reduce downstream erosion and flooding.

Implementing Program: WR-1.b Establish Development Standards for Infiltration. Establish qualitative standards to maximize groundwater infiltration and minimize surface water runoff based on criteria developed by the Bay Area Stormwater Management Agency Associates. Standards should regulate the amount of impervious surfaces; vary by project type, land use, building-site placement, soils, and area characteristics; and provide for water impoundments, protecting and planting vegetation, cisterns, and other measures, such as restricting wet weather grading to increase groundwater recharge and reduce sedimentation.

Implementing Program: WR-1.f Require Stream Restoration Projects. Require restoration of streams in conjunction with associated land use approvals to improve groundwater recharge and filtration and to ensure high-quality water. Restoration projects should follow the design principles of natural channel restoration utilizing geomorphic concepts.

Goal WR-2: Clean Water. Ensure that surface and groundwater supplies are sufficiently unpolluted to support local natural communities, the health of the human population, and the viability of agriculture and other commercial uses.

Policy WR-2.3: Avoid Erosion and Sedimentation. Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and water bodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.

Implementing Program: WR-2.b Integrate Bay Area Stormwater Management Agencies Association Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities. All projects should integrate stormwater pollution prevention design features for water quality protection to the extent feasible, such as those included in the Bay Area Stormwater Management Agencies Association Start-at-the-Source manual and the Tools Handbook

The above-listed goals, policies, and implementing programs are implemented in the Marin County Stormwater Pollution Prevention Program, discussed further below.

Environmental Hazards

Goal EH-2: Safety from Seismic and Geologic Hazards. Protect people and property from risks associated with seismic activity and geologic conditions.

Policy EH-2.1 Avoid Hazard Areas. Require development to avoid or minimize potential hazards from earthquakes and unstable ground conditions.

Implementing Program: EH-2.a Require Geotechnical Reports. Continue to require any applicant for land division, master plan, development approval, or new construction in a geologic hazard area to submit a geotechnical report prepared by a State-certified Engineering Geologist or a Registered Geotechnical Engineer that:

a) evaluates soil, slope, and other geologic hazard conditions;

b) commits to appropriate and comprehensive mitigation measures sufficient to reduce risks to acceptable levels, including post-construction site monitoring, if applicable;

c) addresses the impact of the project on adjacent lands, and potential impacts of off-site conditions; and

d) meets the requirements of other agency regulations with jurisdiction in the hazard area, such as BCDC requirements for the safety of fills consistent with the Bay Plan.

Implementing Program: EH-2.b Require Construction Observation and Certification. Require any work or construction undertaken to correct slope instability or mitigate other geologic hazard conditions to be supervised and certified by a geotechnical engineer and/or an engineering geologist.

Town of Fairfax Municipal Code

Section 15.04.010 Adoption of Construction Codes: The Town of Fairfax has adopted 2016 CBC, including Appendix J Grading, summarized above in the CBC.

Town of Fairfax General Plan

Though the Project would name take place within the limits of the Town of Fairfax, its general plan is referenced here for informational purposes.

Safety Element

Goal S-1: Minimize risks due to geologic hazards.

***Objective S1-1*:** Protect life and property from risks associated with seismic activity and geologic conditions.

Policy S-1.1.6: Town codes and ordinances will be enforced and updated as needed to reflect current scientific data and technical standards.

Program S-1.1.6.1: Rigorously enforce all relevant codes and construction standards.

Town of San Anselmo Municipal Code

San Anselmo Municipal Code Chapter 18, *Excavation, Grading and Erosion Control*, establishes controls on excavation, grading, and fill within the Town. The controls are established for reasons of safety, erosion control, sound soil engineering practice, aesthetics, environmental protection, and water quality protection. Pursuant to this code, it is unlawful for any person to make, cause, or permit to be made or caused, any excavation, fill, or grading in the Town, except in accordance with a permit issued as specified in this chapter. Chapter 18 includes requirements for detailed temporary and permanent erosion control plans, limits on work conducted during the rainy season, and slope and shoring requirements. The Planning Commission must approve applications for activities involving more than 100 cubic yards of material. Before approval may be given, the Planning Commission must make findings including that adjacent properties are adequately protected by project investigation and design from geologic hazards as a result of the work and that sufficient erosion control measures will be employed to offset any impact by the proposed excavation, grading, or fill.

The Town of San Anselmo Urban Runoff Pollution Prevention Ordinance includes permit requirements; discharge prohibitions; construction-phase best management practices; the required preparation and implementation of an Erosion and Sediment Control Plan that addresses erosion and sediment control and pollution prevention during the construction phase, as well as final stabilization control measures.

Section 9-1.101 – Adoption of Construction Codes: The Town of San Anselmo has adopted the 2016 CBC, including Appendix J Grading, summarized above in the CBC.

Town of San Anselmo General Plan Update through August 2016

A. Conservation Goals:

1. Minimize environmental harm and the disruption of natural features, particularly in hillside and unstable soil areas.

2. Protect creeks from pollution and against any unnecessary disturbance of the natural contours and vegetation of the banks.

3. Establish policies and practical guidelines for the prevention of erosion, the stabilization of soils, and the protection of the watershed necessary to minimize excessive water runoff.

B. Conservation and Environmental Policy Guidelines:

1. Air, water, and noise pollution shall be prevented or minimized.

3. Activities causing damage to hydrological and biological processes shall be discouraged.

4. Streams shall be maintained in or restored to their natural state. A flood channel maintaining the natural settings on San Anselmo Creek and Sleepy Hollow Creek shall be of adequate width and properly maintained to allow passage of flood waters and preservation of riparian vegetation and habitat. Removal of vegetation on the hillsides should be closely controlled in order to minimize erosion, siltation of watercourses, and runoff.

7. Construction shall be located and designed to avoid or minimize the hazards from earthquake, erosion, landslides, floods, fire, and accidents.

1. Regulation

   a. Health and Safety zoning including:

      1. Geologic risk zones (fault and landslide);

      2. Flooding risk zones (floodplain, stream and bank protection;

4.7.3 Impacts

This section describes the impact analysis relating to geology and soils and paleontological resources for the Project. It describes the methods and applicable thresholds used to determine the impacts of the Project.

4.7.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact relative to geology, seismicity, and soils if it would:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

   ii. Strong seismic ground shaking;

iii. Seismic-related ground failure, including liquefaction;

iv. Landslides.

b) Result in substantial soil erosion or the loss of topsoil;

c) Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;

d) Be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code, or be located on soils characterized by shrink/swell potential that might result in deformation of foundations or damage to structures, creating substantial risks to life or property;[8]

e) Cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features;

f) Be located in a Mineral Resource Zone identified by the CGS or within an area designated as important Farmland identified by the Soil Conservation Service (U.S. Department of Agriculture);

g) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;

h) Destroy or cause substantial adverse changes to a unique paleontological resource or site.

The following significance criteria are not discussed in this Geology, Seismicity, Soils, and Paleontological Resources section but are discussed in other impact discussion in this EIR:

> Item f, regarding project location in a Mineral Resource Zone or within an area designated as important Farmland is addressed in Section 4.4 Energy, Mineral, Forest and Agricultural Resources.

It was determined in the NOP/Initial Study (see Appendix A) that implementation of the Project would have no impact with regard to Item g, the use of septic tanks or alternative water disposal systems.

4.7.3.2 Approach to Analysis

General

The following analysis discusses the potential significant impacts of the Project related to changes in geology, seismicity, and soils based on the potential for the Project to change geologic and soil conditions or expose facilities or people to unstable geologic conditions during Project activities, using existing site conditions as a baseline for comparison. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. The potential for damage to Project elements or increased risk of injury due to geologic hazards is

[8] The Appendix G significance criteria cites Table 18-1-B from the now defunct Uniform Building Code. The CBC, based on the International Building Code and the now defunct Uniform Building Code, no longer includes a Table 18-1-B. Instead, Section 1803.5.3 of the CBC describes the criteria for analyzing expansive soils.

analyzed using available data from site-specific investigations including the geotechnical reports prepared for the Project site (PBS&J, 2010; Stetson, 2000 and 2016; GEI, 2017a and 2017b) and existing publications and maps completed by federal, state local and agencies, such as the Working Group on California Earthquake Probabilities and National Resources Conservation Service. In addition, the severity and significance of geology and soils impacts are analyzed in the context of existing geologic and seismic hazard regulations and policies.

Paleontological Resources

In addition to the laws, regulations, and policies described in the regulatory framework, the standard practice in analyzing paleontological resources includes using guidance from the Society of Vertebrate Paleontologists. Although not a set of laws or regulations in the legal sense, these guidelines have become the standard in the industry. As discussed above in Section 4.7.1 under *Paleontological Resources*, no paleontological resources were observed during the trenching of the former Sunnyside Nursery site (GEI, 2017b and 2017c).

California Building Industry Association v. Bay Area Air Quality Management District (2015) 62 Cal. 4th 369

CEQA requires analysis of a project's effects on the environment; consideration of the potential effects of a site's environment on a project are outside the scope of required CEQA review (*California Building Industry Association v. Bay Area Air Quality Management District (2015) 62 Cal. 4th 369*). As stated in Ballona Wetlands Land Trust v. City of Los Angeles (2011) 201 Cal.App.4th 455, 473: “[T]he purpose of an [environmental impact report] is to identify the significant effects of a project on the environment, not the significant effects of the environment on the project.” Many of the impacts discussed in this section relate to increased exposure of people or structures to risks associated with seismic occurrences and location of people or structures on unstable geologic units are effects on users of the project and structures in the project of preexisting environmental hazards, and therefore “do not relate to environmental impacts under CEQA and cannot support an argument that the effects of the environment on the project must be analyzed in an EIR.” (Id. at p. 474.) Nonetheless, an analysis of these impacts is provided for informational purposes.

4.7.3.3 Impact Evaluation

Impact 4.7-1: The Project would not expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides. (*Less than Significant*)

The Project sites are not within an Alquist-Priolo Earthquake Fault Zone (i.e., on a state-recognized active fault trace). Therefore, although fault rupture could occur on unknown faults, fault rupture is not expected on these two sites and the impact is considered to be less than significant.

There are several active faults in the region, as shown on Figure 4.7-1. As discussed above in Seismicity and Faults, the region will likely experience a large regional earthquake and high-intensity groundshaking within the operational life of the Project. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, the duration of shaking, and the nature of the geologic materials on which the Project elements would be constructed. The primary and secondary effects of groundshaking could damage structural foundations and place people at risk of injury or death. The impacts from seismic shaking and seismically induced ground failures (e.g., liquefaction, lateral spreading, and/or landslides) are analyzed below.

Construction

The likelihood of a seismic event occurring during construction would be relatively low with minimal risk of injury or property damage because construction would occur over a relatively short period of time and workers would not be on site for extended time periods. Impacts related to seismic shaking and seismically induced ground failures during construction would be less than significant.

Operation

As described in Chapter 3, *Project Description*, the Nursery Basin would be used during wet weather to divert and temporarily detain flood flows and control the volume of flow through the creek. Consequently, the basin would only store water after large rain events, and be emptied shortly afterward, thus reducing the potential for a seismic event to occur at the same time the basin is storing water. The basin would be excavated below existing ground and would have a maximum engineered levee height of 6 to 8 feet on the eastern side.

The basin would be constructed in accordance with state and federal dam and levee design standards. Although the detention basin does not qualify as a dam under Division of Safety of Dams (DSOD) criteria[9] and the detention basin is not being constructed under the US Army Corps of Engineers (USACE) jurisdiction, the District is designing the Basin using USACE, DSOD, FEMA, and United States Society on Dams (USSD) guidance and design documents. The design requirements include fill composition, compaction procedures, and slope limitation requirements for the levees that would reduce the risk of damage or failure to seismic shaking and seismically induced ground failure, and can be found in the following documents:

Division of Safety of Dams

1. Urban Levee Design Criteria (DSOD, May 2012)
2. Guidelines for Use of the Consequence-Hazard Matrix and Selection of Ground Motion Parameters (DSOD], October 2002)

U.S. Army Corps of Engineers

1. Design and Construction of Levees EM 1110-2-1913 (USACE, April 30, 2000)

[9] A structure qualifies as a dam under DSOD criteria if it is 25 feet or higher and impounds 15 or more acre feet of water, or 6 feet or higher and impounds 50 or more acre feet of water.

2. Slope Stability EM 1110-2-1902 (USACE, October 31, 2003)
3. Earthquake Design and Evaluation for Civil Works Projects ER 1110-2-1806 (USACE, May 31, 2016)
4. Safety of Dams - Policy and Procedures ER 1110-2-1156 (USACE, March 31, 2014)
5. Selection of Design Earthquakes and Associated Ground Motions EM 1110-2-6000 (USACE, May 5, 2016; in process of being updated)
6. Seismic Analysis of Embankment Dams EM 1110-2-6001 (The EM is reportedly in progress and is not currently available)
7. Settlement Analysis EM-1110-1-1904 (USACE, September 30, 1990)
8. Design Guidance for Levee Underseepage ETL 1110-2-569 (USACE, May 1, 2005)

United States Society on Dams

1. Strength of Materials for Embankment Dams (USSD, February, 2007)

Federal Emergency Management Agency

1. Title 44 Code of Federal Regulations, Section 65.10 (44 CFR 65.10), Mapping of Areas Protected by Levee Systems

The geotechnical investigation for the Project provided specific recommendations to increase stability and reduce risks, including compaction requirements for fill and the removal of unstable soils, especially the removal of liquefaction-susceptible soils. Implementation of these recommendations consistent with state and federal dam and levee design guidance and existing regulatory requirements would ensure the impact relative to seismic events would be less than significant.

At the Downtown San Anselmo site, a building that straddles the creek would be removed, and improvements would be made within the creek channel. The removal of the commercial building would reduce the exposure of both workers and visitors to injury (i.e., people) or damage to the building caused by seismic shaking and seismically induced ground failures. The regrading and other improvements to the creek channel would have the overall effect of increasing stability by limiting erosion which in turn would reduce susceptibility of the creek banks to failure caused by seismic shaking and seismically induced ground failures. Therefore, the removal of the building and the creek channel improvements would be a beneficial impact related to seismic hazards.

Mitigation: None required.

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Impact 4.7-2: The Project would not result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill. (*Less than significant*)

Project construction would involve localized ground disturbance activities (e.g., grading, excavation, fill compaction, and reworking the creek channel) during construction and localized changes in flow conditions (e.g., Nursery Basin, basin outflow pipe) during operation. These activities could result in substantial soil erosion or the loss of topsoil. The erosion and scour effects of altered drainage patterns at the Nursery Basin, in Fairfax Creek, in San Anselmo Creek and in downstream channels are evaluated in Section 4.9, Hydrology and Water Quality, and therefore are not included in this discussion.

Construction

Because the overall footprint of construction activities would exceed one acre, the Project would be required to comply with the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ) (Construction General Permit), and the Marin County and Town of San Anselmo stormwater and erosion control regulations, all of which are described above in the Regulatory Framework. These state and local requirements were developed to ensure that stormwater is managed and controlled on construction sites such that erosion is minimized. The Construction General Permit, along with the similar County and Town regulations, requires the preparation and implementation of a SWPPP, and in the case of the Town of San Anselmo, an Erosion and Sediment Control Plan, that would include the applications of BMPs to control stormwater run-on and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, use of infiltration swales, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. With compliance with the regulations discussed above, impacts associated with soil erosion and loss of topsoil during construction would be less than significant for all Project elements.

Operation

As described in Chapter 3, *Project Description*, the bottom of the Nursery Basin would be vegetated, which would reduce erosion and the loss of topsoil. The creek channels at both sites have soil along the banks but little in the channel bottom. However, the improvements to flow within the channel would reduce the frequency of flooding the surrounding areas, which would reduce the loss of topsoil in adjacent areas during peak storm events. Therefore, the impacts relative to erosion and loss of topsoil would be less than significant.

Mitigation: None required.

Impact 4.7-3: The Project would not cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability. (*Less than Significant*)

The erosion and scour effects of altered drainage patterns at the Nursery Basin, in Fairfax Creek, in San Anselmo Creek and in downstream channels are evaluated in Section 4.9, Hydrology and Water Quality, and are not included in this discussion.

Construction

Subsidence is commonly associated with severe, long-term withdrawal of groundwater in excess of recharge that eventually leads to overdraft of the aquifer or of petroleum oil from production zones without reinjection of production water to balance the subsurface pressures. The Project does not include groundwater or petroleum oil withdrawal and thus, there would be no subsidence-related impacts. Liquefaction and lateral spreading are more commonly driven by seismic events, previously analyzed above in Impact 4.7-1 as less than significant. The geotechnical investigation did not identify significant potential for other unstable geologic unit or soils slope stability issues, such as landslides, settling, or lateral spreading to affect the Nursery Basin site or Downtown San Anselmo site. Compliance with existing regulations and construction best management practices would further limit slope instability during construction of improvements in and along creek channels.

Operation

As discussed above, the geotechnical investigation did not identify significant potential for landslides, lateral spreading, or other slope stability issues to affect the Nursery Basin. The Project would replace the existing foundation at the Downtown San Anselmo site with bioengineered slope materials designed to stabilize the creek banks in that area. As noted above, the effects of the project on creek bank stability and erosion in other locations is discussed in Section 4.9, Hydrology and Water Quality. Therefore, Project operation would not cause substantial adverse effects related to soil stability and the impacts would be less than significant.

Mitigation: None required.

Impact 4.7-4: The Project would not cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures. (*Less than Significant*)

Expansive soils would only have the potential to damage structures after construction has been completed; for this reason, this discussion only evaluates potential effects that would occur during operation of the Project.

As discussed in the Setting, the area of creek channel improvements does not have expansive soils. At the former Sunnyside Nursery site, the soil borings drilled for the geotechnical investigation did not encounter clays susceptible to expansion. Therefore, soils next to and under the former Sunnyside Nursery site have a low potential for expansive soils. In addition, the construction of the basin would use engineered ill not susceptible to expansion. With compliance with the previously described regulatory requirements and geotechnical practices and the removal of soil beneath the basin site, impacts relative to expansive soils would be less than significant.

Mitigation: None required.

Impact 4.7-5: The Project would not cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features. (*Less than Significant*)

Construction and Operation

The Project's largest topographic surface changes would be at the Nursery Basin with excavation to about 6 feet deep and construction of the 6- to 8-foot high levee on the southeast side. These changes would be limited to the basin site and designed to not adversely affect the surrounding area. The side-weir would be constructed of earth fill, heavy geotextile fabric, and rock slope protection. The interior basin slope would be covered by erosion control blankets and native grass to prevent erosion. The basin bottom and cut slopes would be designed to minimize seepage through the levee and would be planted/hydro-seeded to establish a native grassland. Oak-Bay Woodland vegetation planted along the outer toe of the levee on the east side of the basin and at other selected locations would reduce erosion. At the Downtown San Anselmo site, there would be some regrading of the creek channel to make it more naturalistic and increase flow capacity, but the top of bank and bottom of the channel would not be substantially changed. The changes have been designed to increase flow capacity and reduce erosive forces. Therefore, the impact would be less than significant.

Mitigation: None required.

Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (*No Impact*)

Construction and Operation

As discussed in the Environmental Setting above, paleontological resources have not been found and are not anticipated in sediments and rocks at either of the Project sites. The geologic materials consisting of alluvium and Franciscan bedrock are widespread throughout the Coast Ranges and are not considered to include unique geologic features. The former Sunnyside Nursery site has been repeatedly plowed as a part of the historical nursery operations; therefore, fossils in the uppermost layers of the soil, in the unlikely event that any were ever present, would have been destroyed long ago. The Downtown San Anselmo site is within the creek bed composed of alluvium derived from Franciscan Formation bedrock with no expected paleontological resources. Therefore, the Project would have no impact relative to paleontological resources or unique geologic features.

Mitigation: None required.

4.7.4 References – Geology, Seismicity, Soils, and Paleontological Resources

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4.8 Hazards and Hazardous Materials

This section evaluates the potential for the San Anselmo Flood Risk Reduction Project (Project) to result in adverse impacts related to hazards and hazardous materials. The analysis is based on review of available reports and maps of the Project area and vicinity, including site-specific investigations conducted for the Project, the relevant regulations, and a discussion of the methodology and thresholds used to determine whether the Project would result in significant impacts. Note that flooding hazards are analyzed in Chapter 4, Section 4.9, Hydrology and Water Quality, and air quality is analyzed in Chapter 4, Section 4.3, Air Quality and Greenhouse Gas Emissions.

4.8.1 Environmental Setting

The study area for evaluation of hazards and hazardous materials impacts includes the flood diversion and storage basin at the former Sunnyside Nursery site and the Downtown San Anselmo site, along with nearby properties with the potential to affect the Project. In addition, the larger Project vicinity up to 0.25 mile from Project sites is considered relative to proximity to schools and up to two miles relative to proximity to airports.

4.8.1.1 Hazardous Materials at the Project Sites

Nursery Basin (3000 Sir Francis Drake Boulevard)

The former Sunnyside Nursery site was initially used as a dairy ranch prior to 1940 and as a plant nursery from about 1940 through 2014 (refer to Figure 3-9 for location) (ESA, 2017b; Marin IJ, 2015). Plants were grown both in the ground and in various containers. The use as a nursery is assumed to have included fertilizers, pesticides, and herbicides. Some low detections of volatile and semi-volatile organic compounds, organochlorine pesticide constituents, and metals were found at the site, although none exceeded Regional Water Quality Control Board (RWQCB) environmental screening levels as shown in **Table 4.8-1** (GEI Consultants, 2017) (see Regulatory Setting below for discussion of environmental screening levels).

The site has two buildings: a residence and an art studio. Both buildings are near the northwest corner of the property, an area surrounded by mature trees. The wooden residence was built around 1971; the art studio is a Quonset hut that dates to at least 1952 (ESA, 2017b). Both structures pre-date the banning of the use of asbestos-containing materials (ACM) and lead-based paint (LBP) in the 1970s. In addition, older fluorescent light ballasts, if present, may contain mercury. The structures have not been investigated for the presence of hazardous building materials and it is unknown if any are present.

As discussed in Section 4.6, Geology, Seismicity, Soils, and Paleontological Resources, the geologic units that underlie the Project consist of alluvium underlain by the Franciscan Formation. The alluvium is largely derived from erosion of the Franciscan Formation. The Franciscan Formation includes serpentinite and other ultramafic rocks that are known to contain relatively higher concentrations of certain metals, including arsenic, chromium, and nickel

(Duverge, 2011). Arsenic concentrations in Bay Area soils typically exceed risk-based screening levels by one or more orders of magnitude (RWQCB, 2016). These metals are common to the region and typical of background values (GEI, 2017).

TABLE 4.8-1
SUMMARY OF ANALYTICAL SOIL TESTING RESULTS, FORMER SUNNYSIDE NURSERY SITE

Analyte	San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels[a]		Test Results[c]
	Direct Exposure Human Health Risk Level - Res: Shallow Soil Exposure	Tier 1 ESL[b]	
Volatile Organic Compounds (µg/kg)			
Toluene	970,000	2,900	0.9
Semivolatile Organic Compounds (µg/kg)			
2-Methylnaphthalene	240,000	250	12
Phenanthrene	--	11,000	28
bis(2-Ethylhexyl)phthalate	39,000	39,000	68
Organochlorine Pesticides (µg/kg)			
Heptachlor epoxide	67	0.42	7.3
4,4'-DDE	1,900	1,900	58
4,4'-DDD	2,700	2,700	6
4,4'-DDT	1,900	1,900	110
alpha-Chlordane	480[d]	480[d]	33
gamma-Chlordane			33
Metals (mg/kg)			
Antimony	31	31	0.23
Arsenic[e]	0.07	0.07	8.1
Barium	15,000	3,000	440
Beryllium	150	42	0.59
Cadmium	39	39	0.130
Chromium[f]	0.3	0.3	110
Cobalt	23	23	22
Copper	3,100	3,100	39
Lead	80	80	15
Mercury	13	13	0.66
Molybdenum	390	390	0.79
Nickel[g]	820	86	140
Selenium	390	390	0.20
Silver	390	390	0.063
Thallium	1	1	0.070
Vanadium	390	390	59
Zinc	23,000	23,000	85
Total Organic Carbon (%)			
Total Organic Carbon	--	--	1.00

TABLE 4.8-1 (CONTINUED)
SUMMARY OF ANALYTICAL SOIL TESTING RESULTS, FORMER SUNNYSIDE NURSERY SITE

NOTES:
[a] Environmental Screening Levels, San Francisco Bay Regional Water Quality Contol Board, February 2016 (Rev. 3)
[b] Tier 1 ESLs are used for protecting sites with unrestricted land and water use, shallow soil contamination, shallow groundwater, and permeable soil per *ESL Users Guide, SFRWQCB, February 22, 2016*
[c] Test results list the highest concentration of given analyte from the sample locations
[d] sum Chlordane concentration
[e] Arsenic concentrations in Bay Area soils typically exceed risk-based screening levels by one or more orders of magnitude. In many situations, this is due to naturally-occurring background concentrations; regional studies have identified naturally-occurring background arsenic concentrations of 11 mg/kg and 15.3 mg/kg.
[f] ESL for Chromium VI. Sampling evaluated total chromium. The detected total chromium at the site is expected to mostly consist of Chromium III, for which the Tier 1 ESL is 120,000 mg/kg. Similar to arsenic, chromium can be present in regional soils exceeding the ESLs; regional studies have identified ambient background chromium concentrations of 112 mg/kg.
[g] Similar to arsenic, nickel can be present in regional soils at background levels exceeding the ESLs; regional studies have identified ambient background nickel concentrations of 112 mg/kg.

SOURCE: Appendix C – Hazards and Hazardous Materials Supporting Documentation

634-636 San Anselmo Avenue

The Downtown San Anselmo site, shown on Figure 3-11, includes the one-story commercial building at 634-636 San Anselmo Avenue that straddles San Anselmo Creek and would be removed. The building was constructed in 1938 (ESA, 2017a) and therefore pre-dates the banned use of ACMs and LBP in the 1970s. However, the structure was investigated for the presence of hazardous building materials and was found to contain LBP and other miscellaneous hazardous building materials (such as light ballasts and exit signs) but no ACMs (Ninyo & Moore, 2017).

The history of the building is summarized as follows. In 1938, the Richfield Oil Company constructed an oil service station on this location (ESA, 2017a). The 1950 Sanborn map illustrates that the service station had expanded to provide gas and oil as well as an auto repair shop, and the building is shown as a series of five connected one-story spaces that include a covered area for pumping gas (Sanborn, 1950). In 1972, unspecified alterations were undertaken to renovate the old service station and auto repair shop into a real estate and crafts office (ESA, 2017a).

The previous businesses listed at this address are as follows:

1. C.W. Caletti Service Station (1938)
2. Henrietta Style Shop (1940)
3. Rio Grande Service Station (1941)
4. Wollman Tire Co. and Packard Taxi (1945)
5. Larkspur Pet Shop a.k.a. Griff’s Rod & Dog Shop (1951)
6. Lee’s Tune-Up Service and Chevron Service Station (1953-1961)
7. Prishman Auto Repair (1967-1972)
8. Ted Smith Realtors and coffee shop (1972-1977 or possibly later)

Two 1,000-gallon gasoline and one 750-gallon waste oil underground storage tanks (USTs) were removed from the site in 2000 along with their associated pipelines (Lafferty, 2000). Observations at the time of the removal, indicated that the USTs had not leaked and no stained soil was present beneath the USTs. Soil samples were collected from beneath the USTs and analyzed for fuel and waste oil compounds. No gasoline constituents were detected. Trace concentrations of degraded diesel and waste oil were detected in one sample but all at low concentrations below action levels. Based on the analytical testing results, the Marin County Department of Public Works issued a no further action letter in 2000 (Marin County DPW, 2000).

The current tenants of the property include the Ranch Salon, San Anselmo Optometry, Coldwell Banker, and the L'Appart Resto (restaurant).

4.8.1.2 Hazardous Materials at Nearby Sites

Near Nursery Basin

According to a review of the Geotracker and EnviroStor databases,[1] there are no listed hazardous materials sites at or upgradient (upstream) within at least 4.5 miles of the Nursery Basin site (SWRCB, 2017).

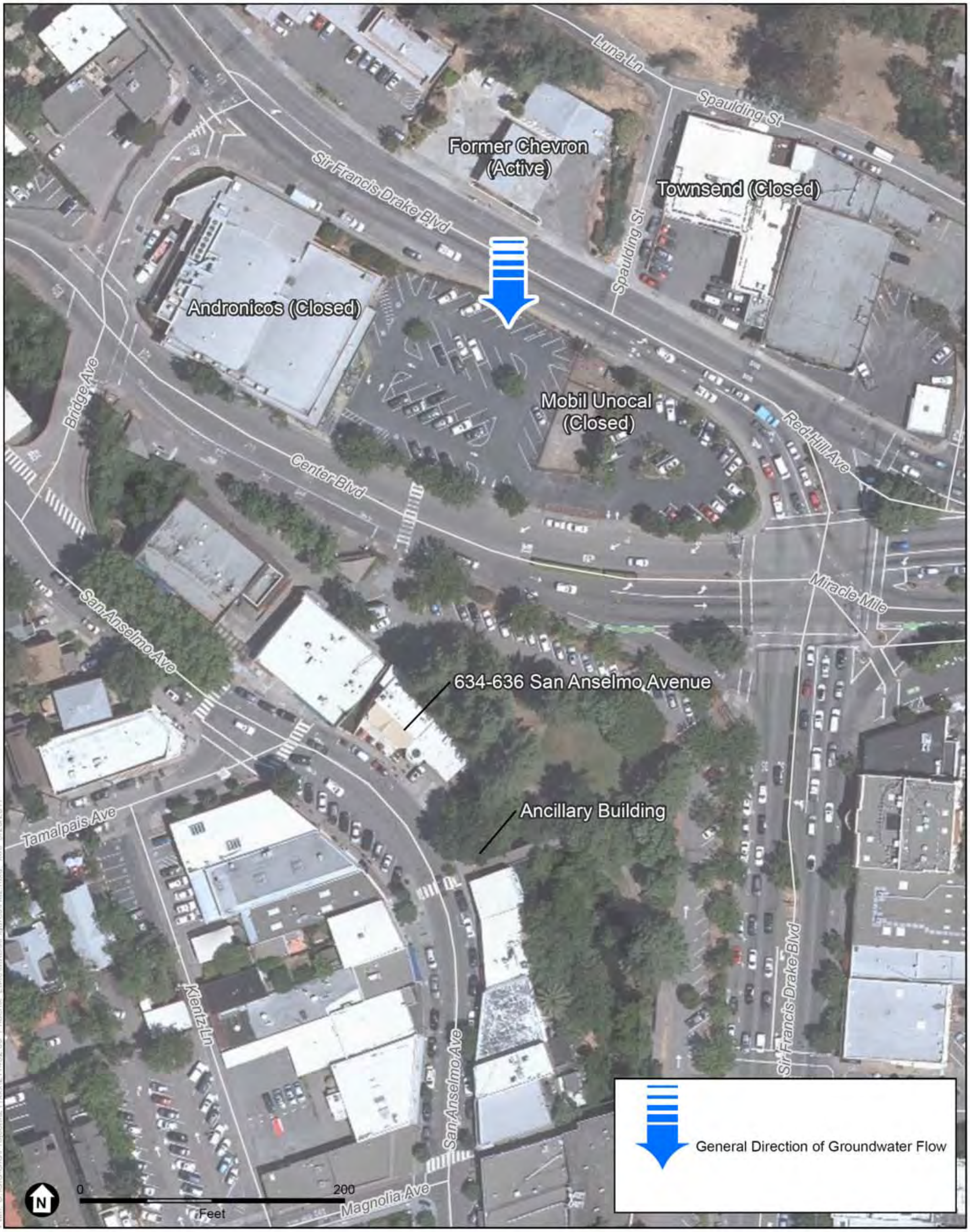
Near 634-636 San Anselmo Avenue

The former Chevron service station, which was located at 700/750 Sir Francis Drake Boulevard, approximately 400 feet north of the commercial building as shown on **Figure 4.8-1**, is an active UST cleanup site (Pangea, 2015). Soil and groundwater have been contaminated with gasoline, diesel, motor oil, and the fuel additive methyl tertiary butyl ether (MTBE). The fuel and waste oil USTs were removed in December 1995 and January 1996, along with 1,700 cubic yards of contaminated soil and 75,000 gallons of contaminated groundwater. The extent of residual soil contamination is limited to the site and is below regulatory action levels.

The direction of groundwater flow is to the south. Groundwater contaminated with gasoline and the fuel additive MTBE is present on site and extends downgradient (south) but still being delineated as to its full extent. The consultant for the former Chevron site opined that the off-site groundwater contamination is a result of a combination of several previously closed UST cases (Pangea, 2015). The Guasco Market (100 Center Boulevard) case located on the current Andronico's Market property was closed in 1996. The former Mobil Unocal case was adjacent and east of the Andronico's at 631 Sir Francis Drake Boulevard, had diesel listed as the contaminant of concern, and was closed in 1997. The Townsend & Townsend Property east of the subject site was closed in 1995. As of March 13, 2017, groundwater contamination extended south to at least Center Boulevard and may extend further (Pangea, 2015).

Adjacent to the Downtown San Anselmo site is the one-story commercial building at 630 San Anselmo Avenue. This building had been considered for removal as part of this Project, but it is no longer included in the construction footprint. Information on it is presented for completeness and contextual purposes. The building was constructed by 1946 (ESA, 2017a). This date pre-dates the banning of the use of ACM and LBP in the 1970s. In addition, older fluorescent light

[1] The State Water Resources Control Board and the Department of Toxic Substances Control maintain the GeoTracker and EnviroStor public websites, respectively, that track active and recently closed hazardous materials sites.



SOURCE: Pangea, 2017; ESRI

San Anselmo Flood Risk Reduction Project / D211432.07

Figure 4.8-1
Hazardous Materials Sites

ESA

ballasts, if present, may contain mercury. The structure has been investigated for the presence of hazardous building materials and was found to contain LBP. The history of the building is summarized below. The original use was as a taxi stand. Since then, the ancillary building has been used a real estate office, beauty salon, hat store, artist's studio, and currently as an art gallery. The listed land uses would not have included large quantities or volumes of hazardous materials.

Nearby Airports

There are no public or private airports within two miles of either of the Project locations. The nearest airport to the Project sites is the San Rafael Airport at 400 Smith Ranch Road in San Rafael. This private airport is more than 3.25 miles away from the Downtown San Anselmo Project site and 5 miles from the Nursery Basin site. The Marin County Airport, known as Gnoss Field, provides a broader range of aviation services (including Civil Air Patrol, medical helicopters, the Sheriff's Department flights) and is located at 451 Airport Road in Novato, which is almost 10 miles away from both sites.

Nearby Schools

Schools within 0.25 miles of the sites include the following:

Nursery Basin Site:

1. White Hill Middle School, 101 Glen Drive, Fairfax, about 650 feet to the east

Downtown San Anselmo Site:

1. ABC Academy Pre-School, 176 Tunstead Ave, San Anselmo, about 950 feet to the southwest
2. Little Sprouts Daycare, 150 Pine St, San Anselmo, about 950 feet to the southwest

4.8.1.3 Wildfire Hazards

California Department of Forestry and Fire Protection (CAL FIRE) maps identify fire hazard severity zones in state and local responsibility areas for fire protection. The Nursery Basin and Downtown San Anselmo sites are not within or near a high or very high fire hazard severity zones (CAL FIRE, 2007, 2008). However, the Nursery Basin site is located adjacent to areas of historical wildfires (ABAG, 2018a). In addition, according to mapping compiled by the Association of Bay Area Governments (ABAG), the Nursery site is located in an area that is considered to be a wildland urban fire threatened area (ABAG, 2018b).

4.8.1.4 Emergency Response or Evacuation Plans

Marin County

Marin County maintains an Emergency Operations Plan that is intended to provide adequate preparation and agency response to natural or human-caused disasters that threaten the health or property of residents and businesses (Marin County, 2007). The plan describes how emergency management will be coordinated; identifies personnel responsibilities and actions necessary to protect health and safety, property, and the environment; and details procedures before, during, and after a major event.

Town of San Anselmo

The Town of San Anselmo has designated Sir Francis Drake Boulevard, Red Hill Avenue, and Oak Springs Drive as emergency and evacuation routes (Town of San Anselmo, 2015). The Downtown San Anselmo site is not on any of these routes, though it is near the intersection of Red Hill Avenue and Sir Francis Drake Boulevard. The site would be accessed from San Anselmo Avenue.

Town of Fairfax

The Town of Fairfax Emergency Operations Plan does not identify specific emergency and evacuation routes (Town of Fairfax, 2015). The former Sunnyside Nursery site is adjacent to and would be accessed from Sir Francis Drake Boulevard, a primary route through the town.

4.8.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.8.2.1 Federal Regulations

Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act of 1986

The Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund or CERCLA, provides for the response and cleanup of hazardous substances that may endanger public health or the environment. The Superfund Amendments and Reauthorization Act (SARA) amended Superfund to increase state involvement and required Superfund actions to consider state environmental laws and regulations. Relevant to this Project, SARA also established a regulatory program for the Emergency Planning and Community Right-to-Know Act.

The applicable part of SARA for the Project is Title III, otherwise known as the Emergency Planning and Community Right-To-Know Act of 1986. Title III requires states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous substances present at facilities in local communities. The law provides primarily for planning, reporting, and notification concerning hazardous substances. Key provisions require notification when extremely hazardous substances are present above their threshold planning quantities, immediate notification to the local emergency planning committee and the state emergency response commission when a hazardous material is released in excess of its reportable quantity, and that Safety Data Sheets (formerly called Material Safety Data Sheets) for all hazardous materials or a list of all hazardous materials be submitted to the state and local emergency planning agencies and local fire department.

SARA applies to the Project because contractors working on the Project that use hazardous materials would be required to comply with requirements for the management of hazardous materials, including ensuring that all hazardous materials they use have Safety Data Sheets.

Resource Conservation and Recovery Act of 1976, Toxic Substances Control Act of 1976, and Hazardous and Solid Waste Act of 1984

Implementation of the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) of 1976 resulted in the creation of a major federal hazardous waste regulatory program that is administered by USEPA. USEPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended by the associated Hazardous and Solid Waste Amendments (HSWA), which affirmed and extended the concept of regulating hazardous wastes from generation through disposal. HSWA specifically prohibits the use of certain techniques for the disposal of some hazardous wastes. Under RCRA, individual states may implement their own hazardous waste programs instead of RCRA, as long as the state program is at least as stringent as the federal RCRA requirements. USEPA approved California’s program to implement federal hazardous waste regulations on August 1, 1992.

RCRA applies to the Project because contractors working on the Project that use hazardous materials would be required to comply with requirements for the use, handling, transportation, storage, and disposal of hazardous materials.

Clean Water Act

The federal Clean Water Act and subsequent amendments, under the enforcement authority of the U.S. Environmental Protection Agency (USEPA), was enacted “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” The Clean Water Act gave the USEPA the authority to implement pollution control programs such as setting wastewater standards for industry. In California, implementation and enforcement of the National Pollutant Discharge Elimination System (NPDES) program is conducted through the California State Water Resources Control Board (SWRCB) and the nine RWQCBs. The Clean Water Act also sets water quality standards for surface waters and established the NPDES program to protect water quality. Under Section 402 of the Act, discharge of pollutants is prohibited unless the discharge is in compliance with an NPDES permit. The NPDES program requires all facilities that discharge pollutants into waters of the United States to obtain a permit. The discharge permit provides limitations on pollutant concentrations to protect the water quality of the receiving waters. In 1972, the NPDES regulations initially focused on municipal and industrial wastewater discharges, followed by stormwater discharge regulations, which became effective in November 1990. NPDES permits for wastewater and industrial discharges specify discharge prohibitions and effluent limitations and also include other provisions (such as monitoring and reporting programs) deemed necessary to protect water quality.

The CWA applies to the Project because contractors working on the Project that use hazardous materials (e.g., fuel) would be required to comply with requirements to prevent spills of hazardous materials into San Anselmo and Fairfax Creeks.

U.S. Department of Transportation Hazardous Materials Transport Act of 1974

The U.S. Department of Transportation, in conjunction with USEPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to transportation of hazardous materials. The Hazardous Materials Transportation Act of 1974 directs the U.S. Department of Transportation to establish criteria and regulations regarding the safe storage and transportation of hazardous materials. CFR 49, 171–180, regulates the transportation of hazardous materials, types of material defined as hazardous, and the marking of vehicles transporting hazardous materials.

The Hazardous Materials Transportation Act applies to the Project because contractors working on the Project that transport hazardous materials such as fuel would be required to comply with requirements for the safe storage and transportation of hazardous materials.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act was passed to address employee safety in the workplace. The act created the Occupational Safety and Health Administration (OSHA), whose mission is to ensure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. The OSHA staff establishes and enforces protective standards and reaches out to employers and employees through technical assistance and consultation programs. Some OSHA regulations contain standards related to hazardous materials handling, including workplace conditions, employee protections requirements, first aid, and fire protection. The regulations in 29 CFR et seq. include the following:

1. Part 1910.38 requires facilities to have an emergency action plan to ensure the safe response to emergencies.
2. Part 1910.119 contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals, which may result in toxic, fire, or explosion hazards.
3. Part 1910.1200 ensures that the hazards of all chemicals produced or imported are classified, and that information concerning the classified hazards is transmitted to employers and employees. The transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets, and employee training.

OSHA would apply to the Project because contractors working on the Project that use or transport hazardous materials such as fuel would be required to comply with requirements to prevent spills and to have an emergency action plan in the event that a spill occurs.

4.8.2.2 State Regulations

NPDES Construction General Permit

The National Pollutant and Discharge Elimination System (NPDES) Construction General Permit is applicable to the Project. Details of the Construction General Permit are provided in

Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources. The Construction General Permit would apply to the Project because more than one acre would be disturbed.

Hazardous Materials Release Response Plans and Inventory Act

The Hazardous Materials Release Response Plans and Inventory Act of 1985, codified in Health and Safety Code, Sections 25500 et seq., also known as the Business Plan Act, requires businesses using hazardous materials to prepare a Hazardous Materials Business Plan (HMBP) that describes their facilities, inventories, emergency response plans, and training programs. HMBPs contain basic information on the location, type, quantity, and health risks of hazardous materials stored, used, or disposed. This code and the related regulations in 19 California Code of Regulations (CCR) Sections 2620 et seq. require local governments to regulate local business storage of hazardous materials in excess of certain quantities. The law also requires that entities storing hazardous materials be prepared to respond to releases. Those using and storing hazardous materials are required to submit a HMBP to their local Certified Unified Program Agency (CUPA) (see more below under the Unified Program) and to report releases to their CUPA and the State Office of Emergency Services. The California Office of Emergency Services is responsible for implementing the accident prevention and emergency response programs established under the Act and implementing regulations.

The HMBP would apply to the Project because contractors working on the Project that use hazardous materials would be required to comply with requirements for the use, handling, transportation, storage, and disposal of hazardous materials. The HMBP would include a spill response plan.

Hazardous Waste Control Act

The Hazardous Waste Control Act of 1972, codified in Health and Safety Code Sections 25100 et seq., created the State hazardous waste management program, which is similar to but more stringent than the federal RCRA program. The Act is implemented by regulations contained in CCR Title 26, which describes the following required aspects for the proper management of hazardous waste: identification and classification; generation and transportation; design and permitting of recycling treatment, storage and disposal facilities; operation of facilities and staff training; and closure of facilities and liability requirements. These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of such waste. Under the Hazardous Waste Control Act and Title 26, the generator of hazardous waste must complete a manifest that accompanies the waste from generator to transporter to the ultimate disposal location. Copies of the manifest must be filed with the Department of Toxic Substances Control (DTSC).

The Hazardous Waste Control Act would apply to the Project because contractors working on the Project that generate hazardous waste (e.g., ACM, LBP) would be required to comply with requirements for the use, handling, transportation, storage, and disposal of hazardous materials.

Unified Hazardous Waste and Hazardous Materials Management Regulatory Program

The Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program), codified in Health and Safety Code Sections 25404 et seq., requires the administrative consolidation of six hazardous materials and waste programs under one agency, a CUPA. The following programs are consolidated under the Unified Program:

1. Hazardous Waste Generator and On-Site Hazardous Waste Treatment Programs (a.k.a. Tiered Permitting);
2. Aboveground Petroleum Storage Tanks and SPCCs;
3. Hazardous Materials Release Response Plans and Inventory Program (a.k.a. Hazardous Materials Disclosure or "Community-Right-To-Know");
4. California Accidental Release Prevention Program;
5. UST Program; and
6. Uniform Fire Code Plans and Inventory Requirements.

The Unified Program is intended to provide relief to businesses complying with the overlapping and sometimes conflicting requirements of formerly independently managed programs. The Unified Program is implemented at the local government level by CUPAs. Most CUPAs have been established as a function of a local environmental health or fire department. The Marin County Department of Public Works is the CUPA for all of Marin Country, including the towns of San Anselmo and Fairfax. Most of the previously described regulations are under the jurisdiction of the Marin County CUPA.

California Occupational Safety and Health Act

The California Occupational Safety and Health Act of 1973, codified in California Labor Code, Sections 6300 et seq., addresses California employee working conditions, enables the enforcement of workplace standards, and provides for advancements in the field of occupational health and safety. The act also created the California Occupational Safety and Health Administration (Cal OSHA), the primary agency responsible for worker safety in the handling and use of chemicals in the workplace. Cal OSHA's standards are generally more stringent than federal regulations. Under Cal OSHA standards, the employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337–340). The regulations specify requirements for employee training, availability of safety equipment, accident-prevention programs, and hazardous substance exposure warnings.

Cal OSHA would apply to the Project because contractors working on the Project that use or transport hazardous materials such as ACM or LBP from the demolition of a building would be required to comply with requirements to manage and dispose of the hazardous materials.

Utility Notification Requirements

The regulations in 8 CCR Section 1541 require excavators to determine the approximate locations of subsurface installations, such as sewer, telephone, fuel, electric, and water lines (or any other subsurface installations that may reasonably be encountered during excavation work) prior to opening an excavation. The California Government Code (Sections 4216 et seq.) requires owners and operators of underground utilities to become members of and participate in a regional notification center. According to Section 4216.1, operators of subsurface installations who are members of, participate in, and share in the costs of a regional notification center, such as Underground Services Alert of Southern California, more commonly referred to as DigAlert, are in compliance with this section of the code. DigAlert receives planned excavation reports from public and private excavators and transmits those reports to all participating members that may have underground facilities at the location of excavation. Members will mark or stake their facilities, provide information, or give clearance to dig. This notification requirement would apply to the Project because of the proposed excavation activities.

Screening Levels for Hazardous Materials in Soil, Soil Gas, or Groundwater

The USEPA RSLs[2] and San Francisco Bay Area RWQCB ESLs are guidelines used to evaluate the potential risk associated with chemicals found in soil or groundwater where a release of hazardous materials has occurred. Screening levels have been established for both residential and commercial/industrial land uses, and for construction workers. Residential screening levels are the most restrictive; soil with chemical concentrations below these levels generally would not require remediation and would be suitable for unrestricted uses if disposed of off site. Commercial/industrial screening levels are generally less restrictive than residential screening levels because they are based on potential worker exposure to hazardous materials in the soil (and these are generally less than residential exposures). Screening levels for construction workers are also less restrictive than for commercial/industrial workers because construction workers are only exposed to the chemical of concern during the duration of construction, while industrial workers are assumed to be exposed over a working lifetime.

TTLCs and Soluble Threshold Limit Concentrations (STLCs) are chemical-specific concentrations used to define whether a material is a hazardous, designated, or non-hazardous waste. TTLCs and STLCs are listed in CCR Title 22, Chapter 11, Article 3, Section 66261. TTLCs and STLCs are used as acceptance criteria for landfills. For example, waste materials with chemical concentrations above TTLCs or STLCs must be sent to Class I disposal facilities, may be sent to Class II disposal facilities depending on the waste material, and may not be sent to Class III disposal facilities.

In the event that excavation activities encounter soil or groundwater that may be contaminated, screening levels would be used to assess whether the materials are hazardous and need further action.

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2 RSLs were previously referred to as Preliminary Remediation Goals (PRG), cited in older investigation reports.

California Construction Safety Orders for Lead

CCR Title 8, Section 1532.1, Lead, establishes the requirements for any construction worker who may be exposed to lead during demolition or salvage, removal or encapsulation, new construction, and cleanup activities. The construction safety orders establish an action level of 30 micrograms of lead per cubic meter ($\mu g/m^3$) of air calculated over an 8-hour time-weighted average without regard for the use of a respirator, meaning this is the limit where safety protocols must be initiated, such as use of a respirator. Under no circumstances may a worker be exposed to 50 $\mu g/m^3$ over an 8-hour weighted period. These regulations require implementation of engineering and work practice controls such as respiratory protection, protective clothing, housekeeping, hygiene practices, and signage requirements to meet worker exposure limits. Survey and cleanup must be conducted by state-certified consultants and contractors. Medical monitoring and training requirements are also identified. The Bay Area Air Quality Control Board is the regulatory agency that oversees and enforces compliance. These regulations apply because the building to be removed at 634-636 San Anselmo Avenue has LBP.

California's Universal Waste Rule

California's Universal Waste Rule (22 CCR 66261.9, 66273.1 through 66273.20) allows individuals and businesses to transport, handle and recycle certain common hazardous wastes, termed universal wastes, in a manner that differs from the requirements for most hazardous wastes (DTSC, 2010). The more relaxed requirements for managing universal wastes were adopted to ensure that they are managed safely and are not disposed of in the trash.

Universal wastes are hazardous wastes that are widely produced by households and many different types of businesses. Universal wastes include televisions, computers and other electronic devices as well as batteries, fluorescent lamps, mercury thermostats, and other mercury containing equipment, among others. Fluorescent light tubes, ballasts, and switches may contain PCBs and/or mercury, especially older fixtures.

Conditionally Exempt Small Quantity Universal Waste Generators are exempt from most of the requirements of the universal waste regulations provided they comply with certain conditions (22 CCR 66273.8). The demolition of the 634-636 San Anselmo Avenue building would qualify because the volume of PCB and/or mercury-containing materials would be less than 100 kilograms (220 pounds) of RCRA hazardous waste, including universal waste that is RCRA universal waste and less than one kilogram of acutely hazardous waste in a calendar month. (RCRA hazardous waste is hazardous waste that is regulated under the hazardous waste regulations adopted by the U.S. Environmental Protections Agency.) Handlers who qualify for these exemptions are not required to obtain an EPA ID number or otherwise notify DTSC, keep records of shipments or provide annual reports to DTSC, or to label their universal waste.

A Conditionally Exempt Small Quantity Universal Waste Generator may not send universal waste to a municipal solid waste (garbage) landfill or a non-hazardous waste recycling center. All handlers of universal waste must relinquish their universal waste to one of the following:

1. Another handler (typically a business that specializes in collecting, storing, accumulating and shipping universal wastes). Examples include a household hazardous waste facility, a "Take-it-Back Partner" such as a retailer or manufacturer, or a collection event.
2. A universal waste transporter. Examples include a curbside household hazardous waste collection program, a package service (e.g., postal service, UPS), or a destination facility that offers a pick-up service.
3. A universal waste destination facility (generally, a facility with a permit to treat, store, or dispose of hazardous waste).

Search engines available to find locations accepting universal waste in the local area include E-Recycle.org; Earth911.org; the CalRecycle database; DTSC; and household hazardous waste list.

NPDES General Permit and Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Order No. 2013-0001-DWQ)

Areas that drain to small separate stormwater collection systems, such as those within Marin County, are subject the State Water Resources Control Board (SWRCB) the General Permit for Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s), Order No. 2013-001-DWQ (Small MS4 General Stormwater Permit), which identifies specific Best Management Practices (BMPs) and management measures to be addressed and requires permittees to submit a guidance document to the SWRCB documenting their strategies for complying with permit requirements. Marin County and the Towns of San Anselmo and Fairfax addressed these requirements with the development and implementation of the Marin County Stormwater Pollution Prevention Program (MCSTOPPP) summarized below. Both the MS4 permit and MCSTOPPP are discussed in more detail in Chapter 4, Section 4.9, Hydrology and Water Quality.

4.8.2.3 Local Regulations

Marin Countywide Plan

The Marin Countywide Plan would apply to the Nursery Basin site since the basin is in the County just northwest of the Town of Fairfax. The following goals and policies are relevant to hazards and hazardous materials:

Public Safety

Goal PS-4: Decreased Exposure to Hazardous Materials. Reduce the risks to human and environmental health from hazardous materials.

Policy PS-4.1: Regulate and Reduce Hazardous Material Use. Control the use and storage of hazardous materials to minimize their presence in, and potential dangers to, the community and environment.

Implementing Program PS-4.b: Regulate Hazardous Material Use. Identify businesses that use, store, dispose of, or transport hazardous materials, and require them to follow measures that protect public health and safety.

Marin County Municipal Code Chapter 23.18, Stormwater Runoff Pollution Prevention (County of Marin Stormwater Runoff Pollution Prevention Ordinance)

The intent of this chapter is to protect and enhance the water quality of Marin County's watercourses, water bodies and wetlands in a manner pursuant to and consistent with the Clean Water Act, the Porter-Cologne Water Quality Control Act (California Water Code Section 13000 et seq.), and the Phase II MS4 NPDES Permit, Water Quality Order No. 2013-0001-DWQ, General Permit No. CAS000004 (Phase II stormwater permit) and subsequent revisions and amendments thereto. This chapter would apply to the Project.

Marin County Stormwater Pollution Prevention Program

The MCSTOPPP is a joint entity of cities, towns, and unincorporated areas constituted to prevent stormwater pollution, protect and enhance water quality in creeks and wetlands, preserve beneficial uses of local waterways, and comply with state and federal regulations governing water quality, including the MS4 permit requirements. The MCSTOPPP is discussed in more detail in Section 4.9 Hydrology and Water Quality.

Town of Fairfax Municipal Code

Title 8: Health and Safety

Chapter 8.32: Urban Runoff Pollution Prevention: 8.32.020 Discharge Regulations and Requirements.

(C) Discharge in violation of permit. (1) Any discharge that would result in or contribute to a violation of the Phase II Stormwater Permit and any amendment, revision or reissuance thereof, either separately considered or when combined, with other discharges, is prohibited.

(D) Illicit discharges and illicit connections. (3) Any person responsible for a discharge, spill, or pollutant release shall promptly cease and desist discharging and/or cleanup and abate such a discharge as directed by the authorized enforcement official.

(E) Reduction of pollutants in urban runoff. Any person engaged in activities which will or may result in pollutants entering the storm drains shall undertake all practicable measures to cease the activities, and/or eliminate or reduce the pollutants. The activities shall include, but not be limited to ownership and use of parking lots, gasoline stations, industrial facilities, commercial facilities, ground disturbing activities, and stores fronting town streets.

(3) Construction-phase best management practices.

- (a) Any person performing construction activities in the town shall implement appropriate BMPs to prevent the discharge of construction wastes or contaminants from construction materials, tools, and equipment from entering the storm drain system or watercourse.

- (b) The town has the authority to review designs and proposals for construction activities to determine whether adequate BMPs will be installed, implemented, and maintained during construction and after final stabilization.

(c) Construction-phase BMPs include erosion and sediment controls and pollution prevention practices. Erosion control BMPs may include, but are not limited to, scheduling and timing of grading activities, timely revegetation of graded areas, the use of hydroseed and hydraulic mulches, and installation of erosion control blankets. Sediment control may include properly sized detention basins, dams, or filters to reduce entry of suspended sediment into the storm drain system and watercourses, and installation of construction entrances to prevent tracking of sediment onto adjacent streets. Pollution prevention practices may include designated washout areas or facilities, control of trash and recycled materials, tarping of materials stored on site, and proper location of and maintenance of temporary sanitary facilities. The combination of BMPs used, and their execution in the field, must be customized to the site using up-to-date standards and practices. The agency will provide references to current guidance manuals and BMP information on request.

(4) Erosion and Sediment Control Plan requirements.

(a) When required by the Phase II Stormwater Permit or by the town, a project shall have an Erosion and Sediment Control Plan (ESCP) which addresses erosion and sediment control and pollution prevention during the construction phase as well as final stabilization control measures. The ESCP and the specific control measures to be utilized shall be subject to the review and approval of the town. The ESCP shall be implemented year round and shall be revised to reflect changing conditions on the project site. The town shall require modifications of an approved ESCP if during the course of construction at a site unanticipated conditions occur or the plans prove inadequate for the intended purpose. Revisions of the approved ESCP shall be submitted to the town for review and approval. An ESCP shall be required for any project:

1. Subject to a grading permit under Chapter 12.20 Excavations Generally;

2. Subject to a building permit or other permit that has the potential for significant erosion and/or significant non-stormwater discharges of sediment and/or construction site waste;

3. As required by the town considering factors such as whether the project involves hillside soil disturbance, rainy season construction, construction near a creek or an intermittent or ephemeral drainageway, or any other condition or construction site activity that could lead to a non-stormwater discharge to a storm drain if not managed by effective implementation of an ESCP.

(b) The ESCP shall be submitted for review and approval by the town. The project applicant shall follow the most recent version of the MCSTOPPP Construction Erosion and Sediment Control Plan Applicant Package. At a minimum, the ESCP shall include:

1. Description of the project and soil disturbing activity;

2. Site specific construction-phase BMPs;

3. Rationale for selecting the BMPs;

4. List of applicable outside agency permits associated with the soil disturbing activity, such as: Construction General Permit; Clean Water Act Section 404 Permit; Clean Water Act Section 401 Water Quality Certification; Streambed/Lake Alteration Agreement (1600 Agreements).

(c) If the project requires coverage under the Construction General Permit issued by the SWRCB, Permit Registration Documents must be filed with the SWRCB for said coverage and a copy of the Waste Discharge Identification Number shall be submitted to the town prior to issuance of a permit for construction. The applicant may submit the Storm Water Pollution Prevention Plan (SWPPP) required by the General Construction Activity Stormwater Permit in lieu of the ESCP provided it meets the requirements of the ESCP.

(d) Financial security may be required to ensure that temporary measures to control stormwater pollution are implemented and maintained during construction and after construction for a period determined by the town. Financial security shall consist of an irrevocable letter of credit, cash deposit, or performance bond as determined by the town.

(e) Implementation of an approved ESCP shall be a condition of the issuance of a building permit, a grading permit, or other permit issued by the town for a project subject to this section. The ESCP shall be implemented year round and must be updated to reflect changing conditions on the project site. Any modifications to the ESCP shall be submitted to the town for review and approval.

Town of Fairfax General Plan

The Project would not take place within the limits of the Town of Fairfax, but portions of its general plan are included here for informational purposes.

Safety Element

Goal S-3: Minimize risk due to fire hazards.

Objective S-3.1.1**:** Protect people and property from risks associated with urban and wildland fire.

Policy S-3.1.3**:** Maximize access and egress for emergency response vehicles.

Program S-3.1.3.5**:** Identify critical emergency access roads maintained by Marin County or other jurisdictions and ensure access by emergency vehicles and equipment.

Town of San Anselmo Municipal Code

Title 5 Sanitation and Health Chapter 8 Urban Runoff Pollution Prevention

5-8.06: Discharge of pollutants. (a) The discharge of non-stormwater discharges to storm drains is prohibited. All discharges of material other than stormwater must be in compliance with an NPDES permit issued for the discharge.

5-8.10: Construction-phase best management practices. This Town code section is focused on runoff from construction sites, which also would apply to the management of hazardous materials at construction sites, and is included in Chapter 4, Section 4.7 Geology, Seismicity, Soils, and Paleontological Resources.

4.8.3 Impacts and Mitigation Measures

The following analysis discusses the potential significant impacts of the Project related to hazards and hazardous materials for the Project. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. Mitigation measures are identified, as necessary, to reduce significant impacts.

4.8.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact relative to hazards and hazardous materials if it would:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment or by exposing sensitive receptors to substantial pollutant concentrations;

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school or other sensitive receptors;

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area;

f) For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area;

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;

h) Expose people or structures to a significant or increased risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

The following significance criteria are considered to have no impact, as discussed below, and are not analyzed further.

1. ***Proximity to schools.*** The three schools within 0.25 mile of the work sites are not immediately adjacent to the work sites and are not on the roads that would be used to travel to and from the work sites. This Project would handle limited quantities of hazardous materials and only during construction. More importantly, trucks used to transport hazardous building materials (e.g., LBP) associated with building demolition, would be appropriately containerized and would not pass by the schools. Therefore, there would be no impact related to use or transport of hazardous materials in proximity to schools.

2. ***Public or private airports or airstrips.*** There are no airports or airstrips within two miles of the Project sites. Therefore, there would be no impacts related to proximity to airports.

3. ***Wildland fires.*** The Downtown San Anselmo site is located in an urban area and is not located within a high or very high fire hazard severity zone. The Nursery Basin site is located in a fire threatened area (ABAG, 2018b), however once constructed would not be associated with bringing people or improvements that could be become substantively damaged by a wildfire. There would therefore be no impact related to increased risk of wildland fires.

4.8.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to hazards and hazardous materials based on the potential for the Project to expose facilities or people to hazards or hazardous materials during Project activities. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. The potential for hazards and hazardous materials is analyzed using available data from site-specific and nearby investigations including the listing of active cleanup sites available on the SWRCB GeoTracker and DTSC EnviroStor websites, on-site inspections (Ninyo & Moore 2017; ESA, 2017a, 2017b), and existing publications and maps completed by federal, state local and agencies, such as the California Department of Forestry and Fire Protection (Calfire, 2007, 2008). In addition, the hazards and hazardous materials impacts are analyzed in the context of existing regulations and policies. Mitigation measures are identified, as necessary, to reduce significant impacts.

4.8.3.3 Impacts and Mitigation Measures

Impact 4.8-1: The Project would not create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard. (*Less than Significant*)

Construction

All Project construction activities would include the use of equipment that would use fuels, oil and lubricants, and cleaning solvents. In addition, the buildings to be removed may contain hazardous building materials. The following discussion analyzes anticipated hazardous materials issues associated with construction.

Construction and Demolition Equipment

Petroleum products, such as gasoline, diesel fuel, oil, lubricants, and cleaning solvents would be used to fuel and maintain construction vehicles and equipment for construction of all Project elements. The routine use or reasonably foreseeable upset and accident conditions for the various hazardous materials that would be used during construction and demolition activities could result in inadvertent releases of small quantities of hazardous materials, which could adversely affect construction workers or the environment.

Construction and demolition activities are required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials to affect stormwater and downstream receiving water bodies, and to respond to accidental spills, if any. The numerous regulations discussed above in the Regulatory Framework, such as RCRA, HMBP, and others would require measures for the safe transportation, storage, handling, and disposal of hazardous materials used for construction, including appropriate containers, secondary containment to contain a potential release. As discussed in Chapter 4, Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources, construction contractors would be required to prepare a SWPPP for construction activities according to the NPDES General Construction Permit requirements and similar related county and town regulations. The SWPPP must be prepared by a state Qualified SWPPP Developer and implementation of the SWPPP must be overseen by a state Qualified SWPPP Practitioner. The SWPPP would list the hazardous materials (including petroleum products) proposed for use during construction and demolition, and describe spill prevention measures, equipment inspections, equipment and fuel storage, and protocols for responding immediately to spills. A Legally Responsible Person, who is legally authorized to sign and certify permit registration documents, is responsible for obtaining coverage under the permit. With implementation of the SWPPP and compliance with existing regulations, the potential impact related to routine transport and accidental releases of hazardous materials would be less than significant.

Hazardous Building Materials

The 634-636 San Anselmo Avenue building predates the 1970’s and has been surveyed for hazardous building materials such as ACM and LBP in building materials, mercury and PCBs in fluorescent light ballasts, tubes, and switches, especially in older fixtures. The building was found to have LBP, light ballasts, and exit signs that are considered to be hazardous materials. The existing structures at the Nursery Basin site also pre-date the banning of the use of ACM and LBP. The wooden residence was built around 1971; the art studio is a Quonset hut that dates to at least 1952. In addition, older fluorescent light ballasts, if present, may contain mercury. If these materials are disturbed or broken during demolition activities at either Project site, they could result in releases exposing workers, the public, and the environment. Existing regulations require that demolition activities that may disturb or require the removal of materials that consist of, contain, or are coated with ACM, LBP, PCBs, mercury, and other hazardous materials must be inspected and/or tested for the presence of hazardous materials. If present, the hazardous materials shall be managed and disposed of in accordance with applicable laws and regulations.

In the case of ACM and LBP, the identification, removal, and disposal is regulated as described under the California Construction Safety Orders for Asbestos and Lead, summarized in the Regulatory Setting. All work must be conducted by a State-certified professional. A site-specific hazard control plan must be prepared detailing removal methods and specific instructions for providing protective clothing and equipment for abatement personnel. A State-certified LBP contractor would be retained to conduct the appropriate abatement measures as required by the plan. Wastes from abatement and demolition activities would be disposed of at a landfill licensed to accept such waste. Once all abatement measures have been implemented, the contractor would conduct a clearance examination and provide written documentation to the Bay Area Air Quality

Management District that testing and abatement have been completed in accordance with all federal, state, and local laws and regulations.

In the case of PCBs and mercury in electrical transformers and fluorescent light ballasts, tubes, and switches, especially older fixtures, the identification, removal, and disposal is regulated under California's Universal Waste Rule as summarized in the Regulatory Framework. Under these regulations, the fluorescent light fixtures must be removed without breakage and disposed of at a licensed facility permitted to accept the materials.

With compliance with existing regulations, the impact relative to routine transport or accidental release of hazardous materials would be less than significant.

Operation

Exposure to ACM, LBP, or other hazardous materials in structures would only occur during demolition of existing structures during construction activities. Once the structures have been removed, there would be no further exposure during operations to hazardous building materials and therefore no impact.

As described in Chapter 3, Section 3.5, Construction, Operation, and Maintenance, the Nursery Basin would be operated as a temporary flood diversion and storage basin, and both the basin and the creek channel would be maintained. Operation and maintenance activities would require occasional site visits using vehicles and construction equipment that would use fuel and oil. Similar to the use of equipment during construction activities described above, contractors, the County, and the Towns would be required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials to affect stormwater and downstream receiving water bodies, and to respond to accidental spills, if any. With compliance with existing regulations, the potential impact would be less than significant.

Mitigation: None required.

Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. (*Less than Significant with Mitigation*)

As discussed in the Environmental Setting, neither the former Sunnyside Nursery site nor the Downtown San Anselmo sites are listed as hazardous materials sites. However, the 634-636 San Anselmo Avenue building previously operated as an automotive service station and repair shop. The USTs were removed in 2000 and the Marin County DPW issued a no further action letter based on soil testing results. One active and three closed UST cleanup sites are located just upgradient and upstream of the Project sites. The downgradient extent of gasoline and MTBE in soil and groundwater is currently under investigation and has not been defined but reportedly may extend as far as Center Boulevard.

Construction

Project construction would involve localized ground disturbance activities (e.g., grading, excavation, fill compaction, and reworking the creek channel) and may temporarily alter the local groundwater flow during construction area dewatering. Though the likelihood is unknown, these activities could result in encountering contaminated soil or groundwater at the Downtown San Anselmo site. Investigation of the release from the former Chevron service station at 700/750 Sir Francis Drake Boulevard is ongoing. Encountering contaminated soil and/or groundwater would be a significant impact considering that much of the work would occur in the creek bed. **Mitigation Measures 4.8-2a**, **4.8-2b** and **4.8-2c** address this potential impact.

Operation

Once the construction of the Nursery Basin and the creek channel improvements adjacent to it and in downtown San Anselmo have been completed, there would be no potential to encounter contaminated soil, and there would be no impact.

Mitigation Measure 4.8-2a: Check 700/750 Sir Francis Drake Boulevard investigation status.

Prior to beginning construction activities, the contractor shall check the status of the 700/750 Sir Francis Drake Boulevard investigation available at the SWRCB GeoTracker website at: http://geotracker.waterboards.ca.gov/. Relevant information from the GeoTracker shall be used to inform the Health and Safety Plan and Soil Management Plan, described in subsequent mitigation measures.

Mitigation Measure 4.8-2b: Health and Safety Plan.

The construction contractor(s) shall prepare and implement a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120 to protect construction workers and the public during all excavation and grading activities. The Health and Safety Plan shall include, but is not limited to, the following elements:

1) Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site health and safety plan;
2) A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals based on the most recent reporting of the investigation at 700/750 Sir Francis Drake Boulevard site overseen by the Regional Water Quality Control Board;
3) Specified personal protective equipment and decontamination procedures, if needed;
4) Emergency procedures, including route to the nearest hospital; and
5) Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered.

These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of unknown discovered or suspected hazardous materials release and notifying the Marin County CUPA (415-473-7085).

Mitigation Measure 4.8-2b applies to both the Nursery Basin and the Downtown San Anselmo sites.

Mitigation Measure 4.8-2c: Soil Management Plan.

For the Downtown San Anselmo site, the Flood Control District or its contractor shall develop and implement a Soil Management Plan that includes a materials disposal plan specifying how the construction contractor shall remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan shall identify protocols for training workers to recognize potential soil contamination (such as soil staining, noxious odors, debris or buried storage containers), soil testing and disposal by a qualified contractor in the event that contamination is identified, and identification of approved disposal sites (e.g., approved landfill or reuse site). Contract specifications shall mandate approval of the Soil Management Plan by the Flood Control District as well as full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of hazardous materials.

Significance after Mitigation: Implementation of **Mitigation Measures 4.8-2a**, **4.8-2b**, and **4.8-2c** would reduce impacts associated with encountering potentially contaminated soil or groundwater to less than significant levels by controlling contact with and release of these materials into the environment. Methods of control include soil testing, stopping work should these materials be encountered, and use of a qualified contractor to dispose of contaminated materials in accordance with regulatory requirements.

Impact 4.8-3: The Project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (*Less than Significant*)

The construction and operations activities would include the use of trucks and equipment that could block roads, including emergency or evacuation routes.

Construction

As described in *Environmental Setting*, above, the Nursery Basin would be accessed from Sir Francis Drake Boulevard, which is a designated emergency or evacuation route. However, the Nursery Basin site is off the road and no lane closures would be required. As described in Chapter 4, Section 4.15 Transportation, the increase in traffic volumes caused by Project-generated construction traffic on the arterials and freeways serving the Project worksites would not be substantial relative to background traffic conditions (i.e., would tend to fall within the daily fluctuation of traffic volumes on those roads), and that Project traffic would not significantly disrupt traffic flow on these roadways. In addition, compliance with requirements of local jurisdictions would include preparation of a Traffic Management Plan (see **Mitigation Measure 4.15-1**) that would ensure that the effect of Project traffic is reduced to less than significant.

Access to the Downtown San Anselmo site would be by San Anselmo Boulevard and possibly Red Hill Avenue or Sir Francis Drake Boulevard. Red Hill Avenue is a designated emergency or evacuation route. Although not a designated emergency or evacuation route, San Anselmo Boulevard and Sir Francis Drake Boulevard are primary routes through downtown San Anselmo. However, the Downtown San Anselmo site is just off the road, a parking area and portions of the adjacent Creek Park are available for equipment staging, and no lane closures would be required. As described above, a Traffic Management Plan (see Mitigation Measure 4.15-1) would be prepared that would ensure that the effect of Project traffic is reduced to less than significant. Contract specifications shall mandate approval of the Traffic Management Plan by the Flood Control District and the County of Marin as well as full compliance with all applicable local, state, and federal regulations.

Operation

Upon completion of construction activities, occasional maintenance vehicles would access the sites. However, the vehicles would be parked off the streets, no lane closures would be required, and the potential impact related to emergency or evacuation plans would be less than significant.

Mitigation: None required.

4.8.4 References – Hazards and Hazardous Materials

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4.9 Hydrology and Water Quality

This section describes existing hydrology and water quality in the Project area, including wastewater and stormwater management, existing and future flooding, groundwater conditions, and the existing regulatory framework governing these topics. Potential impacts that could result from construction and operation of the Project and mitigation measures to avoid or reduce significant adverse impacts are then discussed, as appropriate. The impact assessment includes an evaluation of water quality issues related to construction activities as well as operation of the Project.

4.9.1 Environmental Setting

Marin County encompasses approximately 606 square miles of land, open water, tidal habitats, streams, lakes and ponds extending from the Pacific coast to the San Francisco, San Pablo, San Rafael, and Richardson Bays. This region of the Coast Ranges geomorphic province exhibits northwest-trending ridges and valleys, uplifted and faulted by tectonic activity along the San Andreas Fault to the west and eroded by the winter rains of the region's semi-arid Mediterranean climate.

The Ross Valley Watershed (also called the Corte Madera Creek Watershed) is approximately 28 square miles in area, and is located in eastern Marin County. The topography of the watershed is variable, ranging from the peak of Mt. Tamalpais to the west (elevation 2,571 feet above mean sea level) to the waters of the San Francisco Bay in the southeast. Intermittent and perennial streams drain the watershed, which receives over 80 percent of annual precipitation between November 1 and April 1 (Stetson Engineers, Inc., 2000). Average rainfall varies from about 48 inches along the watershed's southwestern edge to about 34 inches along its northeastern edge (Stetson Engineers, Inc., 2000).

4.9.1.1 Ross Valley Watershed Creeks and Drainage

The Ross Valley watershed is drained by 42 linear miles of natural and channelized creeks in addition to stormwater drainage facilities that collect water from urbanized areas and convey the stormwater to the larger creeks (refer to Figure 3-2 in Chapter 3, *Project Description*). Creek channels are highly modified and encroached upon by roads, narrow bridges, retaining walls, fill, pipelines, and buildings that span the creek as bridges or overhang the creek similar to balconies. The steep upland areas along the ridgetops are vegetated with a mix of forest and grassland cover, and drain to relatively steep and laterally confined alluvial valleys, from which creeks flow generally southeast toward tidal salt marsh in Kentfield before entering San Francisco Bay near Corte Madera. Overland and channelized fluvial sediment transport, downslope soil creep, landslides, earthflows, and debris flows are all mechanisms for transporting sediment from the hillslopes to creek channels (Stetson Engineers, Inc., 2000). Due to patterns of past land use in the adjacent uplands, including clearing and development, the Ross Valley watershed's bedload sediment yield can be considered unnaturally high (Stetson Engineers, Inc., 2000).

There are 29 named tributaries and four subwatersheds in the watershed. One Project element – a flood diversion and storage (FDS) basin at the former Sunnyside Nursery site, generally referred to as “the Nursery Basin” – would be located in the Fairfax subwatershed, which is drained by Bothin and Fairfax Creeks. The Town of Fairfax is in this subwatershed, but the Nursery Basin property is outside of the town borders. The second Project element – the Downtown San Anselmo creek capacity improvements – is in the San Anselmo subwatershed, which is drained by Deer Park Creek, San Anselmo Creek, and Sleepy Hollow Creek, and includes the Town of San Anselmo and the unincorporated areas of Sleepy Hollow and Oak Manor. Downstream of the Project area, the Ross subwatershed includes the Town of Ross and is drained by Phoenix Creek, Bill Williams Creek, and Ross Creek. The Larkspur subwatershed includes the City of Larkspur, the incorporated areas of Greenbrae and Kentfield, and the Town of Corte Madera, and is drained by Corte Madera Creek and Larkspur Creek. The following creeks and water bodies either drain areas where the Project activities would occur or are downstream of Project areas and are thus subject to changes in their hydrology or water quality caused by upstream conditions.

Fairfax Creek. Fairfax Creek drains approximately 3.6 square miles of the northern upland area of the Ross Valley watershed, its smallest tributaries draining steep undeveloped unincorporated County lands. The creek flows through the Town of Fairfax to the confluence with San Anselmo Creek. The Nursery Basin is adjacent to Fairfax Creek upstream of both the Town of Fairfax and the confluence with San Anselmo Creek. Fairfax Creek in the vicinity of the Nursery Basin is shown in **Figure 4.9-1**; it does not flow year-round. Fairfax Creek contributes less than one percent of the total bed load sediment in Corte Madera Creek at the City of Ross (Stetson Engineers, Inc., 2000).

San Anselmo Creek. San Anselmo Creek drains approximately 11 square miles of unincorporated County open space and water district lands before flowing through Fairfax, San Anselmo, and Ross to the confluence with Ross Creek. The creek flows year-round, with fluctuations in flow corresponding to rain events and soil saturation (National Hydrography Dataset, 2018). Sleepy Hollow Creek and Sorich Creek drain to San Anselmo Creek upstream of the confluence with Ross Creek. Sleepy Hollow Creek and Sorich Creek drain 2.8 and 0.2 square miles of the Ross Valley watershed, respectively (Stetson Engineers, Inc., 2000). The Nokomis, Madrone, and Sycamore bridges span San Anselmo Creek in the downtown San Anselmo area, as do several bridge buildings, including one at 634-636 San Anselmo Avenue (formerly known as Building Bridge #2), removal of which is included in this Project. **Figure 4.9-2** shows a typical reach of San Anselmo Creek in the downtown San Anselmo area (the Downtown San Anselmo site). San Anselmo Creek and Sleepy Hollow Creek respectively contribute 29 and 25 percent of the bed load sediment in Corte Madera Creek at the City of Ross (Stetson Engineers, Inc., 2000).

Corte Madera Creek. Downstream of the confluence of San Anselmo and Ross Creeks, the main channel is called Corte Madera Creek. The lower portion of Corte Madera Creek below the College of Marin is a natural earthen channel that was constructed by the U.S. Army Corps of Engineers in 1968. The Lagunitas Road Bridge crosses Corte Madera Creek approximately one mile downstream of downtown San Anselmo. The United States Geological Survey (USGS) stream gage at Ross (USGS Ross Gage; USGS 11460000) measures flows on Corte Madera Creek, and is located just upstream of Lagunitas Road Bridge. Flood conditions in the watershed

SOURCE: ESA

San Anselmo Flood Risk Reduction Project / 211432.07

Figure 4.9-1
Fairfax Creek along the Nursery Basin Site

SOURCE: ESA

San Anselmo Flood Risk Reduction Project / 211432.07

Figure 4.9-2
San Anselmo Creek Typical Downtown Reach

are characterized by flows at this gage. Annual peak stream flow measured at the USGS Ross Gage has generally been below 4,000 cubic feet per second (cfs), with the exception of large storms described in greater detail below (USGS, 2017). Corte Madera Creek flows year-round and is tidally-influenced between the San Francisco Bay and the vicinity of Kentfield, approximately 2 miles downstream of the nearest Project site (National Hydrography Dataset). Sediment from the bay and from sources in the watershed is continually deposited in the channel, reducing its hydraulic capacity (Stetson Engineers, Inc., 2011). Between 1966 and 2004, the annual sedimentation rate in the Corte Madera Creek averaged 22,000 cubic yards per year (Stetson Engineers, Inc., 2011).

San Francisco Bay Estuary. Corte Madera Creek flows into central San Francisco Bay at an inlet around 8 miles north of the Golden Gate channel. San Francisco Bay is an approximately 1,100 square mile region of the San Francisco Bay Estuary, which conveys waters of the Sacramento and San Joaquin rivers, as well as smaller streams surrounding the bay, into the Pacific Ocean through the Golden Gate channel. Salinity levels range from hypersaline to fresh water, and water temperature varies throughout the Bay system (San Francisco Bay Regional Water Quality Control Board [RWQCB], 2017).

4.9.1.2 Hydrology and Geomorphology of the Ross Valley Watershed

The Project Description (Chapter 3) of this document explains the history of flooding in Ross Valley as a whole and in the San Anselmo Creek and Fairfax Creek subwatersheds in particular. It also explains how the combination of historical development in the flood plains and various flow-constraining features such as bridges, bridge buildings, culverts, and so on have contributed to the existing flood risk conditions. That description was intended to explain the Project's purpose and need and to preview how the Project's elements would serve that purpose. This section explains the hydrology and geomorphology of these creeks and their subwatersheds in order to provide more context for how the Project would address the flood risk.

The landforms and drainage patterns within a watershed are the result of the tectonics, climate, geology, and land use of the watershed; these factors in turn affect the characteristics of streams in the watershed that are relevant to flooding patterns, such as sediment load, stream discharge (the volume of water passing a point in the channel over time), and stream slope. Generally, the width and depth of a stream channel adjusts to accommodate the discharge and sediment load supplied from the watershed, though the actual rate of adjustment is also influenced by other factors such as the bank material composition and vegetation. Channel dimensions adjust, through erosion and deposition, to the quantity of water moving through the channel so that the channel contains all but the highest flows (Knighton, 1998). Changes to sediment load, sediment size, stream slope, and stream discharge all can alter the physical characteristics of a stream channel.

As physical characteristics of a stream channel change, the channel capacity and flow and flooding patterns are altered. Rates of channel morphological change range from hours or days (during a large flood event) to hundreds of years or more (resulting from climate change or tectonic forces). To the extent that human activities, such as channel modifications or floodplain development, affect stream channels, the channels may take years or decades to readjust by changes in erosion and deposition that propagate throughout the watershed.

Many lowland and coastal areas of eastern Marin County, including in the Ross Valley Watershed, are developed. As a result, the current hydrology and geomorphology of the watershed reflect human activities. Watershed changes resulting from human activities generally fall into two main types: changes brought about by direct modification of a stream channel, and indirect changes resulting from activity in areas outside the stream channel (such as development in the floodplain). As discussed generally above, these changes can alter the hydrology of a given stream and the pattern of sediment supply over years or decades, with consequences for channel characteristics such as channel width, channel depth, and capacity to contain flows (Knighton, 1998).

Beginning in the late 1800s, rapid channel incision[1] in the Ross Valley watershed occurred as a result of land use changes that increased the volume of surface runoff in the watershed, particularly logging and livestock grazing. These activities led to systemwide channel incision thought to be on the order of 4 or more feet by the early 1900s (Stetson Engineers, Inc., 2000). After a partial respite and natural revegetation in the early 1900s, urbanization of the previously

[1] Incision is the natural process by which a river or other type of stream cuts downward into its bed, deepening the active channel.

grazed areas reinforced the trend of channel incision in the areas of the watershed upstream of the confluence of San Anselmo and Ross Creeks (Stetson Engineers, Inc., 2000). Creekside development was particularly aggressive in the early to mid-1900s, when channel banks were often filled and replaced with vertical walls or rock-slope revetments, or both. This development included the construction of several buildings that partially span or fully cover the stream channel within downtown San Anselmo, as well as numerous undersized public and private bridges which form significant hydraulic constrictions. Many of these bridges were constructed in the early 1900s with center support piers and narrow abutments that constrict channel flow area, in some cases, to 50 percent less than the adjoining reaches (CH2M, 2018a).

Today, the upper parts of the watershed are hilly and mostly wooded (PBS&J, 2010). The lower ridges and valley areas of the watershed are developed suburban residential and commercial areas. Development in the communities of Fairfax, San Anselmo, Ross, Kentfield, Larkspur, and Greenbrae has increased the amount of impervious surfaces within the watershed, thereby decreasing the amount of rainfall that can infiltrate into the soil (PBS&J, 2010). These changes result in more runoff and higher peak flows than those which would occur under natural conditions (PBS&J, 2010). As described above, the morphology of a natural river or stream adjusts to the prevailing hydrologic conditions and sediment load in order to efficiently convey a wide range of discharges and sediment loads. Creek channels in Ross Valley continue to respond to development within the watershed by widening and locally eroding creek banks (Stetson Engineers, Inc., 2000). It is generally believed that most of the channel bed incision ceased in the early 1900s as vertical erosion reached the depth of erosionally resistant bedrock (CH2M, 2018a). It is expected that the process of local and systemic channel widening would continue for decades or more in the absence of human intervention; however, these natural geomorphic recovery processes are impeded by artificial bank stabilization in the watershed (Stetson Engineers, Inc., 2000). Although the channels are still responding to the 1800s land use and subsequent urbanization, the effects are slowing and less dramatic (Marin County Flood Control and Water Conservation District [MCFCWCD], 2017). The ongoing channel adjustments resulting from these changes affect current and projected future drainage patterns in the watershed. Ongoing channel responses include upstream advance of first order tributaries, reduced bed incision and bank erosion in the upper creek channel network, and slowing of channel aggradation in the lower reaches of the watershed (MCFCWCD, 2017).

Erosion and Sedimentation Near Project Components

A geomorphic and scour assessment was prepared for the Project, and describes the existing channel and bank conditions near the Nursery Basin site and the Downtown San Anselmo site. At the Nursery Basin site, as of November 2017, the left (northern) bank of Fairfax Creek was actively eroding and undermining trees. The assessment noted that the erosion appears to occur in response to a recently deposited gravel bar on the southern side of the channel where an unnamed ephemeral tributary discharges into Fairfax Creek from the steep slope across Sir Francis Drake Boulevard to the south (CH2M, 2018a). The drainage area for this small tributary exhibits active landsliding and erosion, indicating a high rate of sediment production and delivery (CH2M, 2018a). This local source adds to the coarse sediment load flowing into the Project site from upper Fairfax Creek (CH2M, 2018a). In addition, a hydraulic constriction (formed by fill placed in the channel on the north side of the creek along with a bend in the creek channel) is located just downstream of the portion of the channel adjacent to the Nursery Basin (CH2M, 2018b). A field inspection conducted in February 2018 identified multiple gravel bar deposits in Fairfax Creek near the former Sunnyside Nursery site, two of which have a higher elevation and flatter gradient than the current stream bed, indicating deposition during peak flood backwater conditions that were caused by the existing hydraulic constriction. The deposits had been partially eroded by subsequent flows to form the current low flow/active (bankfull) channel (CH2M, 2018b). Field inspection of these older flood deposits in Fairfax Creek indicate past episode(s) of channel filling up to around 232 feet (present channel bed elevations are between 221 to 225 feet) (CH2M, 2018a). The age of the bars is unknown; however, preliminary indications are that they date from the extreme January 1982 flood, which was a greater than 100-year flood event known for its extensive erosion of hillslopes that delivered sediment to creek channels (CH2M, 2018a). A smaller, more recent bar was also observed in February 2018, indicating the same fill-and-cut process on a smaller scale (CH2M, 2018b).

In downtown San Anselmo, San Anselmo Creek flows beneath several buildings and pedestrian bridges. Of these, two are included in the Downtown San Anselmo site: 634-636 San Anselmo Avenue and 638 San Anselmo Avenue, which is just upstream of the 634-636 San Anselmo Avenue removal site. Underneath 638 San Anselmo Avenue, a 2- to 3-foot-high (above low water) gravel/cobble bar has formed by sediment deposition in the hydraulic backwater area created by the 634-636 San Anselmo Avenue building during storm runoff events. The gravel bar and low-flow channel are bounded by the 638 San Anselmo Avenue foundation structure that includes support piers and retaining walls. This bar has a surface ‘pavement’ of coarse gravels and cobbles with underlying finer gravels and sands (CH2M, 2018a). The underlying sediments are generally loosely consolidated except for the upstream head of the bar, where interlocking large cobbles and small boulders armor the bed.

4.9.1.3 Flooding

Historical Flooding

Flooding in Ross Valley has been documented since the early 20th century, and occurs when peak stormwater flows exceed the conveyance capacity of the stream channel (PBS&J, 2010). Floods in the Ross Valley watershed are generally flashy[2] and of short duration, lasting only 3 or 4 days (Federal Emergency Management Agency [FEMA], 2016). Flashy runoff patterns in the Ross Valley result from intense rainfall, the shape and steepness of the upper watershed surrounding the valley, and the lack of significant detention and infiltration in the urbanized valley (PBS&J, 2010). Floods may develop within 24 hours after the beginning of a flood-producing storm and will normally recede within 1 day after the end of the storm. Flood peaks occur generally within 3 to 5 hours after periods of intense rainfall and recede within 24 hours after the end of such storms (PBS&J 2010). Sheetflow flooding is caused by inadequate channel capacity and poor drainage in areas close to streams (FEMA, 2016). Bridge constrictions and poorly designed residential streambank stabilization structures have exacerbated flooding on this naturally flood-

2 “Flashy” describes a stream that exhibits significantly increased flows immediately following the onset of a precipitation event and a rapid return to pre-rain conditions shortly after the end of the precipitation.

prone system bridges constricting the channel increase overbank flooding onto the developed floodplains (PBS&J, 2010; CH2M, 2018a).

Historical accounts indicate that major storm events occurred in 1951, 1960, 1966, 1982-83, 1986, and 2005 (PBS&J, 2010). The flood of record, producing the largest recorded flood flows at Ross Gage, occurred in 1982, with a frequency of 150 years. The runoff resulted from a 32-hour rainstorm that became stationary and produced a continuous downpour that averaged about ¾-inch per hour for six hours. Most of the rain gages overflowed during the storm, so reliable statistics were unavailable, although part of the watershed had more than 15 inches of rainfall. The storm produced a peak flow at Lagunitas Road estimated at 7,200 cfs. The flood inundated all of the low areas of the watershed, causing considerable damage in San Anselmo, Ross, Kentfield, and Larkspur. During this period, major flooding occurred in the downtown area of the Town of San Anselmo along San Anselmo Avenue. Channel constrictions (bridges and enclosed channel segments, such as those shown in **Figures 4.9-3** and **4.9-4**) adjoining San Anselmo Avenue were the primary cause of the overbank flows. Trash buildup at these constrictions also added to the flood problem. Recent damaging flood events include those occurring in 1986, 1995, 1997, 2005, and 2017 (CH2M, 2018a). The December 31, 2005, flood was estimated to be 6,757 cfs at the Ross Gage, which included in-channel flow and out-of-channel flow (PBS&J, 2010).

Flooding Near Project Components

There are four critical reaches in the Ross Valley watershed where floodwaters overflow and escape from the creek during large floods, one each along Fairfax, Sleepy Hollow, San Anselmo, and Corte Madera/Ross Creeks (Stetson Engineers, Inc., 2011). The San Anselmo critical reach is within the Project area. **Figure 4.9-5** illustrates the 100-year floodplain in Ross Valley watershed; **Figure 4.9-6** identifies the FEMA flood hazard areas and floodways in the upper watershed and around downtown San Anselmo.

The peak discharge of San Anselmo Creek at the border between the Town of San Anselmo and Town of Ross during the 100-year flood[3] is 5,300 cubic feet per second (cfs) (FEMA 2016). During the 10-year flood, the peak discharge at this same location is 3,200 cfs (FEMA 2016). The existing conditions along the downtown reach of San Anselmo Creek are such that that there is approximately a 17 percent chance of flood flows leaving the channel in any given year (Stetson Engineers, Inc., 2011).

During larger floods, floodwaters overflow and escape from the creek, flowing for extended distances on the historical floodplain as separate side-streams apart from the main channel (Stetson Engineers, Inc., 2011). Flooding will occur along San Anselmo Creek during the 100-year flood between Calumet Avenue and Sycamore Avenue due to inadequate channel capacity and backwater caused by the development of commercial structures adjacent to and over the channel in the business district along San Anselmo Avenue. Floodwaters forced from the channel in this latter area will flow through the business and residential area west of San Anselmo Avenue in the form of

3 The “100-year flood” is the event with a 1% chance of occurring in any individual year. Similarly, the “10-year flood” is the event with a 10% chance of occurring in a year.

SOURCE: ESA

San Anselmo Flood Risk Reduction Project / 211432.07

Figure 4.9-3
Channel Constrictions Along San Anselmo Creek in Downtown San Anselmo

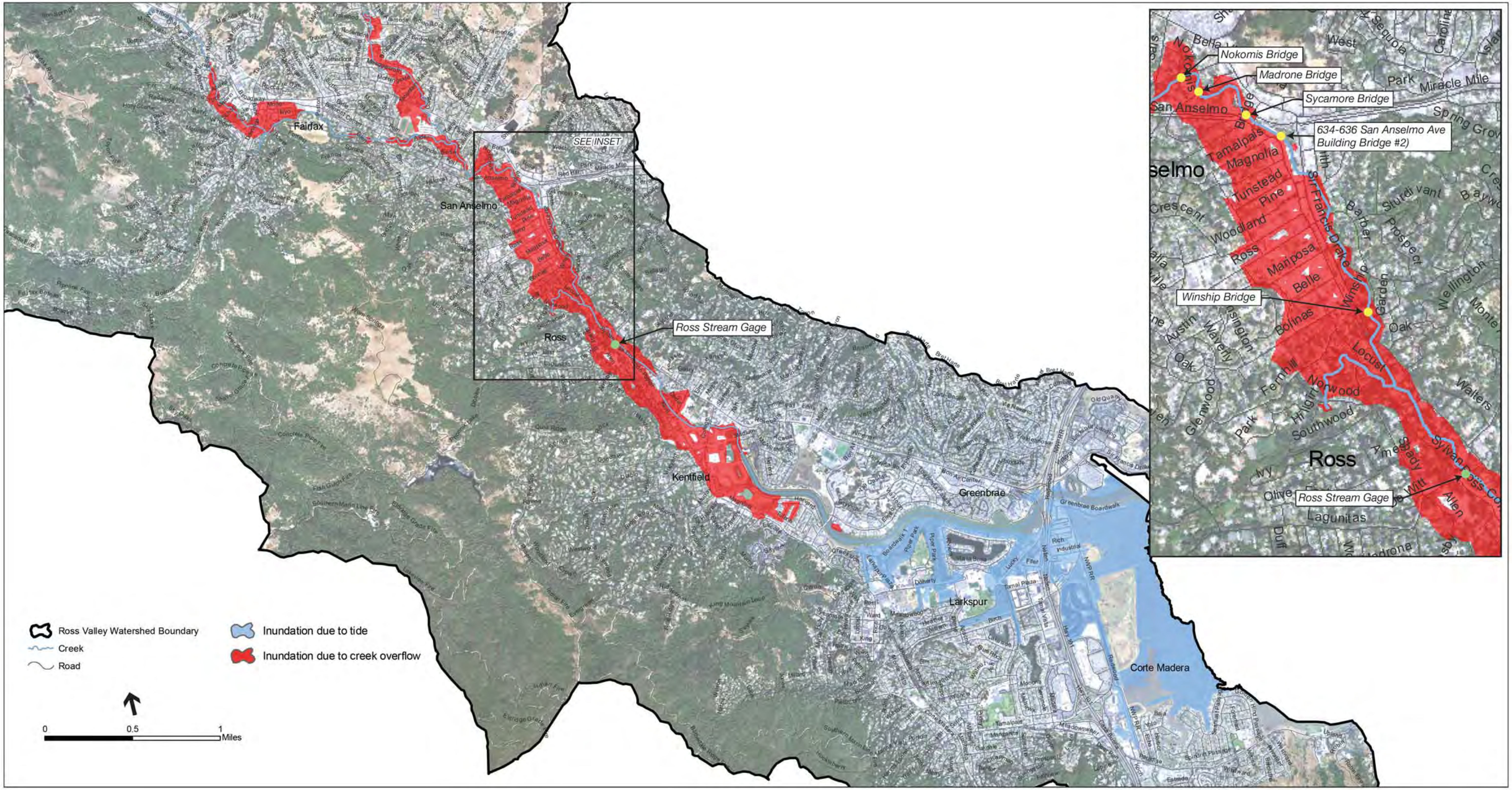
San Anselmo Flood Risk Reduction Project / 211432.07

SOURCE: ESA

Figure 4.9-4
Structures in San Anselmo Creek Supporting 634-636 San Anselmo Avenue

sheetflow (FEMA, 2016). The diverted flow then travels through San Anselmo, and rejoins the channel near its confluence with Ross Creek (PBS&J, 2010). San Anselmo Creek from Sir Francis Drake Boulevard to the Town of San Anselmo corporate limits will contain the flows remaining in the channel after the overflow in the downtown business district (FEMA, 2016). Flood overflows originating near downtown San Anselmo run down Sycamore Avenue and San Anselmo Avenue in San Anselmo, along Shady Lane in Ross, through Ross Commons and along Poplar Avenue in Ross and Kent Avenue in Kentfield before finally returning to the concrete-lined channel downstream of College Avenue in Kentfield. Consequently, these flood overflows are not in the channel at the USGS Ross Gage (PBS&J 2010).

Near White Hill School, close to the Town of Fairfax corporate limits and less than one-quarter mile from the Nursery Basin site, the peak discharge of the 100-year flood on Fairfax Creek is 960 cfs; during the 10-year flood, the peak discharge is 450 cfs (FEMA, 2016). The reach of Fairfax Creek adjacent to the Nursery Basin site is not a reach in which floodwaters overflow the creek channel and escape from the creek, according to FEMA (2009) and as supported by recent modeling work by Stetson Engineers (2018).



SOURCE: Stetson Engineers, Inc.

San Anselmo Flood Management Project . D211432.07

Figure 4.9-5
Inundation Areas During the One-Percent-Annual-Chance Exceedance Flood Event in Ross Valley

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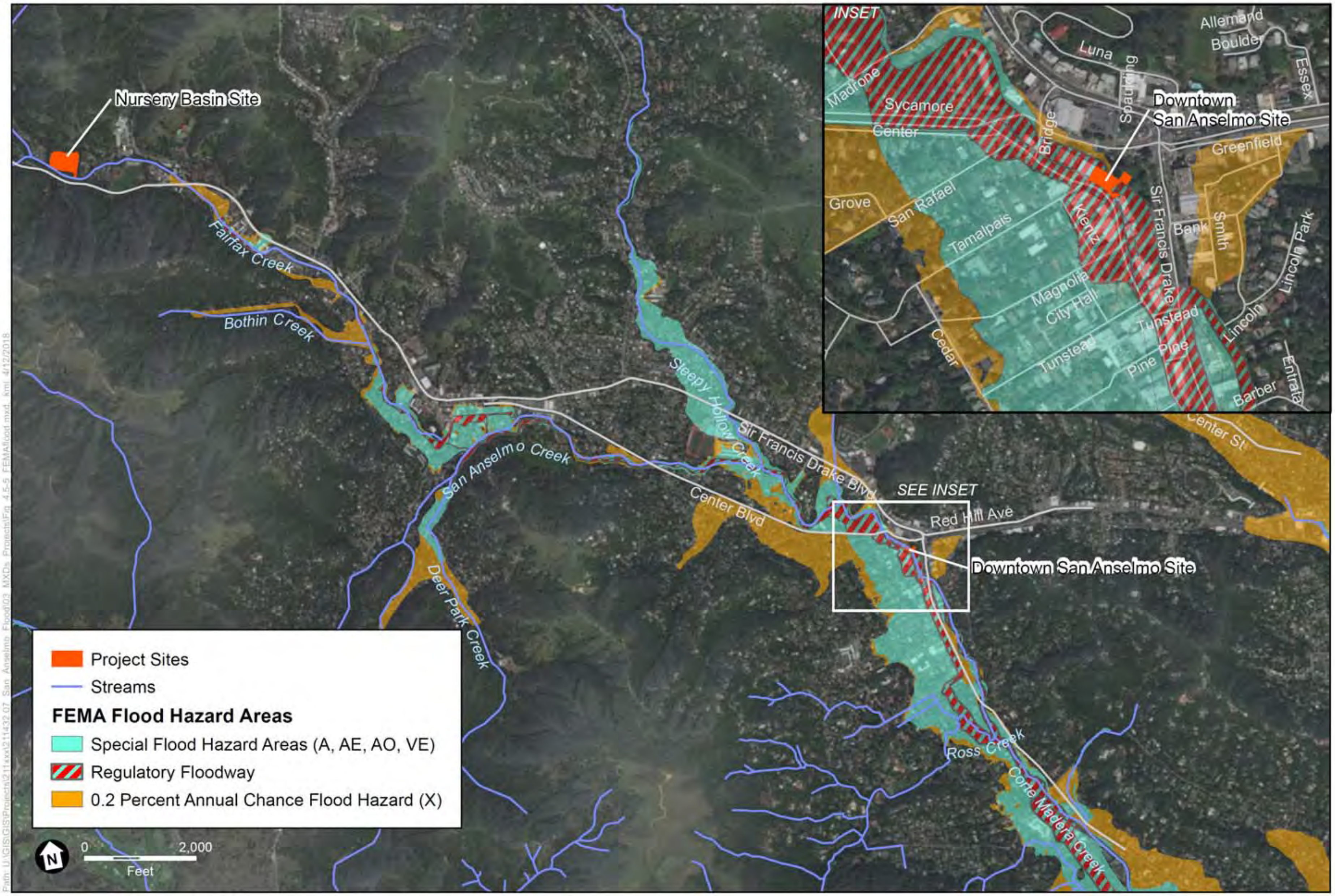


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; FEMA, 2017

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 4.9-6
FEMA Flood Hazard Areas

ESA

Flood Hazard Areas

Fluvial Flooding

The National Flood Insurance Act of 1968 and the Flood Disaster Prevention Act of 1973 established the National Flood Insurance Program (NFIP) to provide insurance coverage to property owners within flood hazard areas. The FEMA administers the NFIP and prepares Flood Insurance Studies (FISs) and associated Flood Insurance Rate Maps (FIRMs) to assist communities in local land use planning and flood control decision-making. Marin County entered into the NFIP in 1982, the date the original FIRM was published for the incorporated areas of the county. To qualify for the NFIP, Marin County adopted local floodplain development policies and now requires flood control measures for new construction and redevelopment projects within their jurisdiction (PBS&J, 2010).

The building at 634-636 San Anselmo Avenue is within the 100-year floodplain and regulatory floodway, as shown in Figure 4.9-6. The water surface elevation at 634-636 San Anselmo Avenue during the 100-year flood is approximately 43 feet NAVD (FEMA, 2016). For reference, the elevation of San Anselmo Avenue in that area is 48 feet. The Nursery Basin site has been determined to be outside the 0.2 percent annual chance floodplain (Zone X; FEMA, 2009).

Dam Inundation

Multiple reservoirs are located in Marin County. The Project sites are not located in dam inundation areas (Marin County, 2007). The nearest dam inundation area to Project components is located downstream along Ross and Corte Madera Creeks in Ross.

Tidal Flooding

In recent years, the scientific community has reached consensus that climate change and sea level rise are already occurring and likely to continue at an accelerating rate. California's position on climate change was formalized in Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006. As an expression of California's position on climate change, the State initially released its *State of California Sea-Level Rise Guidance Document* in 2010, updated it in 2013, and released a second update in 2018.

Adapting to Rising Tides – Flood Modeling

Locally, the San Francisco Bay Conservation and Development Commission has partnered with coastal engineers, flood managers, and technical experts as part of its Adapting to Rising Tides (ART) Program to develop locally specific, actionable sea level rise mapping and modeling products for planning purposes.

While the data relied upon for the ART Program mapping provides sea level rise projections for the San Francisco Bay at this time, scientific uncertainty remains regarding the rate and magnitude of sea level rise. Sea level rise projections beyond 2050 are highly dependent on assumptions regarding future global greenhouse gas emissions and future changes in the rate of land ice melting. In recognition of this uncertainty, the *State of California Sea-Level Rise Guidance* recommends an adaptive management approach for development in areas that may be subject to sea level rise beyond 2050. Adaptive management is an iterative process that involves monitoring conditions to evaluate whether an area could be inundated as a result of sea level rise, and identifying actions to be implemented to ensure that the area and existing structures are resilient to future flooding conditions.

The State of California released *Rising Seas in California: An Update on Sea-Level Rise Science* in 2017, which provides a synthesis of the state of the science on sea-level rise, and is the scientific foundation for the pending update to the *State of California Sea-Level Rise Guidance Document*. Included in *Rising Seas in California* are projections for sea level rise in the San Francisco Bay Area under different emissions scenarios (including a business-as-usual scenario, a stringent emissions reductions scenario, and two scenarios in between), and the probability of these scenarios. The peak level of the likely range of estimated sea-level rise at San Francisco Golden Gate under a business-as-usual scenario is approximately 3.4 feet by 2100 (Griggs et al., 2017). Projected sea-level rise by 2050 at San Francisco Golden Gate ranges to over one foot. Based on this updated sea level rise prediction, the MHHW+77 inches (i.e., mean higher high water plus 77 inches) of sea level rise scenario (approximating 36 inches of sea level rise and 100-year storm surge) from the ART Program maps was selected as the basis for this analysis.

Areas in Marin County within the Project area that would be susceptible to impact based on elevation and proximity to San Francisco Bay include:

1. Lower Corte Madera Creek south of Lagunitas Road in Ross to San Francisco Bay
2. Lower elevations in Larkspur
3. Corte Madera Marsh
4. Lower elevations in Corte Madera

Under this MHHW+77 inches scenario, none of the Project areas would be subject to tidal inundation. This information is presented here in the interest of public disclosure. Public Works agencies in coastal areas of California, including the Marin County Flood Control and Water Conservation District (Flood Control District), will need to review potential future impacts to their facilities and protect them accordingly.

Marin County's BayWAVE

Marin County's Bay Waterfront Adaptation Vulnerability Evaluation (BayWAVE) is a focused vulnerability assessment of the bayside Marin shoreline's susceptibility to sea level rise (SLR) and increased storms. BayWAVE evaluated the extent of impacted assets, assessed the sensitivity and adaptability of selected assets and will work with the local cities and towns to plan implementation of adaptation strategies. The USGS's Coastal Storm Modeling System (CoSMoS) was selected by Marin County to model sea level rise countywide. BayWAVE models six scenarios, the worst-case scenario of which is 60 inches of SLR with flooding from the 100-year storm. In the long-term scenario during the 100-year storm, none of the Project areas would be subject to inundation.

Inundated areas under both models are similar in extent and depth, though the ART modeling analyzes further upstream than BayWAVE. For this analysis, the ART Program maps are used to ensure consistency with larger statewide efforts, to capture more of the Project vicinity, and to reflect the best available science.

Tsunamis and Seiches

Tsunamis (seismic sea waves) are long-period waves that are typically caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides. Low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level are generally the most susceptible to tsunami inundation.

A seiche is caused by the oscillation of the surface of an enclosed body of water such as San Francisco Bay due to an earthquake or large wind event.

In 2009, the California Geological Survey, California Emergency Management Agency, and the Tsunami Research Center at the University of California completed the state's official tsunami inundation maps. None of the Project elements are within the tsunami inundation zone, which in Ross Valley extends from the bay shoreline inland along Corte Madera Creek to Kentfield (CalEMA, CGS, and USC, 2009).

4.9.1.4 Groundwater

In Marin County, areas of significant groundwater recharge typically include the portions of alluvial valleys that have not been subject to intensive urban or suburban developments, and the fractured bedrock that accepts infiltrated rainfall on the surrounding hillslopes (Marin County Community Development Agency, 2005). In general, significant zones of groundwater recharge are coincident with the areas delineated as significant groundwater basins, including the alluvial valley of Ross watershed (Marin County Community Development Agency, 2005).

The nearest named groundwater basin is the Ross Valley groundwater basin, which does not underlie any of the Project components. The Ross Valley groundwater basin is a small, coastal basin located in the cities of Corte Madera and Larkspur. It is bounded on the east by San Francisco Bay and the north by Corte Madera Creek (California Department of Water Resources [DWR], 2004). Existing beneficial uses for the Ross Valley Groundwater Basin are municipal, domestic, and agricultural water supply (RWQCB, 2017); however, groundwater in Ross Valley is used only for landscape irrigation (Marin County Community Development Agency, 2005).

Shallow unconfined groundwater is present at the Nursery Basin site, where subsurface conditions within the footprint of the basin consist of interbedded layers of gravel, sand, silt, and clay sediments overlying valley bedrock (hard mudstone and clay). The potentially water-bearing alluvial strata beneath the site have a significant fine-grained component, and are often separated by layers of non-expansive clay (CH2M, 2018c). Groundwater elevations in the basin during dry periods differ from elevations during storm events (CH2M, 2018c). During dry periods, the local groundwater is recharged by flows from Fairfax Creek. During precipitation events, groundwater levels rise to within 1-3 feet of the ground surface (CH2M, 2018c), reflecting increased runoff and subsurface flow from the hills to the north of the site.

4.9.1.5 Water Supply

The Marin Municipal Water District (MMWD) provides potable water to southern and eastern Marin County, including unincorporated Marin County near the Nursery Basin site and the

Towns of Fairfax and San Anselmo. Nearly 75 percent of MMWD's water originates as rainfall and runoff from the slopes of Mount Tamalpais and west Marin, and is collected in MMWD's seven reservoirs (MMWD, 2017). The seven reservoirs are Lagunitas, Phoenix, Alpine, Bon Tempe, Kent, Nicasio, and Soulajule. Only Phoenix Lake is within the Ross Valley watershed. Phoenix Lake drains to Ross Creek, which is tributary to Corte Madera creek. The confluence of Ross Creek and Corte Madera Creek is located downstream of all Project components. Over 25 percent of MMWD's water is imported from the Sonoma County Water Agency; this water originates from rainfall that flows into Lake Sonoma and Lake Mendocino, and is collected by the Sonoma County Water Agency via the Russian River.

4.9.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.9.2.1 Federal Regulations

Clean Water Act

Under the Clean Water Act (CWA) of 1977, the United States Environmental Protection Agency (USEPA) seeks to restore and maintain the chemical, physical, and biological integrity of the nation's waters by implementing water quality regulations. Multiple sections of the CWA apply to activities near or within surface or ground water.

Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (USACE) to regulate the discharge of dredged or fill material to waters of the U.S., including wetlands (33 U.S.C. Section 1344). The USACE issues site-specific individual or general (i.e., Nationwide) permits for such discharges.

Under Section 401 of the CWA, any applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters must provide the licensing or permitting agency with a certification that the discharge would comply with the applicable CWA provisions (33 U.S.C. Section 1341). If a federal permit is required, such as a USACE Section 404 Nationwide Permit for dredge and fill discharges, the Project proponent must also obtain a Section 401 Water Quality Certification from the RWQCB.

Section 402(p) of the CWA regulates discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) Program, a nationwide surface water discharge permit program for municipal and industrial point sources. In California, NPDES permitting authority is delegated to and administered by the nine RWQCBs. Under Section 402, the San Francisco Bay RWQCB has set standard conditions for each permittee in the Bay Area, including effluent limitation and monitoring programs. In addition to their responsibility to issue and enforce compliance with NPDES permits, the RWQCBs are responsible for preparation and revision of the relevant regional Water Quality Control Plan, also known as the Basin Plan (discussed further under State regulations).

Section 303(d) of the CWA requires that each State identify water bodies or segments of water bodies that are "impaired" (i.e., do not meet one or more of the water quality standards established by the State, even after point sources of pollution have been equipped with the minimum required levels of pollution control technology). USEPA must approve the 303(d) List before it is considered final. Inclusion of a water body on the Section 303(d) List of Impaired Water Bodies triggers development of a Total Maximum Daily Load (TMDL) for that water body and a plan to control the associated pollutant/stressor on the list. The TMDL is the maximum amount of a pollutant/stressor that a water body can assimilate and still meet the water quality standards. Typically, a TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The Basin Plan is amended to legally establish the TMDL and to specify regulatory compliance, including specification of waste load allocations for entities that have permitted discharges. **Table 4.9-1** lists the beneficial uses and impairment status of water bodies in the Project area, including the pollutants that cause the impairments.

Once a water body is placed on the 303(d) List of Water Quality Limited Segments, it remains on the list until a TMDL is adopted and the water quality standards are attained or there are sufficient data to demonstrate that water quality standards have been met and delisting should take place.

TABLE 4.9-1
BENEFICIAL USES AND IMPAIRMENT STATUS

Water Body	Beneficial Use(s)	Impairment Status	Pollutants
Fairfax Creek	Cold Freshwater Habitat (COLD), Fish Spawning (SPWN), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC-1), Noncontact Water Recreation (REC-2)	Not listed; drains to Corte Madera Creek	N/A
San Anselmo Creek	COLD, Fish Migration (MIGR), Preservation of Rare and Endangered Species (RARE), SPWN, WARM, WILD, REC-1, REC-2	Not listed; drains to Corte Madera Creek	N/A
Corte Madera Creek	Commercial and Sport Fishing (COMM), COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2, Navigation (NAV)	At least one beneficial use is not supported; a TMDL has been developed, and the approved implementation plan is expected to result in full attainment	Diazinon
San Francisco Bay Central	Industrial Service Supply (IND), Industrial Process Supply (PRO), COMM, Shellfish Harvesting (SHELL), Estuarine Habitat (EST), MIGR, RARE, SPWN, WILD, REC-1, REC-2, NAV	At least one beneficial use is not supported and a TMDL is needed	Chlordane, DDT, Dieldrin, Dioxin compounds, Furan compounds, Invasive species, Mercury, PCBs, Selenium, Trash

SOURCE: RWQCB, *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin*. With amendments adopted through May 4, 2017.

Federal Antidegradation Policy

The federal Antidegradation Policy, established in 1968 under Section 303 of the Clean Water Act, is designed to protect existing uses and water quality and national water resources. Implementation of antidegradation by the states is based on a set of procedures to be followed when evaluating activities that may impact the quality of the waters of the U.S. Antidegradation implementation is an integral component of a comprehensive approach to protecting and enhancing water quality of both surface water and groundwater.

National Flood Insurance Program

The FEMA determines flood elevations and floodplain boundaries based on USACE studies. FEMA also distributes the flood insurance rate maps used in the NFIP. These maps identify the locations of special flood hazard areas, including 100-year floodplains.

Federal regulations governing development in a floodplain are set forth in Title 44, Part 60 of the Code of Federal Regulations. Those regulations enable FEMA to require municipalities participating in the NFIP to adopt certain flood hazard reduction standards for construction and development in 100-year floodplains. These standards are included below in Local Regulations.

The NFIP sometimes further divides the one percent annual chance floodplain on a river into a floodway and floodway fringe (FEMA, 2016). The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights (FEMA, 2016). The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe, which encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of the 100-year flood by more than 1.0 foot at any point (FEMA, 2016). Figure 4.9-6 shows the flood hazard areas in the vicinity of the Project sites, described in greater detail above.

4.9.2.2 State Regulations

Porter-Cologne Water Quality Control Act

The State of California's Porter-Cologne Water Quality Control Act provides the basis for water quality regulation within California and assigns primary responsibility for the protection and enhancement of water quality to the State Water Resources Control Board (SWRCB) and the nine RWQCBs. Under the Porter-Cologne Act, the SWRCB and RWQCBs also have the responsibility of granting CWA NPDES permits and Waste Discharge Requirements (WDRs) for certain point-source and non-point discharges to waters. The Porter-Cologne Act allows the California SWRCB to adopt statewide Water Quality Control Plans and Basin Water Quality Control Plans, which serve as the legal, technical, and programmatic basis of water quality regulation statewide or for a particular region. The water quality control plans limit impacts on water quality from a variety of sources. The Basin Plan for the San Francisco Bay and the relevant permits are described below.

San Francisco Bay Water Quality Control Plan (Basin Plan)

San Francisco Bay waters are under the jurisdiction of the San Francisco Bay RWQCB, which established regulatory standards and objectives for water quality in the Bay in the Water Quality Control Plan for the San Francisco Bay Basin, commonly referred to as the Basin Plan. The Basin Plan identifies existing and potential beneficial uses for surface and ground waters and provides numerical and narrative water quality objectives designed to protect those uses. The preparation and adoption of water quality control plans is required by the California Water Code (Section 13240) and supported by the federal CWA. Because beneficial uses, together with their corresponding water quality objectives, can be defined pursuant to federal regulations as water quality standards, the Basin Plan is a regulatory reference for meeting the state and federal requirements for water quality control. Adoption or revision of surface water standards is subject to the approval of the USEPA.

The Project sites are located along Fairfax and San Anselmo Creeks, which drain to Central San Francisco Bay. Central San Francisco Bay extends from the San Rafael Bridge at the north to the Bay Bridge at the south, and from the eastern bay shore between these bridges to approximately Point Bonita in the west. The Central San Francisco Bay basin also includes watersheds that drain to this area of the Bay, including the Ross Valley Watershed. Beneficial uses of these water bodies are identified in Table 4.9-1.

NPDES General Permit and Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Order No. 2013-0001-DWQ)

In 2003, the SWRCB required small municipal storm drainage systems, including those in Marin, to be regulated under a statewide NPDES Small Municipal Separate Storm Sewer Systems (MS4s) General Permit. Areas that drain to separate stormwater collection systems, such as those within Marin County, were subject to this permit. The Marin County Stormwater Pollution Prevention Program (MCSTOPPP) Action Plan 2010 is the approved Storm Water Management Plan required under the 2003 MS4 permit. Each municipality complied with the 2003 MS4 permit by implementing Action Plan 2010 through a local stormwater program and through the collaborative efforts of MCSTOPPP (MCSTOPP Annual Report, 2013).

On February 5, 2013, the SWRCB adopted the General Permit for Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems, Order No. 2013-001-DWQ (2013 MS4 permit; SWRCB, 2013). The 2013 MS4 permit modified the 2003 MS4 permit by establishing the storm water management program requirements in the Order and defining the minimum acceptable elements of the municipal storm water management program (SWRCB, 2013). The required program includes specific elements related to program management, education and outreach on stormwater impacts, public involvement/ participation, illicit discharge detection and elimination, construction site stormwater runoff and control, pollution prevention/good housekeeping for permittee operations, post-construction stormwater management for new development and redevelopment, water quality monitoring requirements, program effectiveness assessment, and annual reporting. For renewal permittees such as Marin County, Fairfax, Ross, and San Anselmo, the guidance document must identify and describe Best

Management Practices (BMPs) included in their previous Stormwater Management Plan that may be more protective of water quality than the minimum requirements of the updated permit, and identify whether the permittee proposes to maintain, reduce, or cease implementation of the BMPs.

Marin County completed water quality testing in accordance with the Small MS4 General Stormwater Permit in 2016, including at one location along Corte Madera Creek (at Lagunitas Road Bridge). Constituents monitored included over one dozen pesticides (including diazinon); parameters also measured included organic carbon, suspended sediment, total dissolved solids, turbidity, water temperature, pH, electrical conductivity, and dissolved oxygen (MCSTOPPP and City of Petaluma, 2016). At the Lagunitas Road Bridge, diazinon was not detected during the three sampling events conducted, and dissolved oxygen concentrations met the water quality objective (MCSTOPPP and City of Petaluma, 2016).

NPDES General Permit for Discharges of Stormwater Associated with Construction Activities

Construction associated with the Project would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The Project would therefore be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines. This General Permit requires that storm water discharges and authorized non-storm water discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards (identified in the Basin Plan).

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to the following requirements:

1. Effluent standards
2. Erosion and sediment controls
3. Good site management (“housekeeping”)
4. Inspection, maintenance, and repair
5. Non-stormwater management
6. Monitoring and reporting requirements

7. Run-on and runoff controls

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent sediment and pollutants from contacting stormwater as well as non-storm water, and from moving offsite into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping/site management practices. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

Receiving water risk is based on whether the project drains to a sediment-sensitive water body. A sediment-sensitive water body is one that appears on the most recent 303(d) list for water bodies as impaired for sediment, has a USEPA-approved TMDL implementation plan for sediment, or has the beneficial uses of cold freshwater habitat, fish migration, and fish spawning. As shown in Table 4.9-1, while none of the water bodies near or downstream of the Project sites are listed as impaired for sediment or have a TMDL implementation plan for sediment, San Anselmo and Corte Madera Creeks have the beneficial uses of cold freshwater habitat, fish migration, and fish spawning and thus would be considered sediment-sensitive water bodies under the Construction General Permit.

Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In addition to stormwater discharges, the Construction General Permit also covers other non-storm water discharges including irrigation of vegetative erosion control measures, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by the Regional Water Board. The discharge of non storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;
2. The discharge does not violate any other provision of the General Permit;
3. The discharge is not prohibited by the applicable Basin Plan;
4. The discharger has included and implemented specific BMPs required by the General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.
5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs; and
7. The discharger reports the sampling information in the Annual Report.

In the Project area, the Construction General Permit is implemented and enforced by the San Francisco Bay RWQCB, which administers the stormwater permitting program. Dischargers are required to electronically submit a notice of intent (NOI) and permit registration documents (PRDs) in order to obtain coverage under this Construction General Permit. Dischargers are responsible for notifying the RWQCB of violations or incidents of non-compliance, as well as for submitting annual reports identifying deficiencies of the BMPs and how the deficiencies were corrected. The risk assessment and SWPPP must be prepared by a state Qualified SWPPP Developer and implementation of the SWPPP must be overseen by a state Qualified SWPPP Practitioner. A Legally Responsible Person, who is legally authorized to sign and certify PRDs, is responsible for obtaining coverage under the permit.

Waste Discharge Requirements and Water Quality Certification for Stream Maintenance Program

The Flood Control District has an existing Water Quality Certification (Clean Water Act Section 401) and Waste Discharge Requirements issued by the RWQCB to permit actions associated with its Stream Maintenance Program (SMP; SMP; Order No. R2-2017-0028). The SMP addresses actions necessary to continue providing flood protection and to maintain channel conveyance capacity while enhancing natural resources within subject streams. The routine management actions covered by this permit include sediment management, vegetation management, bank stabilization, and associated actions. This permit is renewed every 5 years, most recently in 2017. The details of the permit’s terms and conditions come largely from the Marin County Stream Maintenance Program Manual, which can be revised as needed (subject to RWQCB approval) to add new streams or new activities. The five categories of maintenance actions covered are (1) vegetation management, (2) sediment and debris removal, (3) erosion control, (4) maintenance and repair of flood control structures, and (5) levee maintenance. These activities can occur in flood control channels, natural channels, and other facilities on an as-needed basis.

The permit includes certain limits on the extents of channels and the volumes of material that can be addressed in a given year. Those limits are as follows:

1. Maximum length of maintenance within a concrete engineered flood control channels is 2,800 contiguous linear feet;
2. Maximum length of maintenance within an earthen engineered flood control channel is 800 contiguous linear feet;
3. Maximum length of maintenance within a natural channel is 600 contiguous linear feet;
4. Maximum volume of debris or sediment removed from any site is 2,100 cubic yards.

These activities may not exceed a program wide cumulative annual total of 5,000 linear feet of creek channel and 11,000 cubic yards of sediment and debris. Over the Order’s 5-year term, these activities may not exceed a program wide cumulative total of 25,000 linear feet and 55,000 cubic yards of sediment and debris. Exceptions to these limits may be approved by the RWQCB on a case-by-case basis. As discussed in the impacts analysis in Section 4.9.3, below, some of these limits may be exceeded by the added maintenance requirements of the Nursery Basin that would be constructed as part of the Project.

Lake and Streambed Alteration Agreement for Routine Maintenance Activities

The Flood Control District has an existing Lake and Streambed Alteration Agreement issued by CDFW under its (California Fish and Game Code Section 1602). This agreement/permit covers several categories of actions that are implemented regularly for ongoing flood control purposes. These activities are (1) vegetation management, (2) sediment and debris removal, (3) erosion control, (4) maintenance and repair of flood control structures, and (5) levee maintenance. Under this permit, the Flood Control District develops an annual work plan for the necessary activities and submits it to CDFW with follow-up reporting on those activities actually performed. This permit is renewed every 5 years, most recently in 2016.

4.9.2.3 Local Regulations

Marin County Stormwater Pollution Prevention Program

In 1993 MCSTOPPP was created to prevent stormwater pollution, protect and enhance water quality in creeks and wetlands, preserve beneficial uses of local waterways, and comply with State and federal regulations governing water quality. MCSTOPPP is composed of unincorporated Marin County, the Cities of Belvedere, Larkspur, Mill Valley, Novato, San Rafael, and Sausalito and the Towns of Corte Madera, Fairfax, Ross, San Anselmo, and Tiburon. The County’s local stormwater program is responsible for implementing MCSTOPPP. The local stormwater program is administered by the Department of Public Works / County Flood Control Division staff in cooperation with the Community Development Agency, Environmental Health Services, and Parks and Open Space (County of Marin, General Plan EIR, 2007). Each MCSTOPPP member agency implements a local stormwater pollution prevention program and funds the countywide MCSTOPPP, which provide for the coordination and consistency of approaches between the local stormwater programs.

MCSTOPPP acts as a separate implementing entity to meet 2013 MS4 permit obligations on behalf of all the municipalities and the County. Under the 2013 MS4 permit, the participating municipalities must implement best management practices for operations and maintenance activities, implement stormwater pollution prevention plans at corporation yards, document the amounts of litter removed, and provide an adequate number of litter receptacles in commercial and other litter source areas. Permit requirements are implemented by the County and staff from municipalities. Permit requirements also include operations and maintenance best management practices that municipalities apply to their own operations, public education and staff training, water quality monitoring, stormwater control ordinances, construction site controls, post-construction stormwater program, TMDL compliance tasks, and annual reporting (MCSTOPPP website, 2017). Marin County and the Towns of San Anselmo and Fairfax have adopted local stormwater runoff pollution prevention ordinances, as described below, which include BMPs that would apply to the Project.

Marin Countywide Plan

The Marin Countywide Plan would apply to the Nursery Basin site since the basin is in the unincorporated portion of Marin County just northwest of the Town of Fairfax. The following goals and policies are relevant to hydrology and water quality:

Water Resources

> **Goal WR-1: Healthy Watersheds.** Achieve and maintain proper ecological functioning of watersheds, including sediment transport, groundwater recharge and filtration, biological processes, and natural flood mitigation, while ensuring high-quality water.
>
> **Goal WR-2: Clean Water.** Ensure that surface and groundwater supplies are sufficiently unpolluted to support local natural communities, the health of the human population, and the viability of agriculture and other commercial uses.
>
> > ***Policy WR-2.3 Avoid Erosion and Sedimentation.*** Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and water bodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.
> >
> > ***Implementing Program: WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities.*** All projects should integrate stormwater pollution prevention design features for water quality protection to the extent feasible, such as those included in the BASMAA Start-at-the-Source manual and the Tools Handbook

The above-listed goals, policies, and implementing programs are implemented in the Marin County Code Chapter on Stormwater Pollution Prevention, discussed further below.

Marin County Municipal Code

In accordance with federal and state regulations, Marin County has adopted water quality standards applicable to areas within unincorporated Marin County.

Marin County Municipal Code Chapter 23.18, Stormwater Runoff Pollution Prevention

The intent of the chapter is to protect and enhance the water quality of Marin County's watercourses, water bodies and wetlands in a manner pursuant to and consistent with the Clean Water Act, the Porter-Cologne Water Quality Control Act (California Water Code Section 13000 et seq.), and the Phase II Small Municipal Separate Storm Sewer System (MS4) NPDES Permit, Water Quality Order No. 2013-0001-DWQ, General Permit No. CAS000004 (phase II stormwater permit) and subsequent revisions and amendments thereto.

The discharge of material other than stormwater to a county storm drain or to an Area of Special Biological Significance (ASBS)[4] is prohibited. All discharges of material other than stormwater must be in compliance with a NPDES permit issued for the discharge. (Section 28.18.061) Any person engaged in activities which will or may result in pollutants entering a county storm drain shall undertake all practicable measures to cease such activities and/or eliminate or reduce such pollutants. Such activities include, but are not limited to, ownership, operation and/or use of parking lots, gasoline stations, industrial facilities, commercial facilities, construction activities, and stores. However, some discharges that could be generated during construction, such as uncontaminated pumped groundwater, diverted stream flows, and flows from riparian habitats and wetlands are exempt from this discharge prohibition provided any pollutants in the discharges are identified and appropriate control measures to minimize the impacts of such discharges are developed and implemented.

In particular, Section 28.18.093 of the County Municipal Code requires implementation of construction-phase best management practices designed to protect water quality as follows:

> Any person performing construction activities in the county shall implement appropriate BMPs to prevent the discharge of construction wastes, including soil or sediment, or contaminants from construction materials, tools and equipment from entering a county storm drain, watercourse, bay or ocean. In addition:
>
> 1. Construction-phase BMPs include erosion and sediment controls and pollution prevention practices. Erosion control BMPs may include, but are not limited to, scheduling and timing of grading (soil disturbing) activities, timely revegetation of graded areas, the use of hydroseed and hydraulic mulches, and installation of erosion control blankets. Sediment control may include properly sized detention basins, dams, or filters to reduce entry of suspended sediment into the storm drain system and watercourses, and installation of construction entrances to prevent tracking of sediment onto adjacent streets. Pollution prevention practices may include designated washout areas or facilities, control of trash and recycled materials, covering of materials stored on-site, and proper location of and maintenance of temporary sanitary facilities. The combination of BMPs used, and their execution in the field, must be customized to the site using up-to-date standards and practices. The agency will provide references to current guidance manuals and BMP information on request.
> 2. Erosion and sediment control plan requirements.
>   a. An erosion and sediment control plan (ESCP) shall be required for:
>   i. Any project subject to a grading permit under Chapter 23.08, Excavating, Grading and Filling.

[4] Area of special biological significance (ASBS) means those areas designated by the California State Water Resources Control Board as ocean areas requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable. All areas of special biological significance are also classified as a subset of state water quality protection areas. ASBS are also referred to as state water quality protection areas—areas of special biological significance. The nearest ASBS to the Ross Valley watershed are located outside the Golden Gate (SWRCB, 2017).

ii. Any project subject to a building permit or other permit issued by the County that the agency determines has the potential for significant erosion and/or significant nonstormwater discharges of sediment and/or construction site waste.

b. The ESCP shall comply with County Code Section 24.04.625 and shall include information required in the most recent version of the MCSTOPPP ESCP applicant package.

In addition, Section 23.18.095 of the County Code requires watercourse protection as follows:

> Every person owning, occupying, leasing, renting, or in control of the premises through which a watercourse passes shall: (A) keep and maintain that part of the watercourse within the property reasonably free of trash, debris, excessive vegetation, and other obstacles which would and/or could pollute or contaminate the flow of water through the watercourse; (B) maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function or physical integrity of the watercourse; and (C) not remove healthy native bank vegetation beyond that actually necessary for said maintenance, nor remove any vegetation in such a manner as to increase the vulnerability of the watercourse to erosion.
>
> No person shall commit or cause to be committed any of the following acts, unless a written permit has first been obtained from the agency:
>
> 1. Discharge into a watercourse;
> 2. Modify the natural flow of water in a watercourse;
> 3. Deposit in or remove any material from a watercourse, including its banks, except as required for necessary maintenance;
> 4. Construct, alter, enlarge, connect to, change or remove any structure in a watercourse; or
> 5. Place any loose or unconsolidated material within a watercourse or so close to the side so as to cause a probability of such material being carried away by storm waters.

Marin County Watershed Program

Conceptually authorized by the Marin County Board of Supervisors in 2006, and formally authorized in 2008, the Marin County Watershed Program is run by the Marin County Department of Public Works. It is not a formal regulatory program but does have goals that are relevant to this Project. The program has multiple goals, including to protect, enhance, and restore habitat and water quality, improve efficiency of flood control maintenance operations, identify sea level rise adaptation strategies, and work with the natural watershed processes.

Town of San Anselmo General Plan

The Conservation Element of the Town of San Anselmo General Plan includes policies that are recommended to apply throughout the planning area, including the following policies relevant to hydrology and water quality:

1. Air, water, and noise pollution shall be prevented or minimized.
2. Activities causing damage to hydrological and biological processes shall be discouraged.

3. Streams shall be maintained in or restored to their natural state. A flood channel maintaining the natural settings on San Anselmo Creek and Sleepy Hollow Creek shall be of adequate width and properly maintained to allow passage of flood waters and preservation of riparian vegetation and habitat. Removal of vegetation on the hillsides should be closely controlled in order to minimize erosion, siltation of watercourses, and runoff.
4. Construction shall be located and designed to avoid or minimize the hazards from earthquake, erosion, landslides, floods, fire, and accidents.
5. Water supply, flood control, waste water and solid waste disposal, soil conservation, and open space preservation shall be coordinated to create the greatest public benefit and the least degree of environmental damage.

Town of San Anselmo Municipal Code

In accordance with federal and State regulations, the Town of San Anselmo has adopted water quality and flood control standards applicable in the Town.

Title 5 Sanitation and Health - Chapter 8 Urban Runoff Pollution Prevention

Under Section 5-8.06, the discharge of non-stormwater discharges to storm drains is prohibited. All discharges of material other than stormwater must be in compliance with an NPDES permit issued for the discharge. Any discharge that would result in or contribute to a violation of the Phase II Stormwater Permit and any amendment, revision, or reissuance thereof, either separately considered or when combined with other discharges, is prohibited.

1. Notification of intent and compliance with general permits. Each industrial discharger, discharger associated with construction activity, or other discharger, described in any general stormwater permit addressing such discharges, as may be adopted by the United States Environmental Protection Agency, SWRCB, or the RWQCB, shall provide Permit Registration Documents, comply with, and undertake all other activities required by any general stormwater permit applicable to such discharges.
2. Each discharger identified in an individual NPDES permit relating to stormwater discharges shall comply with and undertake all activities required by the NPDES permit.
3. Compliance with best management practices. Where best management practices guidelines or requirements have been adopted by any Federal, State of California, regional, and/or local agency, for any activity, operation, or facility that may cause or contribute to stormwater pollution or contamination, illicit discharges, and/or discharge of non-stormwater to the storm drains, every person undertaking such activity or operation, or owning or operating such facility shall comply with such guidelines or requirements as may be identified by the authorized enforcement official.

5-8.10: Construction-phase best management practices. Any person performing construction activities in the Town shall implement appropriate BMPs to prevent the discharge of construction wastes or contaminants from construction materials, tools, and equipment from entering storm drains or watercourse.

The Town has the authority to review designs and proposals for construction activities to determine whether adequate BMPs will be installed, implemented, and maintained during construction and after final stabilization.

Construction-phase BMPs include erosion and sediment controls and pollution prevention practices. Erosion control BMPs may include, but are not limited to, scheduling and timing of grading activities, timely revegetation of graded areas, the use of hydroseed and hydraulic mulches, and installation of erosion control blankets. Sediment control may include properly sized detention basins, dams, or filters to reduce entry of suspended sediment into the storm drain system and watercourses, and installation of construction entrances to prevent tracking of sediment onto adjacent streets. Pollution prevention practices may include designated washout areas or facilities, control of trash and recycled materials, tarping of materials stored on-site, and proper location of and maintenance of temporary sanitary facilities. The combination of BMPs used, and their execution in the field, must be customized to each site using up-to-date standards and practices. The Town will provide references to current guidance manuals and BMP information on request.

1. When required by the Phase II Stormwater Permit or by the Town, a project shall have an Erosion and Sediment Control Plan (ESCP) that addresses erosion and sediment control and pollution prevention during the construction phase, as well as final stabilization control measures. The ESCP and the specific control measures to be utilized shall be subject to the review and approval of the Town. The ESCP shall be implemented year round and shall be revised to reflect changing conditions on the project site. The Town shall require modifications of an approved ESCP if during the course of construction at a site unanticipated conditions occur, or the plans prove inadequate for the intended purpose. Revisions of the approved ESCP shall be submitted to the Town for review and approval. An Erosion and Sediment Control Plan (ESCP) shall be required for any project:
    a. Subject to a grading permit under Chapter 18 Excavation, Grading and Erosion Control;
    b. Subject to a building permit or other permit that has the potential for significant erosion and/or significant non-stormwater discharges of sediment and/or construction site waste;
    c. As required by the Town considering factors such as whether the project involves hillside soil disturbance, rainy season construction, construction near a creek or an intermittent or ephemeral drainageway, or any other condition or construction site activity that could lead to a non-stormwater discharge to a storm drain if not managed by effective implementation of an ESCP.
2. The ESCP shall be submitted for review and approval by the Town and shall include information required in the most recent version of the MCSTOPPP Construction Erosion and Sediment Control Plan Applicant Package. At a minimum, the ESCP shall include:
    a. Description of the proposed project and soil disturbing activity;
    b. Site specific construction-phase BMPs;
    c. Rationale for selecting the BMPs;
    d. List of applicable outside agency permits associated with the soil disturbing activity, such as: Construction General Permit (CGP); Clean Water Act Section 404 Permit; Clean Water Act Section 401 Water Quality Certification; Lake and Streambed Alteration Agreement (1600 Agreements).
3. If the project requires coverage under the CGP issued by the SWRCB, Permit Registration Documents must be filed with the SWRCB for said coverage, and a copy of the Waste

Discharge Identification Number shall be submitted to the Town prior to issuance of a permit for construction. The applicant may submit the Storm Water Pollution Prevention Plan (SWPPP) required by the General Construction Activity Stormwater Permit in lieu of the ESCP provided it meets the requirements of the ESCP.

4. Financial security may be required to ensure that temporary measures to control stormwater pollution are implemented and maintained during construction and after construction for a period determined by the Town. Financial security shall consist of an irrevocable letter of credit, cash deposit, or performance bond as determined by the Town.

5. When any work is being done contrary to the provisions of this article, the authorized enforcement official may order the work stopped by notice in writing served on any persons engaged in doing or causing the work to be done. Such work shall stop until the authorized enforcement official authorizes the work to proceed. This remedy is in addition to and does not supersede or limit any and all other remedies, both civil and criminal, provided in the Town of San Anselmo Municipal Code.

6. Implementation of an approved ESCP shall be a condition of the issuance of a building permit, a grading permit, or other permit issued by the Town for a project subject to this section. The ESCP shall be implemented year round and must be updated to reflect changing conditions on the project site. Any modifications to the ESCP shall be submitted to the Town for review and approval.

Title 7 Public Works - Chapter 11 Protection of Flood Hazard Areas

In order to accomplish its purposes, this chapter includes regulations to:

1. Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

2. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

3. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

4. Control filling, grading, dredging, and other development which may increase flood damage; and

5. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Title 7 Public Works - Chapter 12 Watercourses

Under Section 7-12.06, it is unlawful for any person to construct or repair any pier, retaining wall, slope protection structure, dam, bulkhead, building, bridge or other structure in, over, or within fifteen (15) feet of the bank of any watercourse within the Town without first obtaining a permit therefore from the Director of Public Works. Any and all such work done under such a permit shall be subject to inspection by the Public Works Department and/or the Building Department of the Town as the work progresses. Any person wishing to construct or repair any of the structures mentioned in Section 7-12.06 shall submit to the Department of Public Works an application, including a description of the work to be done, together with the materials to be used, and if the

Director of Public Works, or his representative, deems it necessary, plans and calculations prepared by a registered civil engineer all as described in this chapter.

Hydrologic design shall be predicated upon ultimate development of the tributary watershed, as described in Section 7-12.09. Flood flows to be used for the design of waterways, channels, and closed conduits shall accommodate existing flow or have minimum average recurrence intervals as defined in the code. Major waterways have a drainage area of four square miles or more and shall be designed for an average recurrence interval of 100 years.

Section 7-12.10 describes requirements for hydraulic design. For the solution of hydraulic design problems, the design engineer shall provide reference, model studies, reports, and prototype tests, as is necessary to confirm the hydraulic design. Open channel systems shall be designed to carry the quantity of flow determined as set forth in hydrologic design cross-section with adequate freeboard between design water surface and the top of bank. The hydraulic design of closed conduits outletting into open channels or waterways must limit and control excessive outlet velocities with an energy-dissipator structure, and endwalls must be adequately designed to protect the embankment.

Structures shall be designed and constructed so that hydraulic conditions for both the upstream and downstream waterway will not be altered in a way which would cause degradation, erosion, increased water surface elevation or other undesirable effects. In the case of slope protection, this requirement typically will necessitate the excavation of the creek bank to create a cavity to allow for the placement of slope protection material without reducing the cross sectional flow area of the drainage course.

All graded surfaces, including cut-and-fill slopes, shall be adequately protected against erosion by the installation of erosion-resistant planting or other appropriate measures. Permanent vegetation and other measures for erosion and sedimentation control shall be completed as soon as possible: however, such installation(s) shall be completed no later than two weeks prior to the onset of the rainy season except as provided in this section. The rainy season shall be considered as the period from October 15th to April 15th. Where cut slopes are not subject to erosion due to the erosion-resistant character of the materials. The Director of Public Works may waive the requirement to provide such protective devices.

Grading operations shall not be conducted during the rainy season except upon a clear demonstration, to the satisfaction of the Director of Public Works, that at no stage of the work will thereby create substantial increased risk of erosion, sliding or sediment discharge from the site. When grading operations are permitted during the rainy season, the smallest practicable area of erodible land shall be exposed at any one time during grading operations and the time of exposure shall be minimized.

Runoff shall not be discharged from the site in quantities or at velocities substantially above those which occurred before grading except into approved drainage facilities. The design and installation of erosion and sediment control facilities shall comply with the approved recommendations of the project designer involved in the preparation of the grading design. The specific erosion and sediment control measures to be utilized shall be in general accordance with the various measures described in the current "Manual of Standards for Erosion and Sediment Control Measures" published by the Association of Bay Area Governments (ABAG).

Town of Fairfax General Plan

As noted, the Project would not occur within the limits of the Town of Fairfax, so the General Plan elements and other Town codes or policies are not strictly relevant. However, they are provided here for informational purposes and to help the Flood Control District and other project partners to be inclusive of concerns from the broader community of stakeholders.

Conservation Element

Goal CON-3: Watershed and stream management

Objective CON-3.1: To preserve and restore creeks and waterways to their natural condition and preserve natural habitats and their connectivity.

***Policy CON-3.1.1*:** Maintain floodwater capacity and promote creek restoration.

Program CON-3.1.1.4: Assess, prioritize and coordinate with appropriate agencies to promote peak stormwater flow detention areas.

***Policy CON-3.1.3*:** Creeks that are channelized shall be restored and/or “daylighted” to improve aquatic habitat. Creeks in a natural state shall not be channelized where possible.

Town of Fairfax Municipal Code

In accordance with federal and State regulations, the Town of Fairfax has adopted water quality and flood control standards applicable in the Town.

Title 8: Health and Safety

Section 8.28.110 states that it is unlawful to build, construct or reconstruct any retaining wall, crib wall, bulkhead, bridge or other structure in, over, across or upon any creek, or to remove any tree within the flood level of any creek in the town, without first securing a permit.

CHAPTER 8.32: Urban Runoff Pollution Prevention

Section 8.32.020 includes discharge regulations and requirements applicable in the Town of Fairfax. The discharge of non-stormwater discharges to the town storm drain system is prohibited. With few exceptions, all discharges of material other than stormwater must be in compliance with an NPDES permit issued for the discharge. Among other exceptions, discharges due to diverted stream flows, uncontaminated pumped groundwater, and flows from riparian habitats and wetlands will not be considered a source of pollutants to waters of the US when properly managed, provided any pollutants in the discharges are identified and appropriate control measures to minimize the impacts of such discharges are developed and implemented.

Any discharge that would result in or contribute to a violation of the Phase II Stormwater Permit and any amendment, revision or reissuance thereof, either separately considered or when combined, with other discharges, is prohibited.

Any person engaged in activities which will or may result in pollutants entering the storm drains shall undertake all practicable measures to cease the activities, and/or eliminate or reduce the pollutants. The activities shall include, but not be limited to ownership and use of parking lots, gasoline stations, industrial facilities, commercial facilities, ground disturbing activities, and stores fronting town streets.

This Section also include construction-phase best management practices. Any person performing construction activities in the town shall implement appropriate BMPs to prevent the discharge of construction wastes or contaminants from construction materials, tools, and equipment from entering the storm drain system or watercourse. The town has the authority to review designs and proposals for construction activities to determine whether adequate BMPs will be installed, implemented, and maintained during construction and after final stabilization. Construction-phase BMPs include erosion and sediment controls and pollution prevention practices. Erosion control BMPs may include, but are not limited to, scheduling and timing of grading activities, timely revegetation of graded areas, the use of hydroseed and hydraulic mulches, and installation of erosion control blankets. Sediment control may include properly sized detention basins, dams, or filters to reduce entry of suspended sediment into the storm drain system and watercourses, and installation of construction entrances to prevent tracking of sediment onto adjacent streets. Pollution prevention practices may include designated washout areas or facilities, control of trash and recycled materials, tarping of materials stored on-site, and proper location of and maintenance of temporary sanitary facilities. The combination of BMPs used, and their execution in the field, must be customized to the site using up-to-date standards and practices. The agency will provide references to current guidance manuals and BMP information on request.

When required by the Phase II Stormwater Permit or by the town, a project shall have an Erosion and Sediment Control Plan (ESCP) which addresses erosion and sediment control and pollution prevention during the construction phase as well as final stabilization control measures. The ESCP and the specific control measures to be utilized shall be subject to the review and approval of the town. The ESCP shall be implemented year round and shall be revised to reflect changing conditions on the project site. The town shall require modifications of an approved ESCP if during the course of construction at a site unanticipated conditions occur or the plans prove inadequate for the intended purpose. Revisions of the approved ESCP shall be submitted to the town for review and approval. An Erosion and Sediment Control Plan (ESCP) shall be required for any project: subject to a grading permit under Chapter 12.20 Excavations Generally; subject to a building permit or other permit that has the potential for significant erosion and/or significant non-stormwater discharges of sediment and/or construction site waste; as required by the town considering factors such as whether the project involves hillside soil disturbance, rainy season construction, construction near a creek or an intermittent or ephemeral drainageway, or any other condition or construction site activity that could lead to a non-stormwater discharge to a storm drain if not managed by effective implementation of an ESCP.

The ESCP shall be submitted for review and approval by the town. The project applicant shall follow the most recent version of the MCSTOPPP Construction Erosion and Sediment Control Plan Applicant Package. At a minimum, the ESCP shall include:

1. Description of the proposed project and soil disturbing activity;
2. Site specific construction-phase BMPs;
3. Rationale for selecting the BMPs;
4. List of applicable outside agency permits associated with the soil disturbing activity, such as: Construction General Permit (CGP); Clean Water Act Section 404 Permit; Clean Water Act Section 401 Water Quality Certification; Lake and Streambed Alteration Agreement (1600 Agreements).

If the project requires coverage under the CGP issued by the SWRCB, Permit Registration Documents must be filed with the SWRCB for said coverage and a copy of the Waste Discharge Identification Number shall be submitted to the town prior to issuance of a permit for construction. The applicant may submit the Storm Water Pollution Prevention Plan (SWPPP) required by the General Construction Activity Stormwater Permit in lieu of the ESCP provided it meets the requirements of the ESCP.

Implementation of an approved ESCP shall be a condition of the issuance of a building permit, a grading permit, or other permit issued by the town for a project subject to this section. The ESCP shall be implemented year round and must be updated to reflect changing conditions on the project site. Any modifications to the ESCP shall be submitted to the town for review and approval.

Permanent stormwater controls for new development and redevelopment. The town may require, as a condition of project approval, permanent structural controls designed for the removal of sediment and other pollutants and for control on the volume and rate of stormwater runoff from the project's added or replaced impervious surfaces. These controls may include limits on impervious area. The selection and design of such controls shall be in general accordance with criteria established or recommended by federal, state, and local agencies, and where required by the BASMAA Post Construction Manual. Where physical and safety conditions allow, the preferred control measure is to retain drainage ways above ground and in as natural a state as possible or other biological methods such as bioretention areas. Where required by the Phase II Stormwater Permit Provision E.12, or where required by the nature and extent of a proposed project and where deemed appropriate by the agency, every applicant shall develop, submit and implement a Stormwater Control Plan (SCP) as described below:

1. The SCP shall follow the appropriate SCP template, based on project type, in the most recent version of the BASMAA Post Construction Manual.
2. The specific practices proposed in the SCP shall be subject to the review and approval of the town and shall be in general accordance with the BASMAA Post Construction Manual, and the Phase Il Stormwater Permit.
3. The SCP is separate and distinct from the ESCP requirements described in Section 8.32.020(E)(4).
4. All stormwater management facilities shall be designed in a manner to minimize the need for maintenance and reduce the chances of failure. Design guidelines are outlined in the BASMAA Post Construction Manual.

5. Where required by the town, as a condition precedent to the issuance of a building permit, the applicant shall submit a preliminary Stormwater Facilities Operation and Maintenance Plan (O&M Plan). The approval of the O&M Plan by the town is required prior to final inspection and approval of building permit closure.

6. All stormwater management facilities shall be maintained according to the approved O&M Plan. The person(s) or organization(s) responsible for maintenance shall be designated in the O&M Plan. The O&M Plan shall require that stormwater management facilities be inspected by those responsible for maintenance at least annually. The O&M Plan shall also describe how the maintenance will be funded. Upon the failure of a responsible person to maintain the stormwater management facilities in accordance with the O&M Plan, the town may perform the maintenance and recover its costs from the responsible person as provided in Section 8.32.030.

7. Where deemed appropriate by the town, the town shall have access to stormwater management facilities for inspections, as provided in Section 8.32.030, and through such means as may be appropriate, including, but not limited to, legal agreements, recorded covenants or easements, shall be provided by the property owner.

8. All project proponents and their successors, or successors in fee title, in control of project that is located within the town and that is defined as a Regulated Project in Provision E.12.c. of the Phase Il Stormwater Permit, or where required by the town, shall submit one of the following as a condition prior to final inspection and approval of building permit closure:

    i. The project proponent's signed statement accepting responsibility for the operations and maintenance of stormwater management facilities until such responsibility is legally transferred to another entity;

    ii. Written conditions in the sales or lease agreements or deed for the project that requires the buyer or lessee to assume responsibility for the operations and maintenance of the stormwater management facilities until such responsibility is legally transferred to another entity;

    iii. Written text in project deeds, or conditions, covenants and restrictions for multi-unit residential projects that require the homeowners association or, if there is no association, each individual owner to assume responsibility for the operation and maintenance of the stormwater management facilities until such responsibility is legally transferred to another entity; or

    iv. Any other legally enforceable agreement or mechanism, such as recordation in the property deed, that assigns the operation and maintenance of the stormwater management facilities to the project owner(s) or the town.

9. Financial security may be required to ensure that stormwater management facilities operate and are maintained following construction for a period which may be determined by the agency. Financial security shall consist of an irrevocable letter of credit, cash deposit, or performance bond as determined by the agency.

10. Notification of intent and compliance with general permits.

11. Each industrial discharger, discharger associated with construction activity or other discharger, described in any general stormwater permit addressing such discharges, as may be adopted by the United States Environmental Protection Agency, the state's Water Resources Control Board or the Regional Water Quality Control Board, shall provide Permit

Registration Documents, comply with, and undertake all other activities required by any general stormwater permit applicable to the discharges.

12. Each discharger identified in an individual NPDES permit relating to stormwater discharges shall comply with and undertake all activities required by the permit.

Compliance with best management practices. Where best management practices guidelines or requirements have been adopted by any federal, State of California, regional and/or local agency for any activity, operation or facility that may cause or contribute to stormwater pollution or contamination, illicit discharges and/or discharge of non-stormwater to the storm drain system, every person undertaking the activity or operation or owning or operating the facility shall comply with the guidelines or requirements as may be identified by the authorized enforcement official.

Watercourse protection.

1. Every person owning, occupying, leasing, renting or in control of premises through which a watercourse passes, shall:
    a. Keep and maintain that part of the watercourse within the property reasonably free of trash, debris, excessive vegetation and other obstacles which would and/or could pollute, contaminate or significantly retard the flow of water through the watercourse;
    b. Maintain existing privately-owned structures within or adjacent to a watercourse, so that the structures will not become a hazard to the use, function or physical integrity of the watercourse; and
    c. Not remove healthy bank vegetation beyond that actually necessary for the maintenance, nor remove the vegetation in a manner as to increase the vulnerability of the watercourse to erosion.
2. No person shall commit or cause to be committed any of the following acts, unless a written permit has first been obtained from the Town of Fairfax:
    a. Discharge into or connect any pipe or channel to a watercourse;
    b. Modify the natural flow of water in a watercourse;
    c. Deposit in, plant in or remove any material from a watercourse including its banks, except as required for necessary maintenance; and
    d. Construct, alter, enlarge, connect to, change or remove any structure in a watercourse; or place any loose or unconsolidated material adjacent to or within a watercourse so as to cause a diversion of the flow, or to cause a probability of the material being carried away by storm waters passing through the watercourse.

4.9.3 Impacts and Mitigation Measures

4.9.3.1 Significance Criteria

Consistent with Appendix G of the State CEQA *Guidelines* and with Appendices K and N of the Marin County Environmental Review Guidelines, the Project could have a significant impact if it would:

a) Violate any water quality standards or waste discharge requirements;

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;

e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

f) Otherwise substantially degrade water quality;

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows;

i) Expose people or structures to a significant risk of loss, injury or death involving increased risk of flooding (either on- or off-site), including flooding as a result of the failure of a levee or dam; or

j) Inundation by seiche, tsunami, or mudflow.

Refer to Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources for a discussion of the risk from mudflows and other landslides. Section 4.7 also discusses several federal and state standards for levee and dam design, construction, and inspection, which are referenced in the impact analysis discussion that follows.

The following topics are not analyzed further in this section for the reasons described below:

1. ***Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.*** The Project consists of stormwater flood risk reduction in portions of the Ross Valley watershed, including construction of a stormwater FDS basin and diversion structure adjacent to and within Fairfax Creek, along with associated stormwater drainage structures connecting the basin drain to Fairfax Creek. The Project would detain peak stormwater during high-flow periods, reducing demand on the capacity of existing stormwater drainage systems (which in this case are the creeks in the watershed). The potential for the Project to create or contribute additional sources of polluted runoff is addressed in Impact 4.9-1.

2. ***Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.*** The Project does not include housing development and, thus, would not involve construction of

new housing or structures for human occupancy within a 100-year flood hazard area mapped on a flood hazard delineation map. There would be no impact related to this criterion. The potential for the Project to alter flood flows in areas where housing currently exists is discussed below in Impact 4.9-4.

4.9.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in hydrology and water quality or other hydrology-related impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation and maintenance) impacts of the Project. Impacts are assessed based on changes to the existing conditions described earlier in this section. Mitigation measures are recommended, as necessary, to reduce significant impacts.

Construction Impacts

Construction-related effects on hydrology and water quality are direct or indirect impacts that could occur during construction, including construction and demolition activities as well as groundwater dewatering. The impact analysis considers whether compliance with regulatory requirements for these activities would ensure that these water quality-related impacts are less than significant during construction.

The analysis of flooding (including existing 100-year flooding and flooding associated with sea level rise) considers whether the Project sites are located within a potential flood zone and whether construction-related activities would impede or redirect flood flows. Impacts related to inundation by tsunami are considered significant if the Project site or staging areas are located within a potential tsunami inundation zone and whether construction-related activities would expose people or structures to a significant risk of loss, injury, or death.

Operational Impacts

Operational impacts are associated with long-term operation of the proposed facilities following completion of construction, including changes in water quality, depletion of groundwater resources, and changes in drainage and flooding patterns.

Water Quality. The analysis below evaluates the Project's potential to directly or indirectly increase inputs or mobilization of sediments or pollutants to the streams in the watershed during the operational phase of the Project, as well as whether routine operations and maintenance actions would increase turbidity in the streams themselves.

Groundwater Depletion. The analysis assesses whether there would be a direct or indirect change in the quantity, quality, or flow directions of groundwater from the long-term presence of the Project facilities or the operations and maintenance actions themselves. The analysis also considers whether the presence of Project facilities would impair natural groundwater recharge.

Flooding Patterns. Regarding operational flooding impacts, the California Supreme Court has determined that CEQA does not generally require lead agencies to consider how existing hazards or conditions might affect a project's users or residents, except where the project would exacerbate an existing environmental hazard.[5] Accordingly, hazards resulting from a project that places development in an existing or future flood hazard area are not considered impacts under CEQA unless the project would exacerbate the flood hazard or result in secondary water quality impacts as a result of flooding. This Project would not place new developments in flood hazard areas, and so that aspect of flood impacts is less relevant than is an assessment of whether the Project's designed and intended manipulation of stream flows, while generally reducing flood risk, might also worsen flood risk or severity. Accordingly, the analysis below evaluates whether the Project would exacerbate existing or future flood hazards in the Project area (including existing 100-year flooding and flooding associated with sea level rise) and result in a substantial risk of loss, injury, or death or secondary water quality impacts. The impact is considered significant if the project would exacerbate existing or future flood hazards or increase the frequency or severity of flooding in such a way as to substantially increase the threat to life and/or property.

Hydraulic modeling was performed to assess the Project's effects with regard to flooding. U.S. Army Corps of Engineers software HEC-RAS[6] version 5.0 was used for this purpose. With this software, a combined one-dimensional/two-dimensional unsteady-flow hydraulic model[7] for the Corte Madera Creek watershed (the model) was developed. The model was calibrated to one previous top of bank[8] event (on December 15, 2016) and one previous approximately 100-year flood (on December 31, 2005) on Corte Madera Creek. The model was validated with the January 4, 1982 flood event, and was peer-reviewed by the U.S. Army Corps of Engineers (Stetson, 2018). Three flood event types were modeled: a 10-year event, a 25-year event, and a 100-year event. By modeling these events it was possible to identify changes in flood patterns caused by the Project and to assess the extent to which those changes could present an increased risk of loss, injury, or death relative to the existing conditions.

Channel Morphology and Scour. Generally speaking, where hydraulic forces increase, the channel bed and banks could erode. Conversely, a decrease in hydraulic force (due to slowing and diverting water from the channel during operation of the basin, for example) could induce sediment deposition in the channel and, to a lesser extent, in the basin itself.

Model input was developed and refined based on existing data and information, including information about the Corte Madera Creek watershed geomorphology, flooding, sediment transport, and historical geomorphic and channel stability studies, most notably Stetson (Stetson, 2000), Marin County Watersheds, and the San Anselmo Historical Museum. Hydraulic properties important to

5 *California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal.4th 369.

6 The full name of the model is the "Hydrologic Engineering Center – River Analysis System".

7 Hydraulic models predict the depth and speed of water that will flow over a given location in a channel or floodplain in response to a given creek flow rate, such as the 100-year flood flow. In a one-dimensional (1d) hydraulic model the calculations are made at a series of cross sections surveyed at intervals across the channel and floodplain which might be spaced every 100 feet or more. In a two-dimensional (2d) model the predictions are made at cells across the channel and floodplain, which normally results in denser spatial coverage. A 1d model is very good at estimating the flow at which a channel will overflow and cause flooding, but less good at predicting where water will go once it escapes. A 2d model performs similarly at estimating flood depth in the channel but better predicts where flow will go once it escapes. Steady models run a single flow (e.g. the peak of the 100-year flow) continuously. Unsteady (or dynamic) models run the entire hydrograph with its rising, peak and falling stages. Steady models are generally more conservative than unsteady models because they assume that all parts of the creek and floodplain are receiving the peak flow simultaneously.

8 The maximum volume of water a stream channel can carry without overflowing.

sediment transport, including flow velocity[9], mean shear stress, and stream power, were generated as model output. Existing hydrologic and hydraulic conditions in the broader watershed were also modeled to estimate stream flow characteristics in areas not measured and subsequently aid in model calibration of the main channels. These models were used to analyze existing conditions and project scenarios (CH2M, 2018a); this modeling is also supporting analysis of other projects in the Ross Valley watershed, including the USACE's Corte Madera Creek Project and the Ross Valley Flood Protection and Watershed Program.

Shear stress influences the size of sediment mobilized on a channel bed and is an indication of the potential for channel bed erosion. Scour is the short-term erosion and lowering of the channel bed during peak flow conditions and is used to design protection for infrastructure such as bridges, retaining walls, and rock slope revetments. For this assessment, the bed material sediment sizes at each site were compared with HEC-RAS output and critical shear stress-particle size mobility relations developed by the USGS (USGS, 2008). Using this method, areas of the channels where the peak mean shear stress exceeded the critical shear stress needed to mobilize the sediments in the channel were identified. This comparison was used to determine whether a significant change in scour depth could occur at each site and, thus, produce a potentially significant impact.

4.9.3.3 Impacts and Mitigation Measures

Impact 4.9-1: Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. (*Less than Significant with Mitigation*)

Construction

Construction Site Stormwater Runoff - Both Project Sites

Construction of the creek capacity improvements in downtown San Anselmo, the Nursery Basin, and the diversion and overflow structure in Fairfax Creek could result in violations of water quality standards or waste discharge requirements. Construction could degrade water quality as a result of construction-related soil disturbance and discharge of construction stormwater. Additionally, fuels and other chemicals used during construction could also degrade the water quality of receiving waters if spilled and entrained into stormwater runoff or dewatering discharges.

The primary stormwater pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases. Hazardous materials associated with construction equipment and practices, such as fuels, oils, antifreeze, coolants, and other substances, could also adversely affect water quality if released to surface waters. Construction activities can impact a construction site's runoff sediment supply and transport characteristics both during and after the construction phase. Excess sediment could be mobilized anywhere earthwork occurs, including at the Downtown San Anselmo site and the Nursery Basin

9 Forces acting on materials in the stream channel (such as sand, pebbles, and boulders) are directly related to the velocity of the stream flow over the materials (the flow velocity). Small changes in velocity can result in large changes in the force acting on materials in the stream channel.

site. Demolition and removal of the buildings at the Downtown San Anselmo site could also expose the creek to debris from construction activities. Additionally, removal of any existing vegetation or impervious surfaces/walls would expose underlying soils that were previously not as susceptible to erosion. Contact with loose bare soil could entrain sediments into the runoff causing sedimentation of the water which could impact water quality in receiving waters downstream.

As explained in greater detail in Section 4.9.2 *Regulatory Setting*, the Flood Control District must comply with the Construction General Permit, because the Project would disturb more than one acre of ground. The Construction General Permit characterizes construction activities by the level of risk to water quality. This is determined using a combination of the sediment risk of the Project and the receiving water quality risk. Projects can be characterized as Risk Level 1, Risk Level 2, or Risk Level 3, with Risk Level 1 representing the lowest risk to receiving water quality. The minimum BMPs and monitoring that must be implemented during construction are based on the risk level. For Risk Level 1 sites, the Construction General Permit specifies minimum BMPs to be implemented that address good housekeeping practices (including those for managing hazardous materials used during construction); non-stormwater management, erosion, and sediment control; and run-on and runoff control. For construction activities characterized as higher risk levels, the minimum requirements identified for Risk Level 1 apply, as do other more stringent requirements. The BMPs are designed to prevent pollutants from coming into contact with stormwater and to keep eroded and/or stormwater pollutants from moving off-site into receiving waters. Pursuant to the Construction General Permit, a SWPPP would be prepared for the Project. The SWPPP would be prepared by a Qualified SWPPP Developer and submitted to the San Francisco Bay RWQCB prior to Project implementation, and would specify established BMPs to be used to control stormwater run-on/runoff and sediment (such as use of check dams and fiber rolls for reducing erosion on slopes and retaining sediment in stormwater) that would be implemented during construction. These BMPs would avoid or minimize stormwater and water quality effects caused by construction site runoff. Compliance with the CGP, including preparation and implementation of the SWPPP and associated BMPs as well as inspection and reporting, would effectively reduce degradation of surface water quality to a less-than-significant level.

Adherence to these requirements would also effectively reduce potential impacts associated with spills or leaks of hazardous materials and stormwater quality during construction and thus impacts would be less than significant.

Construction Dewatering – Both Project Sites

Construction dewatering at the Project sites would likely be required to create dry work areas for excavations (groundwater dewatering) and for work within the creek channel (areas separated from the surrounding creek by a cofferdam). Dewatering of groundwater from excavations typically would involve pumping water out of the excavated area into settlement tanks and, following appropriate on-site treatment, discharging the water over land or into municipal separate sewer systems and/or creek. Water pumped from within the cofferdam could be redirected to the creek channel downstream of the work area.

Sediment or other water pollutants originating from construction equipment, existing contaminated groundwater, or surrounding disturbed land could be released with the dewatered water, degrading surface water quality. The removed water could be contaminated with chemicals released from construction equipment, sediments from excavation, or, although unlikely (see Section 4.8, *Hazards and Hazardous Materials*), from contaminated groundwater from offsite sources. Waters isolated within cofferdam areas would likely contain high concentrations of sediment as a result of the amount of ground disturbance within the isolated work area. These discharges could violate water quality standards or substantially degrade water quality resulting in a potentially significant water quality impact.

Under the Clean Water Act, Section 402, discharging pollutants to receiving waters of the United States is prohibited unless the discharge is in compliance with an NPDES permit. Thus, discharge of non-stormwater from a trench or excavation that contains sediments or other pollutants to sanitary sewer, storm drain systems, or receiving waters is prohibited without first securing appropriate NPDES permit authorization. The State Water Board recognizes within the CGP that certain non-storm water discharges may be necessary for the completion of construction projects. Authorized non-storm water discharges may include uncontaminated groundwater dewatering, and other discharges not subject to a separate general NPDES permit adopted by a RWQCB. The CGP authorizes such discharges provided they meet the following conditions:

1. are infeasible to eliminate;
2. comply with BMPs as described in the SWPPP;
3. filter or treat, using appropriate technology, all dewatering discharges from sedimentation;
4. meet the Numeric Action Limits (NALs) for pH and turbidity; and
5. do not cause or contribute to a violation of water quality standards.

If the removed water from is found to be contaminated, to comply with the CGP requirements excavation dewatering would be collected, handled, and treated on-site and discharged in compliance with requirements of the CGP. California Water Code Section 13269 authorizes the RWQCB to waive WDRs for specific discharges or specific types of discharges to land where such a waiver is consistent with any applicable state or regional water quality control plan. Therefore, disposal of dewatering discharge would be required to comply with State permit conditions, either an NPDES Permit or a waiver (exemption) from the RWQCB.

Operation

Both Project Sites

The Project would not construct new impervious surfaces that could collect pollutants and wash them into the creeks or otherwise result in a new ongoing source of stormwater pollution.

The Downtown San Anselmo site would not include substantial new impervious area or other new potential sources of polluted runoff. The existing concrete staircase to the creek and the existing viewing platform would be replaced, as would existing sidewalk, with improvements of equivalent size. The creek banks would be graded, planted, and stabilized along the reach, and existing storm drains that empty into this portion of San Anselmo Creek would be replaced; slope protection would be installed at the storm drain outfalls. The Creek Park deck and stairway would also be replaced, ensuring a non-erodible pathway to the creek remains after the Project is complete.

The Nursery Basin would not be a lined basin; instead, the area would be maintained in a naturalistic state, allowing collected precipitation and groundwater to drain to Fairfax Creek through the gravity outlet pipe most of the time. Access to the site would be limited by fencing, and vehicle access would generally be limited to the maintenance road. The maintenance road along the basin perimeter would be surfaced with gravel. During wet weather events, once the gate on the diversion structure is activated and water from Fairfax Creek flows into the basin, sediment and other debris from Fairfax Creek may collect in the basin. The basin thus may trap sediment and other debris that otherwise would remain in Fairfax Creek. The Flood Control District would remove this material, as needed, from the basin to maintain basin capacity.

The Flood Control District also would conduct routine, annual removal of sediment deposited in the Fairfax Creek channel, generally during the dry season or after large storm events. The volume of deposited sediment would vary from year to year, depending on storm intensity and rainfall quantities. For planning purposes, however, it was estimated that a single 10-year storm event could deposit up to 1,600 cubic yards of sediment in the portion of Fairfax Creek immediately upstream of the diversion structure (CH2M 2018b). Removal of that deposited sediment would occur in accordance with the Flood Control District's Stream Maintenance Program, which includes requirements designed to reduce the impact of stream maintenance activities such as sediment and debris removal. In accordance with the Stream Maintenance Program, the Flood Control District would determine how and where to excavate sediments, such that the excavation is consistent with dominant fluvial geomorphic processes and the resulting channel optimizes sediment transport. The Flood Control District would list and justify the need for the sediment removal as part of the annual Pre-Project Notification submitted to the RWQCB for approval. Routine sediment removal would occur during the dry season (June 15 to October 31). Sediment removal would include a proposed sediment reuse or disposal location. Sediment may be temporarily stockpiled onsite for up to three days, or temporarily stockpiled offsite provided that runoff, sediment, or decant water from the excavated materials do not contact surface waters of the State of California. The Flood Control District or its contractor would have equipment and supplies onsite that could immediately be deployed as additional measures to minimize the levels of turbidity that exceed water quality objectives. Staging would occur on access roads or previously disturbed areas.

As discussed further in Impact 4.9-3, the volume of sediment deposited during larger storms could be sufficient to alter the function of the Nursery Basin such that sediment removal may be required between storms when the creek is flowing. Sediment removal activities in Fairfax Creek when the creek is flowing could adversely affect water quality by increasing turbidity and potentially releasing fuels and other chemicals associated with sediment removal equipment, a potentially significant impact. **Mitigation Measure 4.9-1, Implement Dewatering BMPs for In-Water Work**, would address this impact.

Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work

For in-water dewatering during sediment removal activities, the Flood Control District or its contractor(s) shall prepare a Dewatering Plan. The Dewatering Plan shall identify best management practices (BMPs) that ensure sediment removal activities meet water quality objectives. In-stream sediment removal shall follow approved and permitted dewatering practices for wet weather sediment removal during more infrequent flood events in Fairfax Creek. This work shall be timed to take place as flows are receding and only after instream measures to reduce downstream turbidity are in place. In addition, the Flood Control District shall implement the measures below, or whatever more stringent water quality protection measures are imposed by the RWQCB.

1. All work performed in-water shall be completed in a manner that meets the water quality objectives to ensure the protection of beneficial uses as specified in the Basin Plan
2. All dewatering and diversion methods shall be installed such that natural flow is maintained upstream and downstream of the project area.
3. Any temporary dams or diversion shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area.
4. Screened pumps shall be used in accordance with CDFW's fish screening criteria and in accordance with the NMFS Fish Screening Criteria for Anadromous Salmonids and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes
5. Cofferdams shall remain in place and functional throughout the in-stream construction or maintenance periods.
6. Disturbance of protected riparian vegetation shall be limited or avoided entirely.

Significance after Mitigation: Mitigation Measure 4.9-1 would reduce this potential impact on water quality to a less-than-significant level by requiring the implementation of standard BMPs to remove sediment from the dewatering discharge directed to receiving waters and to control the rate of discharge such that adverse effects related to runoff, flooding, and damage to adjacent structures would not occur.

Impact 4.9-2: The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (*Less than Significant)*

The Project would not lower the groundwater table as a result of groundwater extraction or through a substantive reduction in groundwater recharge. Project impacts relating to groundwater supplies and groundwater recharge are assessed below for both the construction phase and the operation phase.

Construction

Nursery Basin

No State-identified groundwater basins are identified beneath the Project area; however, unconfined groundwater was encountered during geotechnical investigations of the Nursery Basin site. Excavation may encounter shallow groundwater. If water were to accumulate in an open excavation as a result of groundwater seepage, dewatering could be required to maintain a dry working environment so that construction activities may proceed as discussed in Impact 4.9-1. Such dewatering could be required during excavations for the levees, the diversion structure, the basin interior, and other creek improvements. In the excavation expected for base of the diversion structure and the opening(s) within it the inflows are anticipated to be low because groundwater levels are no more than 3 feet above the bottom of the excavations. In the Nursery Basin, soils at the base of the excavation site were found to be clayey to silty soils with horizontal hydraulic conductivity of 1.6×10^{-5} centimeters per second, limiting the amount of water that would enter the basin during construction to low amounts (CH2M, 2018a).

Dewatering of open excavations, when necessary, would involve pumping water out of the excavated area and discharging it as discussed in detail under Impact 4.9-1, above. The affected groundwater for Project excavations would be from the shallow aquifer, which is not used as a source of municipal drinking water. Such dewatering activities would be limited to as-needed pumping, would be temporary in nature, and would only affect unconfined groundwater, and thus would not substantially affect local groundwater levels such that there would be a net deficit in aquifer volume or lowering of the local groundwater table. Additionally, any impact to groundwater during construction would be confined to the vicinity of the excavation. Groundwater levels would return to pre-Project conditions once construction is completed.

Downtown San Anselmo Creek Capacity Improvements

Construction of the creek capacity improvements would not affect groundwater supplies. Construction would involve the removal of the building at 634-636 San Anselmo Avenue and associated improvements. These activities would not interfere with groundwater recharge as no impervious surfaces would be constructed as part of the Project. Construction excavations may intersect the groundwater table but would not cause a net deficit in aquifer volume or lower the local groundwater table. The creek capacity improvements would have no impact on groundwater.

Operation

No long-term groundwater dewatering would be required as part of Project operation. The Project would not involve long-term groundwater extraction as part of operations and would not involve the addition of substantial new impervious surfaces that would impede groundwater recharge.

Nursery Basin

The potentially water-bearing alluvium beneath the Nursery Basin site has a substantial fine-grained component, layers of which are often separated by layers of lean clay (CH2M, 2018c). These materials are unlikely to have hydraulic conductivities capable of producing quantities of water that would affect the performance of the basin (CH2M, 2018c). The floor of the Nursery Basin is positioned within an intermediate lean clay layer, providing several feet of low permeability material beneath the basin (CH2M, 2018c). Groundwater modeling estimated that the average rise in groundwater across a distance of 525.8 feet would be less than 0.01 foot, indicating that there would be minor to no impact to local groundwater levels caused by basin operations (CH2M, 2018c). This minor change in groundwater would be temporary and not lower existing groundwater levels, making this impact less than significant.

Downtown San Anselmo Creek Capacity Improvements

Operation of the creek capacity improvements would reduce the amount of stormwater flowing over the floodplain, which typically increases groundwater recharge in areas with pervious surfaces. However, the existing floodplain in the Project area is composed almost entirely of impervious surfaces and so no groundwater recharge currently occurs during flood events. The creek capacity improvements would have no impact on groundwater.

The Project would not substantially deplete groundwater supplies or interfere with groundwater recharge; the impact would be less than significant.

Mitigation: None required.

Impact 4.9-3: The Project could alter existing drainage patterns, potentially causing new erosion or siltation. (*Less than Significant with Mitigation*)

In the following discussion, the separate effects of each Project element on erosion and sedimentation are first described qualitatively. Then, a detailed discussion of erosion and sedimentation impacts is based on implementation of both elements, because the combined effect of both elements was modeled to determine changes in flood inundation and extent. The effects of the Project combined with other projects that could alter existing patterns of flooding are evaluated in Chapter 5, *Growth-Inducing and Cumulative Effects*.

Construction

During construction of the various Project elements, soil disturbance associated with grading and earthmoving operations could expose soils to stormwater runoff, which could result in on-site erosion and sediments being transported in stormwater runoff, subsequently resulting in downstream siltation. Implementation of relevant construction-related BMPs identified in the SWPPP required by the CGP, discussed in detail in Impact 4.9-1, would decrease these impacts to less than significant.

Operation

Nursery Basin

During operation, the diversion structure in the Fairfax Creek channel would re-route large storm flows out of the creek and into the basin. These alterations to the existing drainage pattern would not result in substantial erosion on-site. However, the diversion structure placed in the creek to route flows could temporarily slow flows at that specific site. Slowed flows carrying sediment could deposit substantial amounts of sediments (across a range of sizes) in the channel behind the diversion structure, as discussed below. The Project would not involve the addition of substantial new impervious surfaces.

Dry Weather Operation. During most of the year and under almost all rainfall conditions except when flooding is observed downstream at the Fairfax Creek stream gage and/or the Ross stream gage, the Project would not alter the drainage pattern of the creek and the creek would flow unimpeded through the low-flow opening(s) in the diversion and overflow structure. The impacts of dry weather operation would be less than significant.

Peak-Flow Operation. The flood diversion and overflow structure would be designed to substantially alter the existing drainage and runoff pattern of Fairfax Creek subwatershed during peak flow events. During these peak flow events, a gate within a fully spanning concrete or other appropriate structure would be lowered so creek flows would rise and spill into the basin over the creek bank via a constructed side-weir or lower opening on the south side of the basin. During a 10-year event (i.e., 10 percent annual chance) and in less frequent flood events, the water surface elevation behind the diversion structure would increase to at least 235 feet; at which point water would flow over the designed low point in the diversion structure and continue into Fairfax Creek. During 25-year flood events (i.e., 4 percent annual chance events), the water surface elevation upstream of the diversion structure would be approximately 236 feet NAVD88, and water would similarly flow over the diversion structure. Finally, during a 100-year flood (i.e., 1 percent annual chance) event, the water surface elevation would be approximately 236.5 feet NAVD88. The detained water would be held in the basin and in the creek channel behind the diversion structure until the flood stage has decreased and then slowly drained back to the creek via gravity flow.

During operations, sediment deposition would be limited primarily within the Fairfax Creek channel (upstream of the diversion structure); some finer sediments could deposit in the lower southeast corner of the basin. Coarse sediments could be deposited in the Nursery Basin if Fairfax Creek's low flow channel is filled with sediment to 228 feet (CH2M, 2018a). Aspects of the basin operations would also be designed to manage collected debris. Sediment would first be screened from re-entering the creek by a riser pipe inlet and a gate to manage outflow from the basin, which are devices used to protect the drains from clogging. Access roads would be retained and added to facilitate cleaning and maintenance of the basin, the seasonal stream, and the basin drain. Maintenance would be completed by the Flood Control District. A more detailed description is included in Section 3.6 of the Project Description.

In the Fairfax Creek channel, during operation of the basin, sediment transport capacity upstream of the flood diversion and overflow structure would be reduced (CH2M, 2018a). Under current conditions, flood flows in this reach are adequate to maintain the low flow and bankfull channel by moving the coarse gravel to small cobble-sized channel bed materials downstream (CH2M, 2018a). During basin operations, this reach of Fairfax Creek would transport sand-sized or smaller sediments through the diversion structure, but gravel and larger bed materials would be deposited upstream of the diversion structure (CH2M, 2018a).

Sediment deposition would reduce the effective Nursery Basin capacity by varying amounts. For example, a 10-year event could deliver enough material to fill about 14 percent of the active channel below the elevation of the overflow portion of the diversion structure (235 feet NAVD88) between the channel and the basin. A 25-year storm event could deposit enough sediment to fill about 32 percent of the channel's storage volume below the overflow portion of the diversion structure. This increased sedimentation would reduce the effective capacity of the Nursery Basin by between one and two acre-feet, respectively. Increased sedimentation would also change the functioning of the diversion and storage system such that a portion of the peak flow of the storm may not be captured in the Nursery Basin. That peak flow would instead be passed over the diversion structure and continue downstream, limiting downstream decreases in flooding.

While sediment deposition in this reach could occur more frequently than under existing conditions, the general cycle of channel filling during large storm events followed by erosion and sediment transport during the remainder of the wet season would continue. Sediment and debris deposited during basin operations may fill in behind the diversion structure and thus reduce the basin's ability to drain after the storm. The gate on the structure would be designed to effectively transport sediment during smaller, more frequent flood events (the 5-year flood event, for example). Modeling would be performed during the design stage to properly determine the proper sizing and operation of the gate to support the intended flood risk reduction function and to allow sediment transport. Generally, gate would only be lowered during high flow events (the only times when the basin would operate), thus reducing the volume of sediment filling the channel during basin operations. The design elevation of the gate would be evaluated and informed by two-dimensional sediment transport modeling. More frequent flows during the wet season after operation of the basin would be able to pass through the diversion structure, and could remobilize some of the deposited gravel bed materials, which would help maintain the existing pattern of sediment aggradation and transport within Fairfax Creek.

Once the wet season has ended and the creek channel has dried, the Flood Control District would conduct annual sediment removal at Fairfax Creek along the Nursery Basin to maintain the existing capacity of the channel. The Flood Control District would conduct sediment removal in accordance with existing requirements of the Stream Maintenance Program. Pursuant to limits in the Stream Maintenance Program, no more than 2,100 cubic yards of material may be removed from any one site annually. The combination of sediment remobilization during low flow events and sediment removal during the dry season would reduce the amount of material accumulating in the channel behind the diversion structure each year. However, during years when very large (25-year event or larger) events occur, the volume of sediment deposited behind the diversion structure may be larger than 2,100 cubic yards. The Project could thus result in ongoing aggradation upstream of the diversion structure and increasing scour downstream, a potentially significant effect. Implementation of **Mitigation Measure 4.9-3a**, **Prioritize Nursery Basin Reach for Stream Maintenance**, would reduce this impact.

During large flow events, once the storage areas in the basin and creek channel are full, flows would pass over a designed low point in the diversion structure and continue down Fairfax Creek, increasing the hydraulic force downstream of the diversion structure and potentially increasing downstream scour. The Project includes installation of scour protection on Flood Control District property to reduce erosion of the existing bed downstream of the diversion structure.

Downtown San Anselmo Creek Capacity Improvements

The Project would remove the existing private commercial building at 634-636 San Anselmo Avenue, which is built directly above the creek and currently forms a substantial impairment to flows in San Anselmo Creek. Removing the building would improve channel capacity and allow flood waters to remain in the creek channel and reduce overflow of the creeks banks onto and around nearby streets and buildings. The increase in flow volume and velocity could result in increased erosion around existing structures in the creek, along creek banks, and in the channel bed.

Upstream of Downtown San Anselmo Site. Local hydraulic forces and sediment transport capacity would increase under the building at 638 San Anselmo Avenue and approximately 70 feet further upstream, to the Bridge Avenue bridge. Based on hydraulic modeling, the sizes and fraction of creek sediment mobilized during a 25-year event at 638 San Anselmo Avenue and further upstream would increase from 80 percent to 90 percent of the channel bed sediment with removal of the building at 634-636 San Anselmo Avenue (CH2M, 2018a). Scour could thus increase in the channel from the Project site upstream to the Bridge Avenue bridge, potentially undermining support piers and retaining walls under the building at 638 San Anselmo Avenue, channel banks, and the concrete sill and pipeline in the creek at Bridge Avenue. This would be a significant impact. Implementation of **Mitigation Measure 4.9-3b**, **Scour Analysis and Protection Measures**, would address this impact.

Downstream of Downtown San Anselmo Site. Removal of 634-636 San Anselmo Avenue would also slightly increase the maximum stream flow velocities, relative to existing conditions, from Barber Avenue past the Winship Bridge and to the Sir Francis Drake Bridge during the 25-year and 100-year events (Stetson Engineers, 2018). The existing channel flow velocities would vary from around 3-7 feet per second in this reach for these flood events.

Flow velocities are neither uniform nor steady in natural channels, and are not the only characteristic influencing erosion patterns (sediment load, channel lining characteristics, and upstream conditions also affect local patterns of erosion; Fischenich, 2001); however, as a general principle, higher flow velocities can be used to evaluate the potential for a stream to scour or erode away the stream banks or incise the channel bottom. The existing condition of the banks and channel influence the resistance to this erosive potential: noncohesive, unvegetated dirt slopes have low resistance, while mature riparian vegetation has more resistance, and rock or other forms of armoring (e.g., retaining walls) have the most resistance (Fischenich, 2001). In the reach of San Anselmo Creek that would occasionally experience increased flow velocities (i.e., for a few hours at a time during large wet-weather events), the channel banks range from unvegetated to fully vegetated. In addition, several of the affected properties are protected by vertical retaining walls of varying age and condition.

To assess the potential for the increased flow velocities to substantially increase erosive potential, this analysis used the HEC-RAS hydrologic model's outputs of flow velocity as the measure of erosive potential. The modeled flow velocities in events of varying sizes (the 10-, 25-, and 100-year events) after Project implementation were compared to those same events under existing conditions. The results indicated that there would be no change in the flow velocities during a 10-year event. During a 25-year event, depending on the location along that stream reach, the flow velocities would increase by up to 4 percent; however, flow velocity increases at all of the affected locations would be within the existing range of flow velocity variability.[10] During a

[10] Determined by comparing the modeled future flow velocities along the creek channel to the standard deviation of the set of modeled existing flow velocities along the same channel. As noted previously, flow velocities vary widely in modeled existing conditions (between 3 and 7 feet per second). All modeled changes in flow velocities were within one standard deviation of the mean of existing flow velocities.

100-year event, the flow velocity would increase by 1 percent to 3 percent, which is also within the existing range of flow velocity variability (and is a reduced change relative to the 25-year event because the baseline conditions for the 100-year event are already high). These increases in flow velocities are small, and are within the range of variability in the existing conditions. The slight increases in maximum flow velocities and potential increases in scour and erosion that could arise from Project implementation also would occur only for brief periods in large and infrequent flood events, and in only a few locations. This impact would be less than significant.

Summary

The Project would not cause new erosion or siltation during construction with implementation of relevant construction-related BMPs identified in the SWPPP required by the CGP, discussed in detail in Impact 4.9-1. During operations at the Nursery Basin, sediment could deposit behind the diversion structure, a significant impact. **Mitigation Measure 4.9-3a, Prioritize Nursery Basin Reach for Stream Maintenance**, would address this impact. During operations near the Downtown San Anselmo site, scour would increase along San Anselmo Creek from the Downtown San Anselmo site upstream to the Bridge Avenue bridge, a significant impact. Implementation of **Mitigation Measure 4.9-3b, Scour Analysis and Protection Measures**, would address this impact. The Project would have a less-than-significant effect on erosion and sedimentation downstream of the Downtown San Anselmo site.

Mitigation Measure 4.9-3a. Prioritize Nursery Basin Reach for Stream Maintenance

The Stream Maintenance Program waste discharge requirements impose limits on the total volume of material allowed to be removed from all of the streams covered by that permit. In order to retain the design capacity of the Nursery Basin and the associated storage within the Fairfax Creek channel behind the diversion structure, the Flood Control District shall prioritize sediment removal at this site over other sites covered by the Stream Maintenance Program and shall remove all deposited sediment up to the maximum volume allowed under the existing permit (2,100 cubic yards). If deposited sediment still remains after removing the maximum volume, then this site shall be prioritized in subsequent years to remove the remaining sediment and any newly accumulated material, again up to the maximum allowed.

Mitigation Measure 4.9-3b. Scour Analysis and Protection Measures Upstream of the Downtown San Anselmo Site

Due to the dependence of erosion and sedimentation patterns on the bed-scale morphology of the new structures, measures to counter scour and sedimentation issues must be based on more advanced project design. To reduce Project impacts on erosion and sedimentation, the Flood Control District shall conduct a scour analysis for the San Anselmo Creek channel upstream of the Downtown San Anselmo site and then develop and implement appropriate scour countermeasures from the analysis into project design and operations. The analysis shall be based on at least 30 percent design and must evaluate the potential for scour and channel bank erosion including specifying the expected depth and lateral extent both immediately upstream and downstream of the Project site from 634-636 San Anselmo Avenue to Bridge Avenue bridge. The analysis shall recommend foundation designs and scour protection measures that protect structures to depths below potential scour, estimated using standard engineering methods. The Flood Control District shall implement the foundation designs and scour protection measures in final project design. Foundation design and scour protection measures commonly used to protect existing in-channel structures and banks and that could be implemented in this Project include but are not limited to:

1. Adding new rock revetment or extending the depth of existing rock revetments
2. Extending the foundations of vertical retaining walls using sheet pile or concrete

Significance after Mitigation: Less than Significant. Mitigation Measure 4.9-3a would avoid or reduce the volume of new sediment deposited by the Project between multiple high flow events by either incorporating design modifications into the Project that result in maintaining existing sediment transport capacity within Fairfax Creek channel or conducting sediment removal. Mitigation Measure 4.9-3b would reduce adverse effects of scour caused by the Project by requiring that existing structures be protected to depths below potential scour, based on advanced project design.

Impact 4.9-4: The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite. (*Significant and Unavoidable*)

As discussed in Chapter 3, *Project Description*, the purpose of the Project is to reduce the frequency and severity of flooding in portions of Ross Valley. The Project was designed to meet this goal by reducing the volume of peak stormwater flows in Fairfax and San Anselmo Creeks and increasing creek capacity by removing obstructions to flow. In the following subsections, the separate effects of each element on flooding is described generally; detailed discussion of flooding impacts is based on implementation of both elements, however, because the combined effect of both elements was modeled to determine changes in flood inundation and extent.

Chapter 5, *Growth-Inducing and Cumulative Effects*, evaluates the effects of the Project combined with other projects that could alter existing patterns of flooding, such as projects included in the Flood Control District's Ross Valley Flood Protection and Watershed Program.

Construction

During construction of the Project components, grading and earthmoving could alter local drainage patterns and redirect or concentrate stormflows, which could temporarily alter drainage patterns within and adjacent to the construction site and redirect or concentrate stormflows into the adjacent creeks.

Ground disturbance associated with Project construction activities at the Nursery Basin site could cause local changes in runoff patterns, but the effects of these changes on flooding would be limited because construction activity would occur during the dry season and the graded areas would continue to drain to Fairfax Creek unless specified otherwise in the SWPPP developed for the Project pursuant to the Construction General Permit. At 634-636 San Anselmo Avenue, ground-disturbing activities would also cause temporary local changes in runoff patterns, but the effects of these activities would be similarly reduced by implementation of best management practices from the Project's SWPPP that slow and control runoff to reduce erosion, discussed in Impact 4.9-1. These best management practices would also be effective in reducing effects on flooding caused by construction activities. Implementation of best management practices would reduce the effects of Project construction activities such that impacts would be less than significant.

Operation – Upstream of the Nursery Basin Site

The Project may change flooding inundation extent and depth adjacent to Fairfax Creek upstream of the Nursery Basin site. As discussed in greater detail in Impact 4.9-3, operation of the diversion structure may result in increased sedimentation upstream. By reducing the capacity of the Fairfax Creek channel, the additional sediment deposited in the creek may cause a minimal increase in the water surface elevation upstream of the Nursery Basin site during peak flow events. Presently, the 100-year flood water surface elevation in the Fairfax Creek channel starting from the western edge of the Nursery Basin site and extending upstream for 400 feet ranges from 233 to 238 feet NAVD88. The existing 25-year event water surface elevation is very similar. With increased sedimentation, the Project could change water surface elevations to between 236.5 to 238.5 feet during the 25-year storm event along this same stream reach. At these elevations, new inundation could occur on a portion of one parcel in an area of low channel banks upstream of the Sunnyside Bridge.

Operation – Downstream of the Nursery Basin

Stormwater runoff volumes and rates can increase significantly when drainage patterns are substantially altered such that flow is concentrated or when the impervious surface area is increased. The Project would not involve the addition of substantial new impervious surfaces, but would alter drainage in the vicinity of the basin and remove channel obstructions in downtown San Anselmo.

The Nursery Basin's system would alter the existing drainage of the site by detaining stormwater flows from Fairfax Creek in the basin under certain flow conditions. However, the Nursery Basin would not increase the amount of surface runoff in a manner that would result in flooding because it would attenuate stormwater flows by detaining them on-site. Removal of the commercial building at 634-636 San Anselmo Avenue would allow more flood flows to stay in the channel, which would reduce localized flooding, but which also could increase the water surface elevation in the creek downstream of the Project site, resulting in inundation depth increases in limited areas. In downtown San Anselmo, the Project would add approximately 190 cubic feet per second of capacity upstream of 638 San Anselmo Avenue and about 90 cubic feet per second of capacity upstream of Center Bridge (Stetson Engineers 2017a, 2017b).

The Project's effects on flood reduction would differ depending on the severity of the flood event. The Project's modeled flood reductions are described below for three types of flood events to characterize this variability. The 10-year event represents flooding with a 10 percent chance of being equaled or exceeded in any given year. The 25-year and 100-year events represent flooding with a 4 percent chance and 1 percent chance, respectively, of being equaled or exceeded in any given year. Due to the size of the Nursery Basin, the Project's greatest reduction in flooding would occur during more frequent storms (the 10-year event), when approximately 300 fewer parcels in unincorporated Fairfax, Fairfax, San Anselmo, and Ross would experience flooding and inundation depth would be decreased on 230 parcels in the floodplain. The depth of inundation associated with a 25-year event would also be reduced by the Project, though not by as much (reducing flooding depth on approximately 615 parcels in the floodplain; 20 parcels would be removed from the floodplain). The Project's reduction of flooding from a 100-year storm event is also limited because the basin's capacity is able to hold only a relatively small portion of that total runoff volume. With Project implementation, the depth of inundation would be reduced on approximately 470 parcels in the floodplain that currently experience flooding during the 100-year event, and 10 parcels would be removed from the floodplain.

Figures 3-13a, 3-13b, and 3-13c (in Chapter 3, *Project Description*) show the change in inundation depth caused by the Project during the 10-year event, illustrating the changes in flooding in three general areas of the watershed. These areas were chosen to capture the complete effects of the Project on existing flood patterns, and range from downtown Fairfax at the upstream end to lower downtown San Anselmo and Ross at the downstream end. Figures 3-14a, 3-14b, and 3-14c show the changes in inundation depth in these three areas during the 25-year event, and Figures 3-15a, 3-15b, and 3-15c show the changes in inundation depth during the 100-year event. **Table 4.9-2** summarizes the changes in inundation depth and extent in the three general areas of the watershed for the 10-year, 25-year, and 100-year events.

TABLE 4.9-2
CHANGE IN FLOOD INUNDATION DEPTH AND EXTENT IN FAIRFAX AND SAN ANSELMO

Q	Location	Maximum Inundation Depth Reduction in the Floodplain (inches)	Change in Inundation Extent	Inundation Depth Increase in areas of new flooding (inches; where relevant)
10	Fairfax	17	reduction	--
	Upper Downtown San Anselmo	20	reduction	--
	Lower Downtown San Anselmo	20	reduction	--
25	Fairfax	2	nearly zero	--
	Upper Downtown San Anselmo	6	nearly zero	--
	Lower Downtown San Anselmo	6	minor increase	4
100	Fairfax	4	nearly zero	--
	Upper Downtown San Anselmo	5	nearly zero	3
	Lower Downtown San Anselmo	5	nearly zero	3

SOURCE: Stetson Engineers, San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018; Stetson Engineers, Water Depth Change point GIS data for D30, D31, D33, December 12, 2017.

In addition, Table 3-1 (also in Chapter 3, *Project Description*) presents summaries of model results for the numbers of parcels that would be removed from the inundation area entirely, that would experience a reduced depth of inundation, or that would experience an increase in inundation depth. The last of those could include being added to a potential inundation area. For convenience, that table is presented again here as **Table 4.9-3**. It is important to note that increased inundation depth on a parcel or the addition of a parcel to the inundation area does not necessarily imply that the flooding reaches or damages a structure or that otherwise causes an adverse impact on those parcels. All of these results are discussed in greater detail below.

TABLE 4.9-3
MODELED PROJECT OUTCOMES ON PARCELS AFFECTED BY FLOODING

Flood Risk Change by Number of Parcels	10-year event	25-year event	100-year event
Removed from Inundated Area	300	20	10
Decreased Inundation Depth	230	615	470
Parcels with New Inundated Area or Increase in Depth	*0*	*20*	*20*
Total with Reduced Flood Risk	530	635	480
Total with Increased Flood Risk	*0*	*20*	*20*

SOURCE: Stetson Engineers, San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018; Stetson Engineers, Water Depth Change point GIS data for D30, D31, D33, December 12, 2017

The 10-year Flood Event

During the 10-year event, the Project would reduce the extent of inundation in Fairfax and downtown San Anselmo, as well as reduce the maximum depth of inundation by 17 and 20 inches, respectively. In the Fairfax area, flooding is anticipated to no longer occur in the area north of San Anselmo Creek and east of Bolinas Road. The depth of flooding in other areas of Fairfax would decline by up to 17 inches in locations along Fairfax Creek west of Bolinas Road.

In upper Downtown San Anselmo, the extent of inundation during the 10-year event would generally remain the same in the upstream portion north of San Rafael Avenue, with some reductions in the areas around Nokomis Avenue. Between San Rafael Avenue and Tunstead Avenue, the extent of inundation is substantially reduced. However, even in areas where the 10-year event inundation is not completely eliminated, the depth of inundation would be reduced throughout the area. Inundation depth in areas near San Anselmo Creek north of San Rafael Avenue would decline by up to 20 inches but typically by 6 to 12 inches. Along San Anselmo Avenue, depth of inundation would decrease by up to 18 inches. In lower Downtown San Anselmo, the extent of inundation during the 10-year event would also diminish substantially. Most areas between Pine Street and Fernhill Avenue would no longer be inundated. The extent of inundation surrounding Ross Creek would remain the same. Overall, the depth of inundation in most of downtown San Anselmo would decrease.

The 25-year Flood Event

During a 25-year flood event, the extent and depth of inundation in Fairfax would not substantially change with the Project. In upper downtown San Anselmo, the extent of inundation would remain about the same as without the Project, but the depth of inundation would decrease throughout the area. The largest decline in inundation depth (a 6-inch reduction) would occur in the vicinity of San Rafael and Tamalpais Avenues. A similar decline would occur in most of lower downtown San Anselmo, with the largest depth reduction occurring in areas north of Ross Creek.

While the Project would reduce flood risk on approximately 635 parcels (about 60 percent of parcels currently inundated) during the 25-year flood event, flooding inundation extent or depth would increase on portions of approximately 20 parcels along San Anselmo Creek channel upstream of the Sir Francis Drake Bridge in the block between Winship Avenue and Sir Francis Drake Boulevard. New inundation of up to approximately 4 inches could occur near the San Anselmo Creek channel in this area, illustrated in **Figure 4.9-7**. The depth of new inundation would taper to about 2 inches midway between Winship Avenue and Sir Francis Drake Boulevard. Removal of 634-636 San Anselmo Avenue would allow more water to remain in the channel, reducing the amount of water that overflows the channel upstream of 634-636 San Anselmo Avenue; this additional water then pools just upstream of Winship Avenue as flows there are constricted by the Winship Bridge.

The 100-year Flood Event

The Project's effects on flooding extent and depth are further reduced during increasingly severe storms. During the 100-year flood event, the Project would not change existing flooding inundation extent in Fairfax, but would slightly reduce inundation depth. Inundation depths in portions of upper downtown San Anselmo would decline by up to 5 inches, but in other areas would remain the same as existing flood conditions or increase slightly. Inundation extent would remain approximately the same as current conditions in both upper and lower downtown San Anselmo. In lower downtown San Anselmo, within areas that are currently inundated during the 100-year storm, the depth of inundation would increase by up to 3 inches east of Sir Francis Drake Boulevard between Barber Avenue and Winship Avenue. As with the 25-year event, the additional inundation in this area is caused by water that would have flowed onto the floodplain in downtown San Anselmo but with the Project instead remains in the channel until being forced out of bank upstream of Winship Bridge. There are approximately 20 parcels in this area of increased inundation depth. Inundation would not occur in any areas not already inundated during the 100-year event.

Summary

Though the Project would result in a net reduction in flooding for the 10-year and 25-year storms, the Project would result in some new flooding downstream of the Project area, upstream of the Sir Francis Drake Bridge and east of Sir Francis Drake Boulevard, and upstream of the Nursery Basin site, during the 25-year storm event. This would be a significant impact.

These are the modeled effects and outcomes of the Project if implemented independently. However, as discussed more fully in Chapter 5*, Growth-Inducing and Cumulative Effects*, several other flow-constraining bridges[11] in San Anselmo, Fairfax, and Ross would likely be removed and replaced in the near-term by the respective Towns with improved designs that allow greater flow volumes to pass downstream into Corte Madera Creek (formed at the confluence of San Anselmo Creek and Ross Creek), where the channel has greater capacity. One of these bridges is the Winship Bridge, and its replacement would remove barriers to flow and reduce channel constriction through the reach of San Anselmo Creek upstream to Barber Avenue, where new inundation would occur from the removal of 634-636 San Anselmo Avenue during the 25-year event. Thus, in the expected future condition, there would be no increase in flood inundation levels upstream of Winship Bridge due to the Project.

[11] The Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Blvd-Sycamore Avenue, and Winship Bridge Replacement Projects.

The near-term bridge replacement projects on San Anselmo Creek are part of the Ross Valley Flood Protection and Watershed Program, and their planned implementation is roughly contemporaneous with the Project (ranging from 2019 through 2022). The Ross Valley Flood Protection and Watershed Program also includes replacement of the Sir Francis Drake Bridge, but the timing of that replacement is less certain. The near-term bridge replacement projects are funded jointly by the California Department of Transportation, the Towns of Ross and San Anselmo (which are also the CEQA lead agencies), and by the Flood Control District. They are fully funded and very likely to occur as planned, which would avoid the potentially significant impact associated with increased inundation levels upstream of the Winship Bridge. However, because the Flood Control District cannot fully control implementation of the bridge replacement projects, the Project's impact on downstream flooding remains significant.

Upstream of the Nursery Basin site, during the 25-year event after sufficient sediment deposition behind the diversion structure, new inundation would occur on a portion of one parcel, a significant impact. While annual sediment removal proposed as part of the Project would reduce the volume of sediment accumulated behind the diversion structure, a single storm could produce enough sediment to cause new inundation during that same storm event, and so the Project's impact on upstream flooding remains significant.

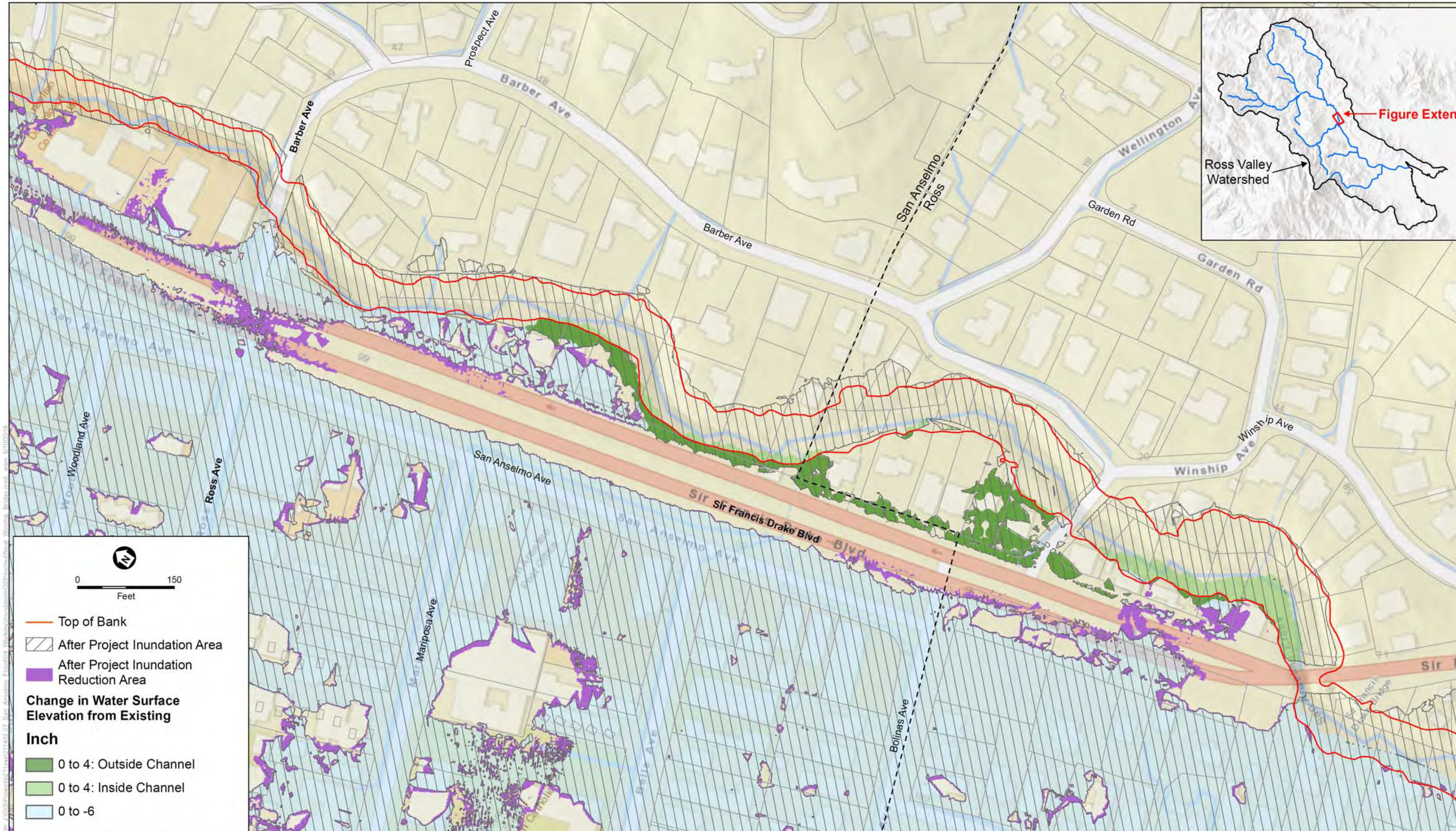
While generally the new inundation during the 25-year event would be below the finished first floor elevations of buildings upstream of the Nursery Basin site and upstream of the Sir Francis Drake Bridge, the water surface elevation may surpass first floor elevations in some areas. On parcels where the 25-year event flood would not reach the finished first-floors of any building, the new inundation would not increase risk of damage to property or loss of life. On parcels where the finished first floor elevation would be surpassed, the Flood Control District would implement **Mitigation Measure 4.9-4, Provide Flood Protection to Substantially Affected Areas** to apply flood risk reduction measures at those properties.

Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas

For areas upstream and downstream of the Winship Bridge (between Barber Avenue and the Sir Francis Drake Bridge): If the Winship Bridge Replacement Project is not completed prior to construction of the Project, the Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. The flood barriers shall be designed based on hydraulic modeling demonstrating that the flood barriers would protect existing habitable structures on any properties upstream of the Sir Francis Drake Bridge from new inundation during the 25-year event.

***For areas immediately upstream of the Nursery Basin site*:** The Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event.

***For both of those locations*:** The flood barriers would ensure that existing habitable structures would not be inundated by the 25-year event. Upon confirmation of permission by the property owners, the Flood Control District shall implement this measure, including implementing any measures identified in permits required from the California Department of Fish and Wildlife, Regional Water Quality Control Board, or other



SOURCE: Stetson, 2018

Map represents simulated changes in inundation depth and extent used to analyze flood impacts at the watershed scale. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors. Any future design work following the EIR would rely on more comprehensive specific site surveys.

ESA

San Anselmo Flood Risk Reduction Project

Figure 4.9-7
Inundation Changes Near Winship Bridge
25 - Year Flood Event: Lower San Anselmo

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regulatory agencies. However, the potentially adversely affected parcels are privately owned, and the Flood Control District cannot necessarily require the installation of flood barriers because the property owner(s) may specifically request that such measures not be implemented. In that case, this Mitigation Measure shall not be implemented and the affected parcels may experience an increased level of flood inundation in a 25-year event or larger.

Significance with Mitigation: Significant and Unavoidable. Mitigation Measure 4.9-4 would be implemented to avoid the potentially adverse effects of flooding resulting from changes to drainage patterns by installing flood barriers to contain the flows within the existing channel such that existing structures on affected parcels would not be flooded during the 25-year event (for areas upstream of the Winship Bridge, this would only occur if the Winship Bridge Replacement project is not completed prior to Project implementation). The additional flow containment barriers upstream of the Sir Francis Drake Bridge would not cause increased downstream flood risk because the creek channel capacity gets much larger immediately downstream of the Sir Francis Drake Bridge. Flood barriers upstream of the Nursery Basin site would not cause increased downstream flood risk because they would not redirect large volumes of flow back into the channel. Implementation of Mitigation Measure 4.9-4 would have other direct and indirect effects on the physical environment similar to those identified for the Project. These impacts are evaluated in other sections of this EIR and include emissions of criteria air pollutants and toxic air contaminants during construction, activities that could degrade water quality during construction, mortality or injury of special-status species and nesting birds, disturbance of wetlands during construction, and increase in downstream and upstream scour during operations. With implementation of the mitigation measures identified for these impacts in this document, the impacts of Mitigation Measure 4.9-4 would be less than significant. However, in the event that property owner permission to install flood barriers under Mitigation Measure 4.9-4 is not secured, the resultant impact would be significant and unavoidable.

Impact 4.9-5: The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows. (*Less than Significant*)

Construction and Operations

The Nursery Basin would not be within a 100-year flood hazard area along Fairfax Creek. It would, however, intentionally impede and redirect flood flows into an FDS basin to reduce downstream flood risk. This is not an adverse effect; rather, it is the intended function of the Project and would reduce risks associated with flooding and/or the unintended redirection of flood flows outside of the existing stream channels. The impact would be less than significant.

The Project would remove structures from a 100-year flood hazard area in downtown San Anselmo. Though this location is within a flood hazard area, the Project would not place structures there, and the impact would be less than significant. Changes in flooding patterns resulting from Project implementation are evaluated in Impact 4.9-4.

As discussed above, the Project would result in an overall net reduction in flooding depths and locations in Ross Valley, although there would be an increase in flood risk in some locations. The

Project's redirection of flood flows would not contribute to substantial additional flooding; therefore, the impact would be less than significant.

Mitigation: None required.

Impact 4.9-6: The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition. (*Less than Significant*)

The Project would result in a net reduction of the elevation and volume of peak flood flows within, upstream, and downstream of the Project sites. Impacts associated with increased sediment deposition caused by the Project are evaluated in Impact 4.9-3 and are not discussed in this impact. Changes in flooding resulting from alterations of existing drainage patterns are addressed in Impacts 4.9-4 and 4.9-5 and are not discussed in this impact. This impact evaluates the Project's potential to cause flooding as a result of the failure of a levee or dam.

Construction

Project construction would not expose people or structures to a significant risk involving flooding or other water-related hazards, including flooding as a result of the failure of a levee or dam. The Project would not include work that could jeopardize the function or safety of existing dams, levees, or other flood control devices. The Project site and adjacent staging areas for the Downtown San Anselmo Element are located within an existing 100-year flood zone. The staging areas for the construction of the Nursery Basin are not within the 100-year flood zone, although the construction footprint is partially within the Fairfax Creek channel, which could directly expose construction workers to flooding hazards, but is not expected to do so because Project construction at both sites would occur only during the dry season. There are also no dams upstream of the Project area that could expose construction workers to flooding as a result of the failure of a dam. Therefore, the Project would not expose people or structures to a significant flooding risk during Project construction.

Operation

Nursery Basin

Although the Project would not affect existing levees, dams, or other flood control mechanisms, the Nursery Basin would be a flood diversion and storage basin. This basin would temporarily detain peak stormwater during large storms that would otherwise pass downstream within Fairfax Creek and cause downstream flooding. The Nursery Basin would be built alongside Fairfax Creek to store flood flows. The proposed basin and berms would reduce flooding downstream, resulting in storage of water for up to eight hours behind levees in a location where water currently is not stored. The Nursery Basin would thus reduce downstream water-related hazards during large storms.

The existing elevation along the eastern boundary of the Former Sunnyside Nursery site is approximately 230 feet NAVD88. The bottom of the basin would be gently sloped from 226 feet NAVD88 in the west to approximately 224 feet NAVD88 in the east. As described in Chapter 3, *Project Description*, due to the existing topography, no levee would be required on the northern boundary of the basin, and the western boundary would require a low levee of up to approximately 2 feet above existing grade in order for the top of the levee to reach 238 feet NAVD88. The basin and diversion structure would be designed to impound water up to elevation 236 NAVD88. The water surface elevation within the basin thus would not be high enough to spill to the west should the western levee fail. In the unlikely event that the eastern levee fails during basin operation, the residential area to the east could be inundated by the volume of water in the basin above about 230 NAVD88. This residential area currently is not mapped as within a special flood hazard area or dam inundation area.

The basin's levees, the overflow weir, and the diversion structure would be designed to control and detain flood flows as their primary purpose. Modern flood control facilities are designed and constructed under conservative guidelines and criteria designed to prevent failure. Levee failure can occur when the difference between the hydrostatic pressure on the water side and dry side of the levee leads to seepage of water beneath the levee (also called underseepage). As discussed in Section 4.7, *Geology, Seismicity, Soils, and Paleontological Resources*, the basin and its levee would also be designed and constructed in accordance with federal and state standards and regulations, which include specifications for fill composition, compaction, procedures, and slope limitations that would reduce the risk of damage or failure during or after an earthquake. These standards include:

1. Designing the levee in accordance with the requirements established in Title 44, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10);
2. Performing an engineering analysis of the levee embankment's slope stability in general accordance with the procedures outlined in the California Department of Water Resources' "Urban Levee Design Criteria" (2012), EM 1110-2-1913, Design and Construction of Levees and EM 1110-2-1902, Slope Stability, ER 1110-2-1806 (Earthquake Design and Evaluation for Civil Works Projects, July 1995 - under revision); ER 1110-2-1156 (Safety of Dams - Policy and Procedures – in final review); EM 1110-2- 000 (Selection of Design Earthquakes and Associated Ground Motions – in final review); EM 110-2-6001 (Seismic Analysis of Embankment Dams – incl. levees – ongoing).
3. Perform a seepage analysis general accordance with the procedures outlined in the following USACE documents: EM 1110-2-1913, Design and Construction of Levees, EM-1110-2-1904, Seepage, and ETL 1110-2-569 Design Guidance for Levee Underseepage.

With modern design criteria and construction practices, including the analyses described below, the probability of levee failure is extremely small.

In accordance with modern construction practices, preliminary seepage, stability, and settlement analyses were performed for the levee on the eastern side of the basin and for the diversion structure. Based on these analyses, a shallow seepage wall is included in the Project along the eastern levee to limit underseepage and the potential for piping when the basin is in use. The seepage wall would consist of a vertical layer of compacted soil-bentonite fill approximately 3 feet thick and 7 feet deep along the eastern levee. The seepage wall would reduce underseepage by blocking seepage through a layer of sand (which has relatively high hydraulic conductivity);

the base of the seepage wall would be installed within an underlying clay layer, with a relatively low hydraulic conductivity (GEI 2017).

The foundation of the diversion structure would be over-excavated to remove poorly consolidated granular soils, and filled with compacted soils specified for the construction of the diversion structure (GEI 2017). Overexcavation and replacement with compacted, low conductivity fill would reduce the potential for underseepage.

In addition to removing destabilizing material and installing seepage control under the levee and diversion structure, these structures would be designed to withstand seismic hazards and flood hazards. The diversion structure would be designed to allow controlled flow over the structure during basin use (i.e., the 10-year event or anything greater than that). The levee and the diversion structure would also be inspected routinely to identify evidence of seepage (such as sand boils, seepage lines, or rodent burrows) or other deformation.

The Nursery Basin would be designed to avoid water-related hazards in the vicinity of the Nursery Basin. Implementation of the Project would reduce water-related hazards downstream of the Nursery Basin site during large storms.

Downtown San Anselmo

The Downtown San Anselmo Element of the Project would remove an existing commercial structure from the special flood hazard area and would not construct levees or other flood control or water detention facilities; for this reason, the Downtown San Anselmo Element would not result in adverse effects related to this topic.

Summary

Project construction would not expose people or structures to a significant risk involving flooding or other water-related hazards, including flooding as a result of the failure of a levee or dam. The Nursery Basin would include a levee and diversion structure, both of which would be designed and constructed in accordance with federal and state standards and regulations. The Downtown San Anselmo Element would not construct levees or other flood control or water detention facilities. For these reasons, impacts related to flooding as a result of levee or dam failure would be less than significant.

Mitigation: None required.

Impact 4.9-7: The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow. (*No Impact*)

Construction and Operation Phases

The Project would not expose people or structures to significant risk from inundation by a tsunami or seiche. The Marin County Emergency Operations Plan states that potential danger from tsunami inundation exists for all areas within one mile of the coast and less than 50 feet above sea level for tsunamis of distant origin, and for all areas within one mile of the coast and less than 100 feet above sea level for tsunamis of local origin (OEMS, 2015). The Project would not alter susceptibility to a tsunami or seiche because it is both inland from the Pacific Ocean and San Francisco Bay coastlines but also over 200 feet above mean sea level. This places it outside of the tsunami inundation zone. The Project elevation would also preclude inundation resulting from extreme high tide and future sea level rise. The Nursery Basin would not be constructed along a fault (as discussed in Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources) and would not be connected to open water; therefore, the Project would not directly or indirectly cause inundation by seiche. Mudflows and other Project impacts related to soils and geology are addressed in Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources.

Mitigation: None required.

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4.10 Land Use and Planning

This section describes the existing land use in the vicinity of the two San Anselmo Flood Risk Reduction Project (Project) sites and evaluates the potential for Project implementation to result in significant impacts from changes to land use or failure to comply with the land use planning policies in effect in the Project area. This section provides an overview of the physical and regulatory settings that apply to land use planning within the Project area, and presents and discusses potential impacts and identifies appropriate mitigation measures where necessary. The discussion in this section does not include or address land uses associated with agriculture, forestry, mining, or energy production, because those topics are addressed in Chapter 4, Section 4.4, *Energy, Mineral, Forest, and Agricultural Resource*s.

4.10.1 Environmental Setting

4.10.1.1 Regional Land Use Setting

The Project would take place at two locations in Marin County. The Downtown San Anselmo site is in the Town of San Anselmo, and the flood diversion and storage basin at the former Sunnyside Nursery site (Nursery Basin) is in unincorporated Marin County, adjacent to the western boundary of the Town of Fairfax.

Both locations are in the Ross Valley Watershed, which is drained by Corte Madera Creek, San Anselmo Creek, Fairfax Creek, and their tributaries. Governmental units in which the Project is located and have jurisdiction over land use and planning are the County of Marin and the Town of San Anselmo. A description of each jurisdiction with land use authority within the Project area is provided below. Based on the former Sunnyside Nursery site's proximity to the boundaries of the Town of Fairfax, information on the Town's land use policies are also presented here for informational purposes.

County of Marin Countywide Plan Land Use

Marin County consists of a mix of both rural and urban areas, with most of the more intensive urban development concentrated along or relatively nearby the U.S. Highway 101 corridor along the eastern portion of the County. The western portion of the County is almost exclusively rural, and is primarily given to agricultural uses; federal, state, and local parklands; and open space areas.

The County adopted its most recent Countywide Plan in 2007 (County of Marin, 2007a). Principal County land use categories as defined in the Countywide Plan that are within and adjacent to the flood diversion and storage basin at the former Sunnyside Nursery site include the following:

> **Agricultural.** Agricultural land use categories (AG 1-3) are established to preserve and protect a variety of agricultural uses, and to enable the potential for agricultural production and diversification. Historically, 60 acres has been the minimum parcel size for most agricultural lands in the county.

Residential. Residential development categories are established at a full range of densities, with an emphasis on providing more affordable housing. The principal Residential category is broken down into several subcategories, including the following residential use category which is adjacent to the Project area:

Rural/Residential. Rural/residential density land use categories (Single-Family 3-4 and Planned Residential with minimum lot sizes of 20,000 square feet to 10 acres) are established for single-family residential development in areas where public services are limited and on properties where physical hazards and/or natural resources may restrict development.

Open Space. Lands in public ownership for open space purposes, such as recreation, and watershed and habitat protection and management, are designated open space. In addition, private lands may be designated open space when subject to deed restrictions or other agreements limiting them to open space and compatible uses.

As part of the Countywide Plan's development, the County was divided into a number of defined "Corridors" within the plan, with the City-Centered Corridor containing most of the urban and built-up development in the County. The City-Centered Corridor is divided into six planning areas, generally based on watersheds. Both the former Sunnyside Nursery site and Downtown San Anselmo site are within the Upper Ross Valley Planning Area, which includes the Towns of Fairfax, Ross, and San Anselmo as well as the unincorporated neighborhoods west and southwest of Sleepy Hollow. **Figure 4.10-1** shows the general land use mix in unincorporated Marin County in the vicinity of the former Sunnyside Nursery site as identified in the Countywide Plan.

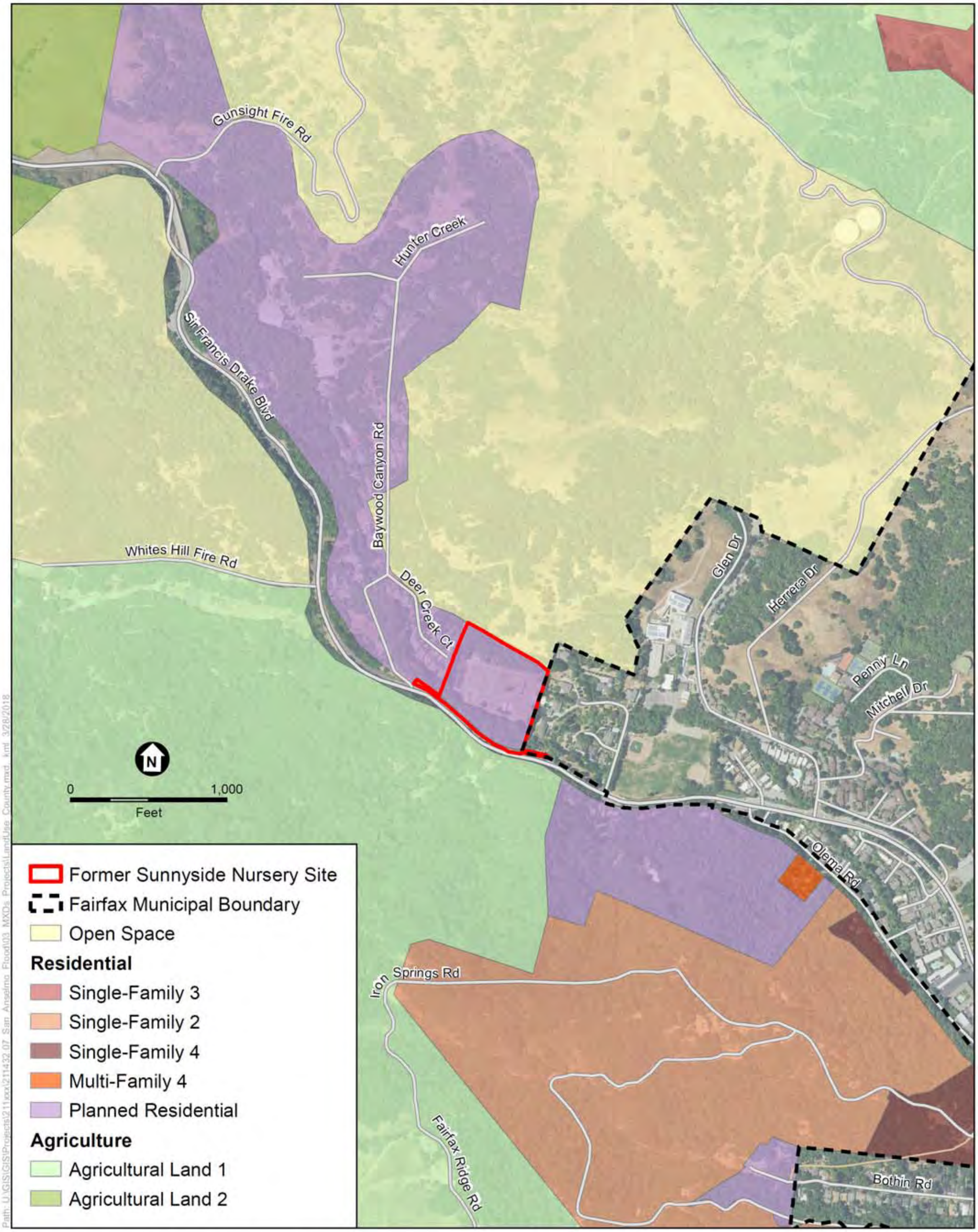
Town of San Anselmo General Plan Land Use

The Town of San Anselmo covers an area of approximately 2.7 square miles, and had a population of 12,336 in 2010 (U.S. Census, 2017). Development within the Town is primarily residential, but there is a substantial area of commercial development in the historic downtown area and along Sir Francis Drake Boulevard and Red Hill Road. San Anselmo is near buildout in terms of its maximum residential development provided for in its General Plan.

The Town of San Anselmo's latest fully adopted General Plan dates from 1988, with amendments as recent as 2015 (Town of San Anselmo, 2015). General Plan land use categories that are within and adjacent to the Downtown San Anselmo site include the following:

Commercial

Central Commercial. This area is located along portions of San Anselmo Avenue and Sir Francis Drake Boulevard between the Hub and Tunstead Avenue. This commercial area is intended to be the retail core of the community. Commercial enterprises in this area are expected to provide a continuity of commercial frontage and attractive area for pedestrian movement. Parking is not anticipated onsite, but would be provided in public or common parking lots within walking distance of all downtown businesses.



SOURCE: Marin Countywide Plan, 2007, amended through 2013

San Anselmo Flood Risk Reduction Project
Figure 4.10-1
Marin Countywide Plan Land Use Designations

ESA

Parks and Open Space

Public Parks and Open Space. This land use category designates existing and planned parks, recreation facilities, and natural open space areas. Areas designated as parks are not intended to be developed with anything other than small structures which accommodate the citizens of the community as it relates to recreation. Commercial structures are not allowed in the parks. The parks will only be improved with facilities for which the park was intended (e.g., tennis courts, baseball diamonds, and open playfields).

Figure 4.10-2 shows the general land use mix in the vicinity of the Downtown San Anselmo site identified in the Town of San Anselmo General Plan.

Town of Fairfax General Plan Land Use

Neither of the Project sites are within the jurisdictional boundaries of the Town of Fairfax, but the former Sunnyside Nursery site is immediately adjacent to the Town's western boundary. Therefore, information on the Town's land use designations is presented here for informational purposes.

The Town of Fairfax covers approximately 2.1 square miles and is home to about 7,500 people (Town of Fairfax, 2017). The portion of the Town with the highest development intensity is along Sir Francis Drake Boulevard, which is where most of the Town's commercial uses are located. Residential land uses are on the slopes and canyons that lie on either side of the valley. Much of the Town of Fairfax could be characterized as built-out, with most of the more easily-developed portions of the Town already occupied. Remaining parcels tend to be on slopes or in other areas where development is more challenging.

The Town of Fairfax adopted its most recent General Plan in 2012 (Town of Fairfax, 2012). The General Plan identified three primary land use categories for the Town; Commercial, Residential, and Public/Quasi-Public. The principal land use categories as defined in the Town of Fairfax General Plan that are within and adjacent to the flood diversion and storage basin at the former Sunnyside Nursery site are the following:

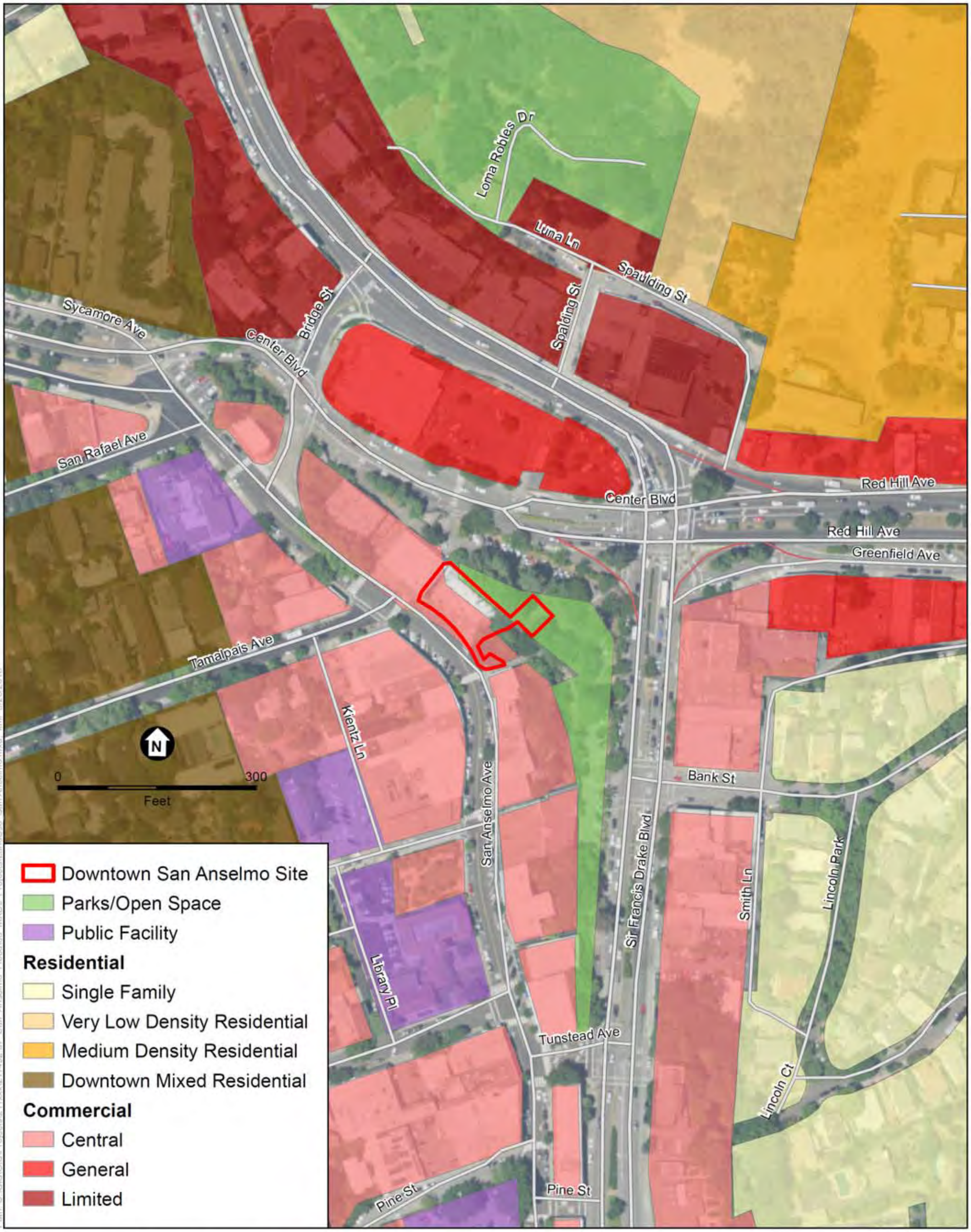
Residential

1. *Residential*: 0.25 dwellings unit/acre
2. *Residential*: 1 to 6 dwellings unit/acre
3. *Planned Development District*: No specific densities prescribed; the primary purpose for this designation is to allow flexibility in the development process while encouraging high quality design.

Public/Quasi-Public

1. *Public/Private Open Space*

Figure 4.10-3 shows the general land use mix in the vicinity of the former Sunnyside Nursery site identified in the Town of Fairfax General Plan.



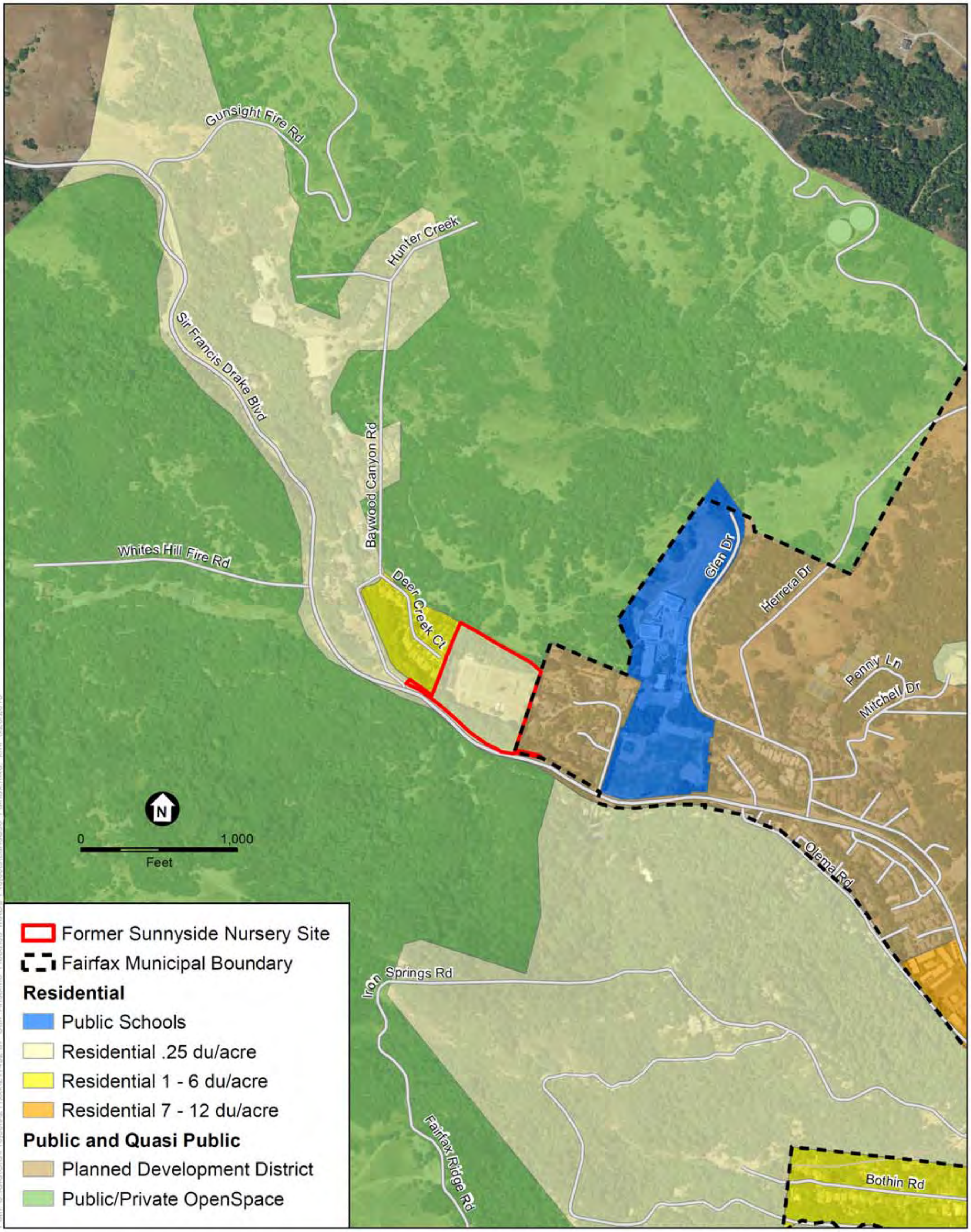
SOURCE: Town of San Anselmo General Plan, amended through 2015

San Anselmo Flood Risk Reduction Project

Figure 4.10-2

Town of San Anselmo General Plan Land Use Designations

ESA



SOURCE: Town of Fairfax General Plan, 2010

San Anselmo Flood Risk Reduction Project

Figure 4.10-3
Town of Fairfax General Plan Land Use Designations

ESA

4.10.1.2 Project Land Use Setting

Former Sunnyside Nursery Site Flood Diversion and Storage Basin

The former Sunnyside Nursery site is within an unincorporated portion of Marin County, immediately west of the Town of Fairfax. The site is designated under the Countywide Plan as Planned Residential, which is a subcategory established within the Rural/Residential category that provides for minimum lot sizes of 20,000 square feet to 10 acres. These areas are established for single-family residential development in areas where public services are limited and on properties where physical hazards and/or natural resources may restrict development. This is the second-lowest density housing designation provided under the Countywide Plan.

Lands to the north of the site are designated as Public/Private Open Space, and are a part of the Loma Alta Open Space Preserve, managed by the Marin County Open Space District. Lands to the south, across Sir Francis Drake Boulevard, are designated as Agricultural, which are lands with resource values for both agricultural production and wetlands and wildlife habitat. Agricultural lands may also have physical constraints, such as heavily wooded hillsides that limit their potential for agricultural production, and deserve protection on the basis of their habitat and visual resource values. Historically, 60 acres has been the minimum parcel size for most agricultural and resource conservation lands in the County.

Lands to the east (in the Town of Fairfax) are designated as a Planned Development District, and were developed in the 1990s with approximately ten homes at a density that is roughly equivalent to the Town's medium-density designation of 1 to 6 dwelling units per acre, with home sizes ranging from around 2,700 square feet up to 4,000 square feet. Lands to the west are designated under the County's Planned Residential designation, and are currently occupied by about a dozen homes constructed in the early 1990s, ranging in size from around 2,500 square feet up to nearly 4,000 square feet.

Downtown San Anselmo

The private commercial building at 634-636 San Anselmo Avenue (formerly known as Bridge Building #2), which is the site of the Downtown San Anselmo Project Element, is within the Town's central commercial district, and it and the parcels to the west, south and east of the site are designated as Central Commercial in the Town's General Plan. To the north of the site lies Creek Park, a Town-managed public park that is designated in the General Plan as Parks/Open Space.

4.10.2 Regulatory Setting

The following laws, statutes, regulations, codes and policies would apply to the Project and are defined as standard conditions for the Project.

4.10.2.1 Federal Regulations

The National Flood Insurance Program (NFIP) provides insurance to property owners, renters, and businesses in communities which agree to adopt and enforce floodplain management regulations. The County of Marin, as well as the Towns of Corte Madera, San Anselmo, and Ross all participate in the NFIP and the Community Rating System (CRS), a part of the NFIP which recognizes and encourages floodplain management activities that exceed federal standards. To qualify for the NFIP, the communities must adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHA). The Special Flood Hazard Area for the Project Area was updated in 2014 (FEMA, 2014).

4.10.2.2 State Regulations

State law (Government Code, Section 65300) requires that each county and city, including charter cities, prepare and adopt a comprehensive, long-term general plan for future development. This general plan must contain the following seven elements: (1) land use; (2) circulation; (3) housing; (4) conservation; (5) open space; (6) noise; and (7) safety. Govt. Code Section 65302. Of these, state law mandates that the land use element must correlate with the circulation element. In addition to these, state law permits cities and counties to include optional elements in their general plans; thereby, providing local governments with the flexibility to address the specific needs and unique character of their jurisdictions. California law also requires that the day-to-day decisions of a city or county follow logically from and be consistent with the general plan. More specifically, Government Code Sections 65860, 66473.5, and 66474 require that zoning ordinances and subdivision and parcel map approvals be consistent with the general plan. Goals, objectives, and programs established for each element of the general plan must meet the existing and future needs and desires of the community. These goals, objectives, and programs are specific, action-oriented and promoted during the life of the general plan.

State law (Government Code Section 65402(b)) requires the Marin County Flood Control and Water Conservation District (Flood Control District) to notify cities of its plans to construct projects or acquire extraterritorial property within the city's jurisdiction. Cities then have 40 days to determine project consistency with their general plans. These consistency determinations are advisory to the Flood Control District rather than binding.

Building and zoning ordinances represent the most specific expressions of general plan goals, objectives and policies. State law and judicial interpretation of state law (California Government Code Section 53091 *et seq*) mutually exempt cities and counties from complying with each other's building and zoning ordinances. The Flood Control District, which is a special district in Marin County, is therefore exempt from complying with the building and zoning ordinances of the Towns of San Anselmo and Fairfax. Nonetheless, it is the practice of the Flood Control District to work cooperatively with cities and neighboring communities to avoid conflicts with local land use plans and building and zoning codes.

4.10.2.3 Regional Plans

A number of regional plans have been developed and adopted by San Francisco Bay Area agencies—some individually, some in collaboration with other agencies. These agencies acknowledge a variety of environmental interests in the San Francisco Bay Area in their discussions, analyses, policies, and/or objectives. Some of these plans could be applicable to certain elements of the Project if those elements are proposed in areas under the jurisdiction of those plans. In addition, regional plans address land uses when they discuss the intensity of development throughout the region. Some regional plans advocate for developing specific areas and conserving other areas, while other plans discuss the impacts of potential future development and other activities on existing natural habitats and resources.

Plan Bay Area – Association of Bay Area Governments

Plan Bay Area is a long-range integrated transportation and land-use/housing strategy through 2040 for the San Francisco Bay Area. On July 26, 2017, the plan was jointly approved by the Association of Bay Area Governments Executive Board and by the Metropolitan Transportation Commission. The plan includes the region's Sustainable Communities Strategy and the 2040 Regional Transportation Plan and represents the next iteration of a planning process that has been in place for decades. Plan Bay Area marks the nine-county region's first long-range plan to meet the requirements of California's landmark 2008 Senate Bill 375, which calls on each of the state's 18 metropolitan areas to develop a Sustainable Communities Strategy to accommodate future population growth and reduce greenhouse gas emissions from cars and light trucks. Working in collaboration with cities and counties, the plan advances initiatives to expand housing and transportation choices, create healthier communities, and build a stronger regional economy (ABAG and MTC, 2017).

Basin Plan – San Francisco Bay Regional Water Quality Control Board

The San Francisco Bay Regional Water Quality Control Board (RWQCB) was founded in 1950 with the purpose of protecting the quality of surface water and groundwater within the San Francisco Bay region for beneficial uses. The State Water Quality Control Board required that the RWQCB develop a Water Quality Control Plan (Basin Plan) for the San Francisco basin, and the first comprehensive Basin Plan was adopted in 1975. The most recent amendment was approved in 2017 (RWQCB, 2017).

The Basin Plan is the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the San Francisco Bay region. The Basin Plan includes a statement of beneficial water uses that the RWQCB will protect, the water quality objectives needed to protect the designated beneficial water uses, and the implementation plans for achieving the water quality objectives through its regulatory programs. Because land use has a direct impact on the water quality of the basin, including impacts such as stormwater runoff, potential hazardous material spills, and groundwater extraction, the Basin Plan is discussed in this section as well as in several others, where aspects of it are applicable. For more discussion of the Basin Plan, see Section 4.9, Hydrology and Water Quality.

4.10.2.4 Local Plans and Policies

The governmental jurisdictions within the Project area each have goals and policies within their general planning documents that are relevant to the Project. These goals and policies concern discretionary actions related to land use that may have a bearing on implementation of the Project. Some of the goals and policies presented here may overlap with other topical sections of this environmental impact report.

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan are relevant to the Project with respect to land use.

Open Space

Goal OS-2: Preservation of Open Space for the Benefit of the Environment and Marin Residents. Close the gaps in the pattern of protected public open space and private lands where land acquisition or other methods of preservation would create or enhance community separators, wildlife corridors, watershed and baylands protection, riparian corridors, sensitive habitat, or trail connections. Relevant policies:

Policy OS-2.4: Support Open Space Efforts Along Streams. Support efforts to restore, enhance, and maintain natural vegetation and other habitat values along streams in the Baylands and City-Centered corridors. Maintain strict controls and high environmental standards in these zones. Targeted streams and creeks in the Baylands and City-Centered corridors includes Corte Madera Creek.

Community Development

Goal CD-2: Balanced Communities. Maintain balanced communities that house and employ persons from all income groups and provide the full range of needed facilities and services. Relevant policies:

Policy CD-2.8: Limit Development in Resource or Hazard Areas. Discourage development in areas with high natural resource value or threats to life or property, and restrict development in such areas to minimize adverse impacts.

Goal CD-4: Coordinate Planning with Other Jurisdictions. Coordinate implementation of the Countywide Plan with community plans and planning efforts by local cities, towns, and special districts, and adjacent counties, as well as regional, State, and federal agencies. Relevant policies:

Policy CD-4.4: Provide a Forum to Monitor Issues of Concern. Provide periodic forums with the cities and towns, other local agencies, and members of the public to engage in discussions on issues of mutual concern, such as more-efficient delivery of services, and to promote the sharing of ideas, information, resources, and best practices for Marin.

Town of San Anselmo General Plan

The following objectives and policies in the Town of San Anselmo General Plan (1988) are relevant to the Project with respect to land use.

Land Use

Objective 2: To preserve and enhance the unique natural and urban characteristics of the community while accommodating suitable new growth.

***Policy 2.1*:** All land use decisions within the Town of San Anselmo and the planning area will take into consideration the protection and preservation of the area's surrounding hillsides, ridges, water courses, and any unique natural habitats.

Objective 7: To protect and preserve those areas of unique natural and visual resources within the planning area.

Policy 7.1**:** To limit or prohibit development in hazardous areas or areas of high resource value.

Objective 16: To protect the community from danger to life and property caused by flooding.

Policy 16.2**:** To only allow development within the 100-year floodplain which is consistent with the Town of San Anselmo's adopted Protection of Flood Hazard Areas and Water Course Ordinance.

Policy 16.4**:** To repair and improve the Town of San Anselmo's storm drainage system to handle existing and projected runoff.

Open Space

Objective 3: To require the preservation of open space on properties to be developed by requiring open space easement for properties.

Policy LU-E.3-1**:** Memorial Park may not be utilized as a flood detention basin, nor may any non-recreational uses be permitted that adversely affect or reduce the recreational amenities at the Park.

Policy LU-E.3.2**:** No public land parcel occupied by Memorial Park may be sold or transferred by the Town without approval by the citizens of San Anselmo as part of a general election.

Town of Fairfax General Plan

Neither of the Project sites are within the jurisdictional boundaries of the Town of Fairfax, but the former Sunnyside Nursery site is immediately adjacent to the Town’s western boundary. Therefore, Town land use policies that could be relevant to the Project are presented here for informational purposes.

Conservation

Goal CON-3: Watershed and stream management.

Policy CON-3.1.1**:** Maintain floodwater capacity and promote creek restoration.

Policy CON-3.1.2**:** The Town of Fairfax shall protect and restore riparian habitat and ensure natural channel process in the San Anselmo Creek and Fairfax Creek watersheds.

Policy CON-3.1.3**:** Creeks that are channelized shall be restored and/or daylighted to improve aquatic habitat. Creeks in a natural state shall not be channelized even where possible.

Policy CON-4.2.2**:** Improve town stormwater management through improved assessment, design, and implementation of standard practices as contained in a Storm Drain Master Plan.

Safety

Goal S-2: Minimize risks due to flood hazards.

Policy S-2.1.1**:** Development and land use decisions will be made using the best available hydrological and flood hazard information.

> ***Policy S-2.1.2*: ** Town codes and ordinances will be enforced and updated as needed to reflect current floodplain-related scientific data and technical standards.
>
> ***Policy S-2.1.4*:** Ensure that new developments or substantial improvements are designed to reduce or eliminate future flood damage.
>
> ***Policy S-2.1.5*:** The Town of Fairfax will reduce community risk and vulnerability to flooding by maintaining and improving creek and hillside drainage systems.
>
> ***Policy S-2.1.7*:** The Town will actively support watershed-based planning efforts.
>
> ***Policy S-2.1.8*:** The Town will evaluate flood reduction proposals to determine the most technically feasible, cost-effective, and environmentally sound methods of reducing community and watershed based flooding.

Marin County Flood Control and Water Conservation District

The Marin County Public Works Department maintains the public infrastructure of Marin County, including its roads, bridges, flood channels, and natural creeks. The Flood Control District is a separate political entity from Marin County which works to reduce the risk of flooding for the protection of life and property while utilizing sustainable practices. The Flood Control District aims to meet this mission through effective, transparent, and responsive planning, design, construction, operation, and maintenance of facilities such as stormwater pump stations, detention basins, bypass drains, creeks, ditches, and levees. All Project elements would be designed to comply with the Flood Control District's own policies and – whenever practicable – to be consistent with County policies and ordinances.

The Ross Valley Flood Protection and Watershed Program (Program) is a regional effort led by the Flood Control District. The overall objective of the Program is to substantially reduce the frequency and severity of flooding throughout the Ross Valley Watershed in an economically viable manner while prioritizing public safety and minimizing environmental impacts. The San Anselmo Flood Risk Reduction Project is a part of the Program and would be implemented to work toward the objectives of the Program.

4.10.3 Impacts and Mitigation Measures

4.10.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist), and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:

a. Physically divide an established community;

b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect;

c. Conflict with any applicable habitat conservation plan or natural community conservation plan;

d. Convert prime agricultural land to non-agricultural use or impair the productivity of prime agricultural land;

e. Convert open space into urban or suburban scale development;

f. Result in impacts arising from incompatible land uses; or

g. Substantially alter the character or functioning of a community, or present or planned use of an area.

The following significance criteria are not discussed in this Land Use and Planning section but are discussed in other impact discussion in this EIR:

a. Item c, regarding conflict with any applicable habitat conservation plan or natural community conservation plan is addressed in Section 4.5 Biological Resources.

b. Item d, regarding converting prime agricultural land to non-agricultural use or impairing the productivity of prime agricultural land is addressed in Section 4.4 Energy, Mineral, Forest, and Agricultural Resources)

Finally, due to the nature of the Project, there would be no impacts related to converting open space into urban or suburban scale development. The Project would not make those types of land conversions; therefore, there is no impact, and this topic is not discussed further.

4.10.3.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to changes in land use and land use impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation and maintenance) impacts of the Project on land use. This analysis considers the Project's potential to physically divide a community by removing or creating new facilities and operations that affect established land uses. Regarding consistency with land use plans and policies, the analysis compares the Project to policies of relevant land use plans and policies adopted for the purpose of avoiding or mitigating an environmental effect. Impacts are assessed based on changes to the existing conditions described earlier in this section.

4.10.3.3 Impacts and Mitigation Measures

Impact 4.10-1: The Project would not physically divide an established community. (*No Impact*)

Nursery Basin

The Nursery Basin site is adjacent to Fairfax Creek, which by its nature serves as a barrier to crossing except in locations where bridges are provided. In addition, the Nursery Basin site had been privately owned for many years prior to its recent acquisition by the Flood Control District, and therefore has had restricted public access across the site to other properties lying adjacent to it. The Nursery Basin would be similarly restricted with respect to public access, so those existing conditions would remain unchanged. Regardless, the site does not currently divide an established community, and would not do so in the future, because its northern boundary abuts public open space, and its southern boundary abuts Sir Francis Drake Boulevard, with a small number of homes to the east and west, and additional open space beyond. The Project would not alter existing means of access to those areas, and the residential areas to the west and east of the Project area would retain the existing access points to and from adjacent areas that they currently have. These existing conditions would remain unchanged with respect to the physical division of the community. Therefore, there would be no impact.

Downtown San Anselmo

The private commercial building at 634-636 San Anselmo Avenue that would be removed as part of the Project currently spans San Anselmo Creek between San Anselmo Avenue and the parking area for Creek Park. San Anselmo Creek itself passes through the middle of the Town, and acts as a barrier to movement in those portions of its channel where it is not spanned by buildings, roadways, or bridges. In this portion of the Town, however, most stretches along the creek are covered over with various types of structures, some of which allow public access across the creek. For instance, approximately 75 feet south (downstream) of the site, a pedestrian bridge provides access across the creek between San Anselmo Avenue and Creek Park. Immediately north (upstream) from the site, another walkway crosses the creek. With implementation of the Project, all existing crossing points would remain in place, and conditions would remain unchanged with respect to the physical division of the community. Therefore, there would be no impact.

Mitigation: None required.

Impact 4.10-2: The Project would not conflict with local land use plans. (*Less than Significant*)

Construction activities associated with the two Project elements would be temporary activities and would not create a permanent change in land use. There would therefore be no conflict with the land use portions of local plans as a result of construction activities. (The various physical effects of construction are analyzed throughout this EIR.) Therefore, the following discussion is limited to the operational (post-construction) phase of the Project.

The discussions of plan consistency below have been prepared in accordance with the State CEQA *Guidelines,* Appendix G (Environmental Checklist), and with Appendices K and N in Marin County's Environmental Review Guidelines. Whether the project is consistent with particular plans will be determined at the time of project approval by the agency charged with making that consistency determination.

The Town of San Anselmo would likely serve as a Responsible Agency for purposes of CEQA, and would act in that role in its consideration of the discretionary approvals associated with implementation of Project elements in its area of control (i.e., the removal of the building at 634-636 San Anselmo Avenue and associated changes to San Anselmo Creek in downtown San Anselmo). As defined in State CEQA *Guidelines* Section 15381, Responsible Agencies include all agencies other than the Lead Agency which have discretionary approval power over a project.

Agencies of the Town would comply with CEQA for its portions of the Project by considering this EIR and any other subsequent environmental documents prepared by the Flood Control District and by reaching their own conclusions on whether and how to approve the Project elements under their control, as described in State CEQA *Guidelines* Section 15096. In so doing, the applicable agency or jurisdiction would be required to consider if the project elements would conflict with its own land use plans or policies before it could approve that portion of the project lying within their area of control.

Former Sunnyside Nursery Site

The former Sunnyside Nursery site is within an unincorporated area of the County, and is thus subject to the land use policies contained within the Countywide Plan. Relevant Countywide Plan goals and policies were listed previous in Section 4.10.2, *Regulatory Setting*. **Table 4.10-1**, below, lists the relevant policies, and provides a rationale and a determination as to whether or not the Project would conflict with those policies.

TABLE 4.10-1
POLICIES OF THE COUNTY OF MARIN COUNTYWIDE PLAN

Policy	Analysis
Policy OS-2.4: Support Open Space Efforts Along Streams. Support efforts to restore, enhance, and maintain natural vegetation and other habitat values along streams in the Baylands and City-Centered corridors. Maintain strict controls and high environmental standards in these zones. Targeted streams and creeks in the Baylands and City-Centered corridors includes Corte Madera Creek.	The Nursery Basin would modify an area of open space immediately adjacent to Fairfax Creek, and would facilitate effective flood risk reduction without substantially negatively impacting natural vegetation and other valued riparian characteristics; the design of the diversion structure in Fairfax Creek includes a permanently open gate and a low-flow channel to allow constant flows and stream habitat connectivity. The Project would not conflict with this policy.
Policy CD-2.8: Limit Development in Resource or Hazard Areas. Discourage development in areas with high natural resource value or threats to life or property, and restrict development in such areas to minimize adverse impacts.	Construction of the Nursery Basin would effectively disallow the development of housing or other structures on the site. The basin would provide enhanced levels of flood risk reduction for existing developments further downstream. In addition, the basin would be constructed in a manner that would not negatively impact existing natural vegetation or other valued riparian characteristics. Finally, the basin is not within a special flood-hazard zone. The Project would not conflict with this policy.
Policy CD-4.4: Provide a Forum to Monitor Issues of Concern. Provide periodic forums with the cities and towns, other local agencies, and members of the public to engage in discussions on issues of mutual concern, such as more-efficient delivery of services, and to promote the sharing of ideas, information, resources, and best practices for Marin.	The Nursery Basin has been conceived through the collaborative efforts of the County and area municipalities. The basin would assist with delivering effective flood management to all downstream jurisdictions. The Project would not conflict with this policy.

SOURCES: Marin County, *Marin Countywide Plan*, November 6, 2007.

The site is not within the jurisdictional boundaries of the Town of Fairfax, but it is very close to the Town's western boundary. Accordingly, Town land use policies that could be relevant to the Project are presented here in **Table 4.10-2** for informational purposes.

TABLE 4.10-2
POLICIES OF THE TOWN OF FAIRFAX GENERAL PLAN

Policy	Analysis
Policy CON-3.1.1: Maintain floodwater capacity and promote creek restoration.	The Project would not just maintain, but would enhance floodwater capacity, and would do so in a manner that would not degrade existing creek conditions. The Project would not conflict with this policy.
Policy CON-3.1.2: The Town of Fairfax shall protect and restore riparian habitat and ensure natural channel process in the San Anselmo and Fairfax Creek watersheds.	The Project would enhance floodwater capacity, and would do so in a manner that would not degrade existing creek conditions. The Project would not conflict with this policy.
Policy CON-3.1.3: Creeks that are channelized shall be restored and/or daylighted to improve aquatic habitat. Creeks in a natural state shall not be channelized even where possible.	The Project would not channelize existing waterways, and would enhance floodwater capacity in a manner that would not degrade existing creek conditions. The Project would not conflict with this policy.
Policy CON-4.2.2: Improve town stormwater management through improved assessment, design, and implementation of standard practices as contained in a Storm Drain Master Plan.	The Project would improve stormwater management, and would do so in a manner that would be consistent with applicable plans and regulatory requirements. The Project would not conflict with this policy.
Policy S-2.1.1: Development and land use decisions will be made using the best available hydrological and flood hazard information.	The Project would be designed based on the best available information. The Project would not conflict with this policy.
Policy S-2.1.2: Town codes and ordinances will be enforced and updated as needed to reflect current floodplain-related scientific data and technical standards.	The Project would be consistent with applicable plans and regulatory requirements. The Project would not conflict with this policy.
Policy S-2.1.4: Ensure that new developments or substantial improvements are designed to reduce or eliminate future flood damage.	The Project would improve stormwater management and decrease flood damage, and would do so in a manner that would not conflict with applicable plans and regulatory requirements. The Project would not conflict with this policy.
Policy S-2.1.5: The Town of Fairfax will reduce community risk and vulnerability to flooding by maintaining and improving creek and hillside drainage systems.	The Project would improve creek drainage systems and would reduce community risk and vulnerability to flooding. The Project would not conflict with this policy.
Policy S-2.1.7: The Town will actively support watershed-based planning efforts.	The Project is consistent with and being developed and planned in cooperation with the Ross Valley Watershed and Flood Protection Program, which is a watershed-wide planning effort aimed at reducing flood risk and vulnerability throughout the basin. The Project would not conflict with this policy.
Policy S-2.1.8: The Town will evaluate flood reduction proposals to determine the most technically feasible, cost-effective, and environmentally sound methods of reducing community and watershed based flooding.	The Project is consistent with and being developed and planned in cooperation with the Ross Valley Watershed and Flood Protection Program, which is a watershed-wide planning effort aimed at reducing flood risk and vulnerability throughout the basin. Project elements have been evaluated for feasibility with respect to cost and effectiveness. The Project would not conflict with this policy.

SOURCES: Town of Fairfax, *Town of Fairfax 2010 – 2030 General Plan,* 2012. Available online at http://www.town-of-fairfax.org/html/gpac_progress.html. Accessed on June 22, 2017.

Downtown San Anselmo Site

The private commercial building at 634-636 San Anselmo Avenue that would be removed as part of the Project is within the Town of San Anselmo, and is subject to the land use policies contained within the Town's General Plan. Relevant General Plan goals and policies were listed previously in Section 4.10.2, Regulatory Setting. **Table 4.10-3**, below, lists the relevant policies, and provides a rationale as to whether or not the Project would conflict with those policies.

TABLE 4.10-3
POLICIES OF THE TOWN OF SAN ANSELMO GENERAL PLAN

Goal/Policy	Analysis
Policy 2.1: All land use decisions within the Town of San Anselmo and the planning area will take into consideration the protection and preservation of the area's surrounding hillsides, ridges, water courses, and any unique natural habitats.	The Project would enhance floodwater capacity, and would do so in a manner that would not degrade existing creek conditions or conditions in unique habitats. The Project would not conflict with this policy.
Policy 7.1: To limit or prohibit development in hazardous areas or areas of high resource value.	The existing building that would be removed as part of the Project currently presents a hazard under flooding conditions. Removal of the structure, as proposed under the Project, would improve this existing hazardous condition. The Project would not conflict with this policy.
Policy 16.2: To only allow development within the 100-year floodplain which is consistent with the Town of San Anselmo's adopted Protection of Flood Hazard Areas and Water Course Ordinance.	The existing building that would be removed as part of the Project currently presents a hazard under flooding conditions. Removal of the structure, as proposed under the Project, would improve this existing hazardous condition. The Project would not conflict with this policy.
Policy 16.4: To repair and improve the Town of San Anselmo's storm drainage system to handle existing and projected runoff.	The existing building that would be removed as part of the Project currently presents a hazard under flooding conditions. Removal of the structure, as proposed under the Project, would improve this existing hazardous condition. The Project would not conflict with this policy.
Policy LU-E.3-1: Memorial Park may not be utilized as a flood detention basin, nor may any non-recreational uses be permitted that adversely affect or reduce the recreational amenities at the Park.	The Project is not within Memorial Park; therefore the Project would not conflict with this policy.
Policy LU-E.3.2: No public land parcel occupied by Memorial Park may be sold or transferred by the Town without approval by the citizens of San Anselmo as part of a general election.	The Project is not within Memorial Park; therefore the Project would not conflict with this policy.

SOURCES: Town of San Anselmo, T*own of San Anselmo General Plan,* Last amended November 3, 2015. Available online at http://www.townofsananselmo.org/index.aspx?NID=79. Accessed on June 25, 2017.

As shown in the preceding tables, the Project would not conflict with policies contained in the Marin Countywide Plan. In addition, the Project would not conflict with policies in the Town of San Anselmo General Plan.

Therefore, the Project's impact with respect to potential conflicts with applicable land use plans would be less than significant.

Mitigation: None required.

Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or conflict with present or planned use of an area. (*Less than Significant*)

All Project Elements

This topic is directly related to the analysis presented under Impacts 4.10-1 and 4.10-2 above. The flood risk reduction elements proposed as part of the Project would generally occur within existing flood channels or in similar areas where similar uses are already present. The proposed improvements would occur in areas where a similar use (i.e., a creek drainage) are already present, and the improvements would not conflict with the land use plans that have already been envisioned for the area.

The Nursery Basin would be built on the site of a former commercial nursery and in an adjacent portion of Fairfax Creek. The Nursery Basin site has no connectivity with the surrounding land uses, and is generally not visible from the surrounding areas (see Section 4.2 *Aesthetics* for a discussion of the visibility of this site from Sir Francis Drake Boulevard and from the Loma Alta Open Space District trail to the north). The construction of the Nursery Basin and its associated diversion structure would be a change in land use but one that would not alter the existing character or function of the community. It is currently not a publicly-accessible parcel of land, and that would not change. The removal of the building at 634-636 San Anselmo Avenue and its flow-restricting foundational structure in downtown San Anselmo would likely be a noticeable change in that neighborhood. But the removal of a single building and the resultant changes in the community's function and character would not be substantial. Implementation of the Project would improve the functioning of the community by reducing the potential for flooding. For these reasons, this impact would be less than significant.

Mitigation: None required.

4.10.4 References – Land Use and Planning

Association of Bay Area Governments and Metropolitan Transportation Commission, *Plan Bay Area*, adopted July 26, 2017. Available online at http://2040.planbayarea.org/cdn/farfuture/u_7TKELkH2s3AAiOhCyh9Q9QlWEZIdYcJzi2QDCZuIs/1510696833/sites/default/files/2017-11/Final_Plan_Bay_Area_2040.pdf.

California Regional Water Quality Control Board - San Francisco Bay Region, *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*, Oakland, California, May 2017.

Marin County, *Marin Countywide Plan*, November 6, 2007.

San Francisco Bay Conservation and Development Commission, *San Francisco Bay Plan*, (As Amended), 2008. Available online at http://www.bcdc.ca.gov/plans/sfbay_plan.html. Accessed on February 28, 2018.

Town of Fairfax, *Town of Fairfax 2010 – 2030 General Plan*, 2012. Available online at http://www.town-of-fairfax.org/html/gpac_progress.html. Accessed June 22, 2017.

Town of Fairfax, About Fairfax, 2017. Available online at http://www.town-of-fairfax.org/html/about_fairfax.html. Accessed on February 28, 2018.

Town of San Anselmo, T*own of San Anselmo General Plan*, last amended November 3, 2015. Available online at http://ca-sananselmo2.civicplus.com/documentcenter/view/5210. Accessed on February 28, 2018.

4.11 Noise

This section evaluates the potential noise and vibration impacts associated with construction and operation of the San Anselmo Flood Risk Reduction Project (Project). This section describes the existing noise environment and identifies nearby sensitive receptors, presents relevant local noise ordinances and standards, and evaluates the potential for the Project to result in noise and vibration impacts. This section focuses on noise and vibration impacts on humans and structures.

The analysis included in this section was developed based on Project-specific construction and operational features, and data provided in the *Marin Countywide Plan, Town of Fairfax's 2010 General Plan, Town of San Anselmo General Plan*, the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment, and the Federal Highway Administration's Roadway Construction Noise Model.

4.11.1 Fundamentals of Noise

4.11.1.1 Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air). Noise is generally defined as unwanted sound (i.e., loud, unexpected, or annoying sound). Acoustics is defined as the physics of sound. In acoustics, the fundamental scientific model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determine the sound level and characteristics of the noise perceived by the receiver. Acoustics addresses primarily the propagation and control of sound.

4.11.1.2 Frequency

The number of sound pressure peaks travelling past a given point in a single second is referred to as the frequency, expressed in cycles per second or Hertz (Hz). A given sound may consist of energy at a single frequency (pure tone) or in many frequencies over a broad frequency range (or band). Human hearing is generally affected by sound frequencies between 20 Hz and 20,000 Hz.

4.11.1.3 Amplitude

The amplitude of pressure waves generated by a sound source determines the perceived loudness of that source. Sound pressure amplitude is measured in micro-Pascals (μPa). One μPa is approximately one hundred billionths of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 μPa to 100,000,000 μPa. Because of this huge range of values, sound is rarely expressed in terms of pressure. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of human hearing (near total silence) is approximately 0 dB which corresponds to 20 μPa.

4.11.1.4 Addition of Decibels

Because dBs are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic means. Under the dB scale, a doubling of sound energy corresponds to a 3 dB increase. In other words, when two sources are each producing sound of the same magnitude, the resulting sound level at a given distance would be approximately 3 dB higher than one of the sources under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB – rather they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level of approximately 5 dB louder than one source, and ten sources of equal loudness together produce a sound level of approximately 10 dB louder than the single source.

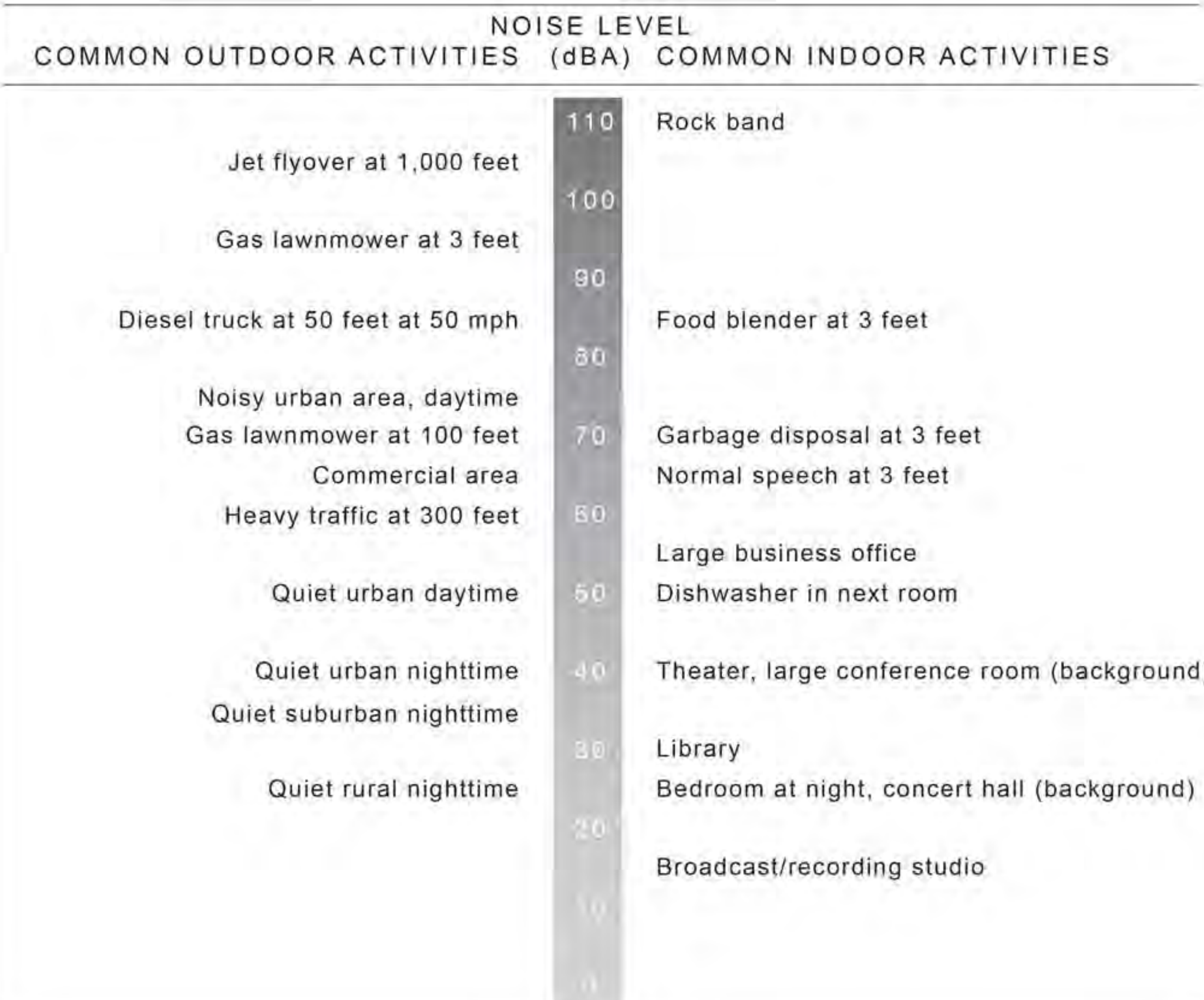
4.11.1.5 A-Weighted Decibels

Figure 4.11-1 illustrates sound levels associated with common sound sources. The perceived loudness of sound is dependent on many factors, including magnitude and frequency. However, within the usual range of environmental sound levels, perception of loudness is relatively predictable, and can be approximated by frequency filtering using the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the dBA sound level has become the standard descriptor for environmental noise assessment. All noise levels reported in this section are expressed as A-weighted levels.

4.11.1.6 Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3 dB increase in sound. However, for a given sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in a laboratory setting, the trained, healthy human ear is able to discern 1 dBA changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency range (1,000 Hz to 8,000 Hz). In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 6-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy that would result in a 3-dB increase in SPL would generally be perceived as barely detectable. Refer to **Table 4.11-1** for the approximate relationship between increases in environmental noise level and human perception.



SOURCE: Caltrans, 2013

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Figure 4.11-1
Typical Noise Levels

TABLE 4.11-1
APPROXIMATE RELATIONSHIP BETWEEN INCREASES IN ENVIRONMENTAL NOISE LEVEL AND HUMAN PERCEPTION

Noise level increase, dBA	Human perception (typical)
up to about 3	generally not perceptible
about 3	barely perceptible
about 6	distinctly noticeable
about 10	twice as loud
about 20	four times as loud

SOURCE: Egan, *Architectural Acoustics,* McGraw-Hill, Inc., 1988.

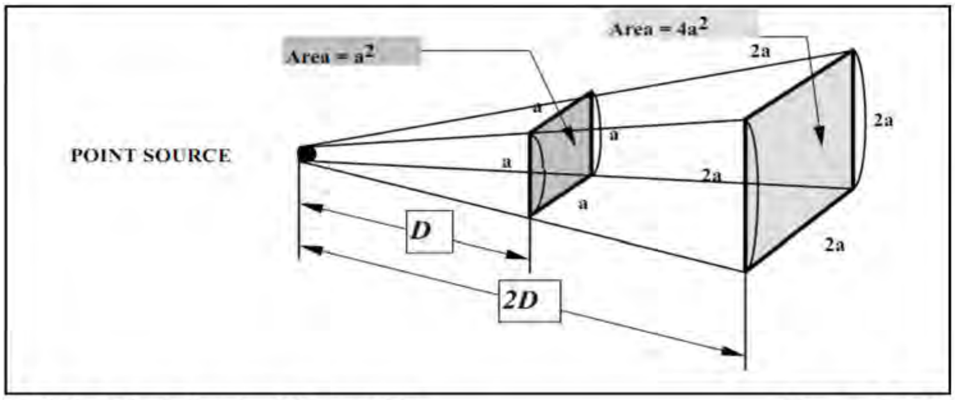
4.11.1.7 Noise Descriptors

Noise in our daily environments fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in environmental noise analysis, and are applicable to this study:

1. **Equivalent Sound Level (L_{eq}):** The L_{eq} represents an average of the sound energy occurring over a specified time period. In effect, the L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour, A-weighted L_{eq} level is the energy average of dBAs occurring during a 1-hour period.
2. **Maximum Sound Level (L_{max}):** The L_{max} is the highest instantaneous sound level measured during a specified period.
3. **Minimum Sound Level (L_{min}):** The L_{min} is the lowest instantaneous sound level measured during a specified period.
4. **Day-Night Average Level (L_{dn}):** The L_{dn} is the energy-average of dBAs occurring over a 24-hour period, with a 10-dB "penalty" applied to dBAs occurring during nighttime hours (10:00 p.m. to 7:00 a.m.).
5. **Community Noise Equivalent Level (CNEL):** Similar to the L_{dn}, the CNEL is the energy average of A weighted sound levels over a 24-hour period with a 5-dB penalty added for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dB penalty between the hours of 10:00 p.m. and 7:00 a.m.

4.11.1.8 Sound Propagation

Sound from a localized source (i.e., point source) propagates uniformly outward in a spherical pattern; therefore, this type of propagation is called spherical spreading. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source as its energy is continuously spread out over a spherical surface (see **Figure 4.11-2** for an illustration of spherical spreading of noise from a point source). Point sources of noise, such as stationary equipment or on-site construction equipment, attenuate (lessen) at a rate of 6.0 dB per doubling of distance from the source. Noise attenuation from a point source increases by 1.5 dB from 6.0 dB to 7.5 dB for each doubling of distance due to ground absorption and reflective wave canceling. These factors are collectively referred to as *excess ground attenuation*. The basic geometric spreading loss rate is used where the ground surface between a noise source and a receiver is reflective, such as parking lots or a smooth body of water. The excess ground attenuation rate (7.5 dB per doubling of distance) is used where the ground surface is absorptive, such as soft dirt, grass, or scattered bushes and trees.



SOURCE: California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013a.

Figure 4.11-2
Point Source Spreading with Distance

Widely distributed noises such as a street with moving vehicles (a "line" source) would typically attenuate at a lower rate of approximately 3.0 dB for each doubling of distance between the source and the receiver. If the ground surface between source and receiver is absorptive rather than reflective, the nominal rate increases to 4.5 dB for each doubling of distance. Atmospheric effects, such as wind and temperature gradients, also can influence noise attenuation rates from both line and point sources of noise. However, unlike ground attenuation, atmospheric effects are constantly changing and difficult to predict.

Trees and vegetation, buildings, and/or barriers between a source and receiver reduce the noise level that would otherwise occur at a given receptor. However, for a vegetative strip to have a noticeable effect on noise levels, it must be dense and wide. For example, a stand of trees must be at least 100 feet wide and dense enough to completely obstruct a visual path to the roadway to attenuate traffic noise by 5 dB (Caltrans, 2013a). A row of structures can shield more distant receivers depending upon the size and spacing of the intervening structures and site geometry. Similar to vegetative strips discussed above, noise barriers, which include natural topography and soundwalls, reduce noise by blocking the line of sight between the source and receiver. Generally, a noise barrier that breaks the line of sight between source and receiver will provide at least a 5-dB reduction in noise.

4.11.1.9 Vibration

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Several descriptors are typically used to quantify the amplitude of vibration including peak particle velocity (PPV) and root mean square velocity. PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave and is typically expressed in units of inches per second (in/sec). The PPV is most frequently used to describe vibration impacts on buildings. Root mean square velocity is defined as the average of the squared amplitude of the signal, usually measured in decibels referenced to 1 microinch/second and are reported as VdB. The decibel notation acts to compress the range of numbers required to describe vibration (FTA, 2006). VdB vibration velocity amplitudes are used to evaluate human response to vibration. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows. In suburban environments, such as the Project area, sources of groundborne vibration include construction activities and heavy trucks and buses. Typically, groundborne vibration generated by human-made activities attenuates rapidly with distance from the source of the vibration.

Groundborne vibration can be annoying to people. The primary effect of perceptible vibration is often a concern. However, secondary effects, such as the rattling of a china cabinet, can also occur, even when vibration levels are well below perception. Any effect (primary perceptible vibration, secondary effects, or a combination of the two) can lead to annoyance. The degree to which a person is annoyed depends on the activity in which they are participating at the time of the disturbance. For example, someone sleeping or reading will be more sensitive than someone who is running on a treadmill. Reoccurring primary and secondary vibration effects often lead people to believe that the vibration is damaging their home, although vibration levels can be well below minimum thresholds for damage potential. Vibration generated by construction activity has the potential to damage structures. This damage could be structural damage, such as cracking of floor slabs, foundations, columns, beams, or wells, or cosmetic architectural damage, such as cracked plaster, stucco, or tile.

4.11.1.10 Construction Vibration

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans. The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec, PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels such as people in an urban environment may tolerate a higher vibration level. Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Construction-induced vibration that can be detrimental to a building is very rare and has only been observed in instances where the structure is in a high state of disrepair and the construction activity (e.g., impact pile driving) occurs immediately adjacent to the structure.

Table 4.11-2 displays the human reactions and effects on buildings that can be caused by various continuous vibration levels. As discussed previously, annoyance is a subjective measure and vibrations may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations at the threshold of perception can be annoying.

TABLE 4.11-2
APPROXIMATE REACTION OF PEOPLE AND DAMAGE TO BUILDINGS FROM CONSTRUCTION VIBRATION LEVELS

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe – vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

SOURCE: Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013b.

4.11.2 Physical Setting

4.11.2.1 Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication, and can cause physiological and psychological stress and hearing loss. Given these effects, some land uses are considered more sensitive to noise levels than others due to the duration and nature of time people spend at these uses. In general, residences are considered most sensitive to noise as people spend extended period of time in them including the nighttime hours. Therefore, noise impacts to rest and relaxation, sleep, and communication are highest at residential uses. Schools, hotels, hospitals, nursing homes, and recreational uses are also considered to be more sensitive to noise as activities at these land uses involve rest and recovery, relaxation and concentration, and increased noise levels tend to disrupt such activities. Places such as churches, libraries, and cemeteries, where people tend to pray, study, and/or contemplate, are also sensitive to noise but due to the limited time people spend at these uses, impacts are usually tolerable. Commercial and industrial uses are considered the least noise-sensitive.

Near the former Sunnyside Nursery site (which is where the flood diversion and storage basin referred to in this document as “the Nursery Basin” would be constructed), the sensitive receptors are single-family residences and White Hill Middle School. The closest single-family residences have backyards immediately adjacent to the Project site's western and eastern boundaries. These single-family buildings are as close as 25 feet from the property line of the Project site. The White Hill Middle School is approximately 650 feet northeast of the Nursery Basin site.

The Downtown San Anselmo site, which includes the demolition of the building at 634-636 San Anselmo Avenue (sometimes referred in design documents and elsewhere as Building Bridge #2) and associated creek capacity improvements, is surrounded by single-family, multi-family, and commercial uses. The single- and multi-family residences are west, northwest, and southwest of the site. The nearest sensitive receptor is a single-family residence approximately 235 feet west of the site.

Existing Ambient Noise Environment

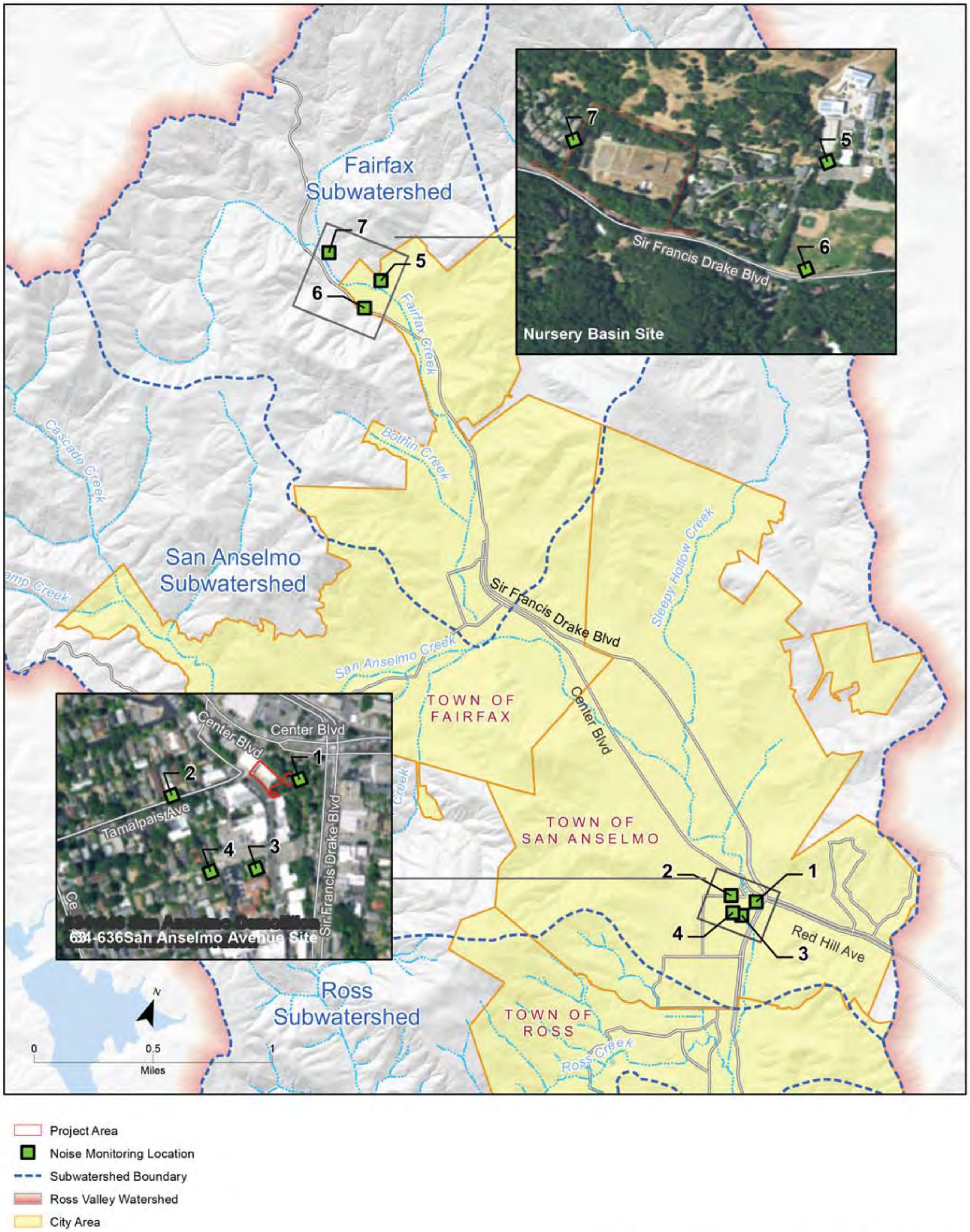
In order to help characterize ambient noise in the Project area, noise measurements were collected at the Downtown San Anselmo and Nursery Basin sites near noise-sensitive areas. The areas surrounding the Downtown San Anselmo site were dominated by vehicular traffic noise from Sir Francis Drake Boulevard and other noise sources typical of a suburban environment (e.g., people talking, distant music). The area surrounding the Nursery Basin site was also dominated by vehicular traffic noise from Sir Francis Drake Boulevard as well as natural sounds (e.g., birds chirping, insects buzzing).

The noise measurement survey was conducted on June 19, 2017, and consisted of a total of seven 15-minute noise measurements. The survey site locations are illustrated on **Figure 4.11-3**. The results of the noise survey, which include the measured L_{min}, L_{eq}, and L_{max} levels as well as descriptions of localized noise sources at all nine monitoring locations, are presented in **Table 4.11-3**. As shown in the table, much of the Project area is typified by relatively low to moderate (low 40s to high 50s dBA L_{eq}) noise levels due to the lack of loud noise sources. All noise measurements were conducted using a Larson Davis 831 Type 1 sound level meter. The meter was calibrated before and after each noise measurement.

TABLE 4.11-3
AMBIENT NOISE MONITORING RESULTS

Location No.	Start time	L_{min} (dBA)	L_{eq} (dBA)	L_{max} (dBA)	Primary Noise Source(s)
Downtown San Anselmo Site					
1	9:36 a.m.	48	55	65	Sir Francis Drake Boulevard
2	9:57 a.m.	44	59	76	Tamalpais Avenue
3	10:19 a.m.	49	53	62	People talking, San Anselmo Avenue
4	10:39 a.m.	44	52	74	Magnolia Avenue
Nursery Basin Site					
5	7:45 a.m.	34	43	56	Sir Francis Drake Boulevard, birds chirping
6	8:14 a.m.	42	56	66	Sir Francis Drake Boulevard, birds chirping
7	8:47 a.m.	42	47	66	Residents talking, nearby construction activity

SOURCE: Environmental Science Associates (ESA), *15-minute Short-Term Noise Measurements and Traffic Noise Spreadsheet*, June 19, 2017.



SOURCE: Ch2m

San Anselmo Flood Management Project . D211432.07

Figure 4.11-3
Noise Measurement Locations

4.11.3 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.11.3.1 Federal Regulations

Truck Operations

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 CFR, Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters (approximately 50 feet) from the vehicle pathway centerline. These limits are implemented through regulatory controls on truck manufacturers.

Occupational Safety and Health Administration

The Occupational Safety and Health Administration aims to ensure worker safety and health in the United States by working with employers and employees to create better working environments. With regard to noise exposure and workers, Occupational Safety and Health Administration regulations set forth accepted criteria to protect the hearing of workers exposed to occupational noise. Noise exposure regulations are listed in 29 CFR Section 1910.95. Most applicable to the Project, 1910.95(c)(1) states that an employer shall administer a hearing conservation program whenever noise exposure levels equal or exceed an 8-hour time-weighted average sound level of 85 dBA.

4.11.3.2 State Regulations

California Government Code Section 65302 encourages each local government entity to implement a noise element as part of its general plan. In addition, the California Governor's Office of Planning and Research has developed guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure. According to the guidelines, exterior noise exposures generally fall into three categories: normally acceptable, conditionally acceptable, and unacceptable. Each land use has a particular dBA range within each exterior noise exposure category. For residential uses, an exterior noise environment of less than 62.5 dBA L_{dn} or CNEL is considered "normally acceptable" while a noise environment of 62.5 to 77.5 dBA L_{dn} or CNEL is considered "conditionally acceptable." For neighborhood parks, the General Plan guidelines indicate that an exterior noise environment of less than 65 dBA L_{dn} or CNEL is considered "normally acceptable," between 65 dBA and 80 dBA L_{dn} or CNEL is considered "conditionally acceptable," and 80 dBA or greater is considered "unacceptable."

4.11.3.3 Local Regulations

Activities associated with the Project would take place within the jurisdictions of unincorporated Marin County and the Town of San Anselmo. The Town of Fairfax is almost immediately adjacent to the Nursery Basin site. Noise-related goals and policies from the general plans of these jurisdictions are presented below.

Marin County

Countywide Plan

The Built Environment Element of the Marin Countywide Plan contains the following goal, policy, and implementing program that relate to noise and are applicable to the Project (Marin County, 2007):

> **Goal NO-1: Protection from Excessive Noise.** Ensure that new land uses, transportation activities, and construction do not create noise levels that impair human health or quality of life.
>
> > ***Policy NO-1.3: Regulate Noise Generating Activities.*** Require measures to minimize noise exposure to neighboring properties, open space, and wildlife habitat from construction-related activities, yard maintenance equipment, and other noise sources, such as amplified music.
> >
> > > *Implementing Program NO-1.i*: Regulate Noise Sources - Sections 6.70.030(5) and 6.70.040 of the Marin County Code establish allowable hours of operation for construction-related activities. As a condition of permit approval for projects generating significant construction noise impacts during the construction phase, construction management for any project shall develop a construction noise reduction plan and designate a disturbance coordinator at the construction site to implement the provisions of the plan.

Municipal Code

Section 6.70.030 of the Marin County Municipal Code limits the operation of loud noise-generating construction-related equipment to the hours of 8:00 a.m. to 5:00 p.m., Monday through Friday only. However, a special exemption to this limitation could be granted to public agencies such as the Marin County Flood Control and Water Conservation District (Flood Control District) (Marin County, 2017).

Town of San Anselmo

General Plan

The Town of San Anselmo General Plan does not contain noise-related goals or policies that would be applicable to the Project.

Municipal Code

Municipal Code Section 4-7.203, Construction and demolition, contains the following noise level and hourly restrictions for the operation of construction equipment.

a) Except as otherwise provided in subsections (b), (c), and (d) of this section, for a period of two (2) years after March 13, 1975, it shall be unlawful to operate any powered equipment if the operation of such equipment emits a noise level of eighty-five (85) dBA when measured at the loudest point fifty (50) feet away from the equipment. On and after March 13, 1977, the permissible noise level shall be reduced to eighty (80) dBA.

b) Impact tools and equipment shall be excluded from the provisions of subsection (a) of this section; provided, however, on or after September 13, 1975, such impact tools and equipment shall have intake and exhaust mufflers recommended by the manufacturers thereof; and provided, further, pavement breakers and jackhammers shall also be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers thereof. In lieu of or in the absence of manufacturers' recommendations, the Director of Public Works shall have the authority to prescribe such means of accomplishing maximum noise attenuation as he deems to be in the public interest, considering the available technology and economic feasibility.

c) Construction or demolition work may be performed during the following times: Mondays through Fridays from 7:00 a.m. to 7:00 p.m.; Saturdays from 9:00 a.m. to 5:00 p.m.; and Sundays from 12:00 p.m. to 5:00 p.m.; provided, however, such hours shall be extended until 8:00 p.m. for work performed by homeowners or residents upon their own property.

d) Construction or demolition under the ordinance is allowed at any time provided the noise level does not exceed five (5) dB above the ambient at the nearest property plane with allowance for correction factors as set forth in the General Maximum Noise Standards specified in subsection (b) of Section 4-7.104 of Article I of the code.

Town of Fairfax

General Plan

The following goal and policy relevant to noise are in the Town of Fairfax's 2010 General Plan (Town of Fairfax, 2012).

> **Goal N-3:** Maintain the current quality of the acoustical environment.
>
> > ***Policy N-3.1.2*:** Noise created by new non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of the Noise Ordinance. Where proposed non-transportation noise sources are likely to produce noise levels exceeding the standards, an acoustical analysis shall be required as a part of project review or as part of the environmental review process so that noise mitigation may be included in the project design.

According to the General Plan, if a major project is expected to take less than 18 months and work would be done following all of the standard controls that would be established, including limiting the work to a certain schedule of allowable days and hours, then the project would be found to cause a less-than-significant impact under the California Environmental Quality Act (CEQA). Alternatively, if the project is going to necessitate construction activities that would last beyond 18 months, or occur outside of allowable time periods, then the project would be found to cause a potentially significant impact and would be subject to environmental review under CEQA. The General Plan also provides a representative list of standard noise control measures that could be implemented.

Municipal Code

Municipal Code Section 8.20.060 (C): Construction/demolition domestic power tools, contains the following hourly restrictions for the operation of construction equipment.

1. The operation of any tools or equipment used in construction or demolition work or in property maintenance work between the hours of 6:00 p.m. and 8:00 a.m. Monday through Friday or on weekends and holidays between the hours of 4:00 p.m. and 9:00 a.m. such that the sound therefrom creates a noise disturbance is prohibited.

2. Operating or permitted the operation of any mechanically powered tools between the hours of 6:00 p.m. and 8:00 a.m. Monday through Friday and between 4:00 p.m. and 9:00 a.m. on weekends and holidays is prohibited.

4.11.4 Impacts and Mitigation Measures

4.11.4.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact on noise and vibration if it would:

a) Result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) Result in exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels;

c) Result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project (including in areas with sensitive receptors);

d) Result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project;

e) For a project within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, expose people residing or working in the area to excessive noise levels; or

f) For a project in the vicinity of a private airstrip, expose people residing or working in the Project area to excessive noise levels.

The following significance criterion was found to result in no impacts and was therefore not evaluated further:

> ***Exposure of people to excess noise due to proximity to an airport or private airstrip.*** There are no public airports or private airstrips within the Project areas. The Project would not result in the placement of workers in areas where they would be exposed to excessive noise levels associated with airports or airstrips. Therefore, the Project would have no impact related to this criterion and this issue is not discussed further below.

4.11.4.2 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to noise and vibration impacts in the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section.

Temporary or Periodic or Permanent Increase in Ambient Noise Levels

The FTA's *Transit Noise and Vibration Impact Assessment* provides guidelines for reasonable criteria for assessment of construction noise (FTA, 2006). The guidance indicates that construction noise that exceeds a 1-hour L_{eq} level of 90 dBA during the day would provoke an adverse community reaction at noise sensitive land uses (FTA, 2006). This noise level is used here to assess whether construction- and maintenance-related on-site and off-site noise levels would have the potential to cause a substantial temporary or periodic or permanent increase in ambient noise levels at sensitive receptor locations.

Noise Level Standards

Consistency with local noise standards are determined by comparing the applicable noise level standard to published equipment noise levels. In some cases, this requires calculating noise levels at various distances (i.e., to a property line or sensitive receptor) using widely published noise propagation equations (FHWA, 2006) in order to assess whether a potential conflict could occur.

While both the jurisdictions have established land use noise compatibility standards for ambient noise levels, only Town of San Anselmo has an established noise level standard for construction. However, the Town of San Anselmo construction noise standard would only apply to construction activities that occur outside of the Town's allowed construction hours. The construction time limits adopted by the County and Town are considered in the analysis of Project consistency with regional and local plans and policies (see Impact 4.11-2).

Groundborne Vibration

The Marin Countywide Plan and Town of San Anselmo General Plan and relevant municipal codes do not address vibration or provide numerical thresholds for identifying groundborne vibration impacts. In the absence of local standards for construction equipment vibration, the evaluation presented under Impact 4.11-3 uses the vibration thresholds presented in **Table 4.11-4** to assess the significance of groundborne vibration and noise impacts. For adverse human reaction, the analysis applies the "strongly perceptible" threshold of 0.9 in/sec PPV for transient sources (Caltrans, 2013b). For risk of architectural damage to historic buildings and structures, this analysis applies a threshold of 0.12 in/sec PPV (Caltrans, 2013b). A threshold of 0.3 in/sec PPV is used for all other buildings. The FTA provides an equation that may be used to estimate vibration at different distances based on a reference PPV of 25 feet for various construction equipment. Using the FTA equation, the distances at which vibration-generating construction equipment would be lower than the annoyance or damage thresholds were calculated and compared to potential distances to receiving buildings.

TABLE 4.11-4
VIBRATION THRESHOLDS

	Maximum Peak Particle Velocity (PPV), inches per second (in/sec)
Adverse human reaction (human annoyance) Historic buildings and structures	0.1 0.12
All other structures	0.3

NOTE: The vibration criteria is based on continuous or frequent intermittent sources, including impact pile drivers, pogo-stick compactors, crack and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

SOURCES: Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013b.

4.11.4.3 Impacts and Mitigation Measures

Impact 4.11-1: Project construction would not result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity. (*Less than Significant*)

Construction of the Project would occur at the Nursery Basin and Downtown San Anselmo sites concurrently, with work at each site taking place during a 4- to 8-month construction period in a single season. The noise levels generated during Project construction would vary, depending on the construction phase and the types of construction equipment being used. In addition, certain types of construction equipment generate impulsive noises, which can be disruptive. **Table 4.11-5** shows typical noise levels produced by the types of construction equipment that would likely be in operation during construction/demolition activities at the two sites.

TABLE 4.11-5
REFERENCE CONSTRUCTION EQUIPMENT NOISE LEVELS
(50 AND 100 FEET FROM SOURCE)

Type of Equipment	L_{max}, dBA at 50 feet	Percent Usage	Hourly L_{eq}, dBA	
			at 50 feet	at 100 feet
Dump Truck	84	40	80	72
Excavator	85	40	81	73
Loader	80	40	76	68
Grader	85	40	81	73
Saw	90	20	83	75
Jack Hammer	85	20	78	70
Bulldozer	85	40	81	73
Crane	85	16	77	70
Paver	85	16	77	70
Roller	85	20	78	70
Generator	82	50	79	71
Backhoe	80	40	76	68

SOURCE: Federal Highway Administration (FHWA), *FHWA Roadway Construction Noise Model User's Guide*, 2006.

Construction activities at both sites would include site mobilization, clearing and grubbing, demolition, excavation, grading, floodwall installation, possible utility line removal or relocation, relocation or extension of the existing storm drain piping, and demobilization. Additional activities at the Nursery Basin site include basin earthwork, building the diversion structure across Fairfax Creek, constructing an outlet control structure, and installing pipes and drains. Additional activities in downtown San Anselmo include building new sidewalks and guardrails, and reconstructing the existing public access features at Creek Park.

The operation of each piece of off-road equipment at the Nursery Basin and downtown San Anselmo construction areas would not be constant throughout the day, as equipment would be turned off when not in use. Most of the time during a typical workday, the equipment would be operating at different locations within the Nursery Basin site, and different pieces of equipment would not all be operating concurrently. To quantify construction-related noise exposure at the nearest sensitive land use, it is assumed that the two loudest pieces of construction equipment would operate within the Project area closest to the nearest off-site sensitive land use.

The closest sensitive land use to the Nursery Basin site are single-family residences with back yards immediately adjacent to the site's western and eastern boundaries. These single-family buildings are as close as 25 feet from the parcel boundary around the Project site. Using the reference noise levels provided in Table 4.11-5, a saw and grader running at the same time and pace could generate a noise level of 85 dBA L_{eq} from a distance of 50 feet. Assuming a 7.5 dB per doubling of distance drop-off rate, the nearest sensitive receptors from the construction area would be exposed to a noise level of 93 dBA L_{eq}. These sensitive land uses would be exposed to noise levels that would be substantially higher than existing ambient noise levels, a potentially significant impact. As noted above in Section 4.11.3.3, the Marin Countywide Plan indicates that as a condition of approval for projects generating significant construction noise impacts during the construction phase, construction management for any project shall develop a construction noise reduction plan and designate a disturbance coordinator at the construction site to implement the provisions of the plan. The construction noise reduction plan developed pursuant to the Countywide Plan would include measures to reduce construction noise. These measures shall include, but not limited to, the following:

1. Distribute to the potentially affected residences and other sensitive receptors within 100 feet of Project construction boundary a "hotline" telephone number, which shall be attended during active construction working hours, for use by the public to register complaints. The distribution shall identify a noise disturbance coordinator who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaints and institute feasible actions warranted to correct the problem. All complaints shall be logged noting date, time, complainant's name, nature of complaint, and any corrective action taken. The distribution shall also notify residents adjacent to the Project site of the construction schedule.

2. All construction equipment shall have intake and exhaust mufflers recommended by the manufacturers thereof. Further, pavement breakers and jackhammers shall also be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers thereof. In lieu of or in the absence of manufacturers' recommendations, the Director of Public Works shall have the authority to prescribe such means of accomplishing maximum noise attenuation as he deems to be in the public interest, considering the available technology and economic feasibility.

3. Maintain maximum physical separation between noise sources (construction equipment) and sensitive noise receptors. Separation may be achieved by locating stationary equipment to minimize noise impacts on the community.

4. Impact tools (e.g., jack hammers, pavement breakers) used during construction activities will be hydraulically or electrically powered where feasible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used.

5. Use construction noise barriers such as paneled noise shields, barriers, or enclosures adjacent to noisy stationary equipment. Noise control shields shall be made featuring a solid panel and a weather-protected, sound-absorptive material on the construction-activity side of the noise shield.

6. Truck hauling access routes to Project sites along local roadways shall use roadways with the fewest residences feasible to minimize vehicle noise exposure to nearby residences.
7. Whenever construction occurs within 100 feet of a sensitive receptor or has direct line-of-sight of a first-floor occupied residence, a temporary six-foot or greater barrier(s) shall be constructed around construction areas to shield the ground floor of the noise-sensitive uses. These barriers shall be of ¾-inch Medium Density Overlay (MDO) plywood sheeting, or other material of equivalent utility and appearance, and shall achieve a Sound Transmission Class of STC-30, or greater.

Through the implementation of measures in the construction noise reduction plan, it is anticipated that construction-related noise levels would be reduced by requiring the Project to implement best management practices. Therefore, with implementation of the construction noise reduction plan temporary noise impacts associated with Nursery Basin construction would be less than significant.

Sensitive land uses in the vicinity of the Downtown San Anselmo site are single- and multi-family residences west, northwest, and southwest of the site. The nearest sensitive receptor is a single-family residence approximately 235 feet west of the site. Assuming a 7.5-dB per doubling of distance drop-off rate, the nearest sensitive from the construction area would be exposed to a noise level of 68 dBA L_{eq} during construction. These sensitive land uses would not be exposed to noise levels that would be substantially higher than existing ambient noise levels.

In addition to on-site construction noise, off-site hauling and material deliveries associated with construction activities would occur along designated truck routes within both of the construction areas. This increase in truck traffic compared to existing conditions would contribute incrementally to traffic noise along local streets. Truck noise levels depend on vehicle speed, load, terrain, and other factors. The effects of off-site truck noise would depend on the existing level of background noise at a particular sensitive receptor. It is anticipated that a maximum day of truck traffic from the Downtown San Anselmo site and the Nursery Basin site would equate in 150 one-way trips (75 round trips) and 392 one-way (196 round trips), respectively, during on-site construction at each location.

Haul truck routes would likely occur along U.S. Highway 101, Sir Francis Drake Boulevard, and other local roadways in the immediate vicinity of the Project sites. Noise associated with a single truck pass-by can be approximately 80 dBA at 50 feet (FHWA, 2006). However, it takes a doubling of traffic to increase average noise levels by only 3 dB, which is considered barely perceptible to the average person (Caltrans, 2013a). Since U.S. Highway 101 and the majority of Sir Francis Drake Boulevard experience elevated traffic levels, the worst-case worker and haul truck traffic of 392 one-way trips per day would not double traffic volume along these roadways and would therefore not result in a perceptible increase in traffic noise at existing sensitive receptor locations.

It is possible that Project-related truck trips could more than double existing traffic levels of some of the lightly travelled local roadways in the Project area where residential areas are located, which could increase ambient noise levels at residences by more than 3 dB. Calculation of an example roadway noise level that would be associated with Project-related hauling on these local roadways was completed using the traffic noise prediction acoustical algorithms developed by the Federal Highway Administration. Assuming the construction activities could result in 40 one-way truck trips on local roads during the peak-hour of hauling when local traffic levels would be negligible, a 1-hour L_{eq} of 66 dBA at residences 50 feet from the roadway center was modeled. Sensitive receptors would not likely be located within 50 feet of Project-related haul routes. Consequently, nearby sensitive land uses would not be exposed to construction-related haul truck traffic noise that would be substantially higher than existing ambient noise levels.

Mitigation: None required.

Impact 4.11-2: Project construction would not generate noise that would expose people to noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction. (*Less than Significant*)

Construction activities at the Nursery Basin and Downtown San Anselmo sites would be located entirely within an unincorporated area of Marin County and Town of San Anselmo, respectively. As described in Section 4.11.3, above, Marin County has established exemptions for noise related to construction activities and the Town of San Anselmo has established allowed construction hours provided construction equipment do not exceed 80 dBA from a distance of 50 feet. The allowed construction hours identified in the Marin County and Town of San Anselmo municipal code are summarized in **Table 4.11-6**. Construction activities within the Town of San Anselmo are allowed to occur outside of the Town's allowed construction hours provided construction activities do not expose the nearest sensitive receptor to noise levels that elevated the existing ambient by 5 dB.

TABLE 4.11-6
CONSTRUCTION NOISE TIME-OF-DAY EXEMPTIONS

Jurisdiction	Weekdays	Saturdays	Sundays	Federal Holidays
Marin County	8:00 a.m. to 5:00 p.m.	Construction not allowed	Construction not allowed	Construction not allowed
Town of San Anselmo	7:00 a.m. to 7:00 p.m.	9:00 a.m. to 5:00 p.m.	12:00 p.m. to 5:00 p.m.	Construction not allowed

SOURCES: Refer to Section 4.11.3., Regulatory Setting.

Since construction activities proposed at the Nursey Basin site would only occur within the allowed hours identified in the Marin County municipal code (see Table 4.11-6), Project construction activities at the Nursey Basin site would be exempt from the County's noise standards.

Project construction activities at the Downtown San Anselmo Site would only occur within the allowed hours identified in the Town of San Anselmo municipal code. As previously discussed under Impact 4.11-2, the nearest sensitive receptor to the Downtown San Anselmo site would be exposed to a noise level of 68 dBA L_{eq} and a maximum noise level of 73 dBA, which would not exceed the Town of San Anselmo construction noise standard. Furthermore, since construction activities would only occur within the daytime hours identified in the Town of San Anselmo municipal code, the Project would not be required to demonstrated compliance with the Town's 5 dB increase over ambient standard.

The Project would not operate outside of the daytime construction exemption hours specified in the Marin County and Town of San Anselmo municipal codes (see Table 4.11-6) and would not exceed the Town of San Anselmo construction noise standard. Therefore, residences near Project construction areas would be exposed to noise levels that would not result in violation of either Marin County and Town of San Anselmo municipal codes, resulting in a less-than-significant impact.

Mitigation: None required.

Impact 4.11-3: Project construction would not expose people to or generate excessive groundborne vibration during construction. (*Less than Significant*)

Temporary sources of groundborne vibration and noise during construction and maintenance activities at the Nursery Basin and Downtown San Anselmo sites would result from operation of conventional heavy construction equipment such as graders, bulldozers, and loaded haul trucks. Typical reference vibration levels for these types of equipment are listed below in **Table 4.11-7**.

As described above in Section 4.11.4, sensitive land uses that are exposed to a vibration levels that exceeds 0.9 in/sec PPV and 0.3 in/sec PPV would result in adverse human reaction or building damage. There are no historic structures in or near the Nursery Basin or Downtown San Anselmo sites that could be exposed to construction-induced vibration that would result in structural damage.

TABLE 4.11-7
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Equipment/Activity	PPV at 25 feet (inches/second)[a]
Large Bulldozer	0.089
Jackhammer	0.035
Loaded Trucks	0.076
Caisson Drilling (represents Tunnel boring machine)	0.089

SOURCE: Federal Transit Administration (FTA), *Transit Noise and Vibration Impact Assessment* (Guidance Manual), May 2006. (Chapter 12)

The nearest sensitive land uses are approximately 25 and 235 feet from the Nursery Basin and Downtown San Anselmo sites, respectively. Assuming that a large bulldozer would be used during Project construction, these sensitive land uses would be exposed to a vibration level of approximately 0.089 in/sec PPV and 0.003 in/sec PPV, respectively. Since the nearest sensitive land uses to the Nursery Basin and Downtown San Anselmo sites would not be exposed to vibration levels that would exceed the established adverse human reaction threshold or the building damage threshold, this would result in a less-than-significant impact.

Mitigation: None required.

Impact 4.11-4: The Project would not cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations. (*Less than Significant*)

The operation and maintenance activities at the Nursery Basin and Downtown San Anselmo sites would largely be similar to those already conducted by the Flood Control District, Marin County Department of Public Works, and the Town of San Anselmo for the stream channels and banks, buildings, bridges, culverts, and other aspects of their management responsibilities. Typical activities include management of invasive vegetation that may have adverse flooding impacts, catch floating debris, or increase erosion; removal of litter or debris; regular inspection and as-needed repair of flood walls, retaining walls, or other structures; and replanting, tree-trimming, or other vegetation management actions, as described in the Flood Control District's Stream Maintenance Program. These activities may include the use of off-road equipment such as lawn mowers, backhoes, and loaders. These activities would be temporary and occur infrequently throughout the year. In addition, removal of sediment deposited in the Nursery Basin or the Fairfax Creek channel would be removed one to two times per year, using a small bulldozer and backhoe similar to those used for construction but would generally be smaller and quieter. This activity would take place during allowed hours identified in the Marin County municipal code (see Table 4.11-6), and would be at a greater distance from the nearest sensitive receptors than the construction.

Unlike during Project construction, it is unlikely that multiple pieces of noise-generating maintenance equipment would be operating at any one place concurrently. To quantify construction-related noise exposure at the nearest sensitive land use, it is assumed that one of the loudest pieces of off-road equipment would operate within the Project area closest to the nearest off-site sensitive land use. Using the reference noise levels provided in Table 4.11-5, an excavator operating could generate a noise level of 73 dBA L_{eq} from a distance of 50 feet. Assuming a 7.5 dB per doubling of distance drop-off rate, sensitive receptors near the Nursery Basin and Downtown San Anselmo sites would be exposed to a noise level of 81 and 56 dBA L_{eq}, respectively. These sensitive land uses would not be exposed to noise levels that would exceed the applied FTA adverse community reaction threshold of 90 dBA L_{eq}. Therefore, this would result in a less-than-significant impact.

Mitigation: None required

4.11.5 References – Noise

California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013a.

Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013b.

Egan, M. David, *Architectural Acoustics,* McGraw-Hill, Inc., 1988.

Federal Transit Administration (FTA), *Transit Noise and Vibration Impact Assessment* (Guidance Manual), May 2006. (Chapter 12)

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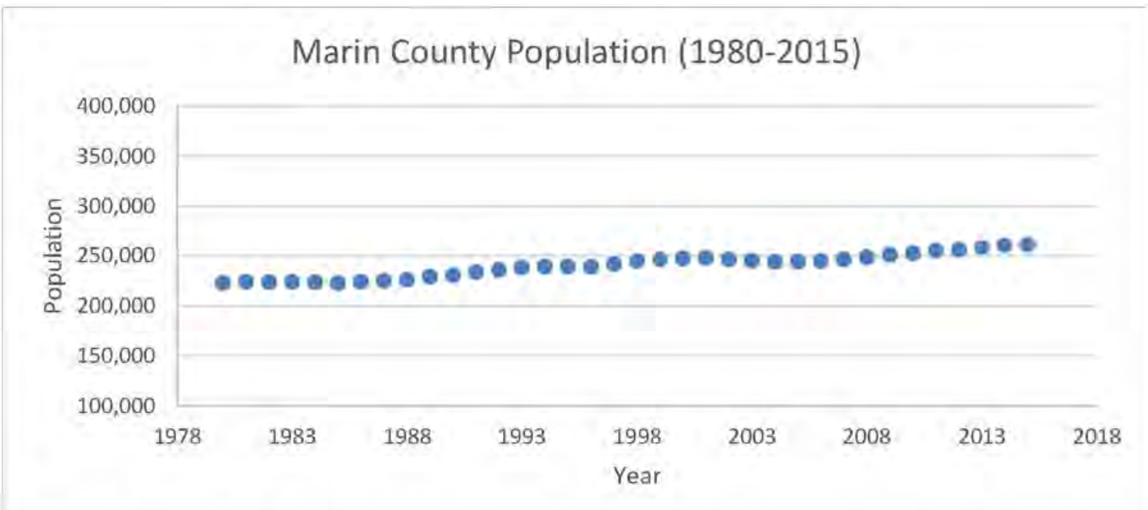
4.12 Population and Housing

This section evaluates the potential impacts of the San Anselmo Flood Risk Reduction Project (Project) on population and housing. It provides an overview of the physical and regulatory setting that applies to population and housing. Potential impacts are discussed and evaluated, and appropriate mitigation measures are identified, where necessary.

4.12.1 Environmental Setting

In 2015, Marin County's population was approximately 262,305. As shown on **Figure 4.12-1**, the population grew 17.4 percent from 1980 to 2015, adding approximately 38,629 people. The estimated growth rate for 2010 to 2015 was 3.9 percent and the projected 2015 to 2050 growth rate is 5.7 percent (**Table 4.12-1**). According to the 2007 Marin Countywide Plan, the County's population could grow to nearly 283,100 in the future if all land designated for residential development were to be fully developed and occupied (Marin County Community Development Agency, 2007).



SOURCE: U.S. Census Bureau, 1980 Census, 1980. Available online at https://www.census.gov/programs-surveys/decennial-census/decade.1980.html; U.S. Census Bureau, 1990 Census, 1990. Available online at https://www.census.gov/programs-surveys/decennial-census/decade.1990.html; U.S. Census Bureau, 2000 Census, Bay Area Census, 2000a. Available online at http://www.bayareacensus.ca.gov/counties/MarinCounty.htm. Accessed on August 31, 2017; U.S. Census Bureau, 2010 Census, Bay Area Census, 2010a. Available online at http://www.bayareacensus.ca.gov/counties/MarinCounty.htm. Accessed on August 31, 2017; U.S. Census Bureau, U.S. Census Bureau Population Estimates 2015 Vintage 2015 Population Estimates, 2015. Available online at https://www.census.gov/programs-surveys/popest/data.html. Accessed on August 31, 2017.

Figure 4.12-1
Population of Marin County (1980 to 2015)

Marin County had approximately 103,210 households in 2010 with an average household size of 2.36 people (**Table 4.12-2**). If both vacant and underdeveloped lots were developed, approximately 15,200 new housing units, including both single-family and multi-family, could be added countywide (Marin County Community Development Agency, 2007).

In 2015, the Town of San Anselmo's population was approximately 12,862. As shown in Table 4.12-1, the estimated growth rate for 2010 to 2015 was 4.2 percent, despite the decrease in population between 2000 and 2010. The population of San Anselmo is expected to increase to 13,400 in 2040 (Town of San Anselmo, 2015).

TABLE 4.12-1
POPULATION AND GROWTH RATES OF MARIN COUNTY AND TOWNS WITHIN THE PROJECT AREA

Region	Population				Growth Rates (%)		
	2000	2010	2015 (Estimated)	2050 (Projected)	2000-2010	2010-2015 (Estimated)	2015-2050 (Projected)
Marin County	247,289	252,409	262,305	277,335	2.1%	3.9%	5.7%
Town of San Anselmo	12,378	12,336	12,862		-0.3%	4.2%	
Town of Fairfax	7,319	7,441	7,525		1.7%	1.1%	

SOURCE: U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2000, Fairfax town, California, 2000b; U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2000 Marin County, California, 2000c; U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2000, San Anselmo town, California, 2000d; U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, Fairfax town, California, 2010b; U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, Marin County, California, 2010c; U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, San Anselmo town, California, 2010d; State of California Department of Finance, P-2: County Population Projections (2010-2060), County Population by Age (1 year increments), 2017a; State of California Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State, January 2011-2017, with 2010 Benchmark, 2017b.

TABLE 4.12-2
MARIN COUNTY HOUSING DEMOGRAPHICS

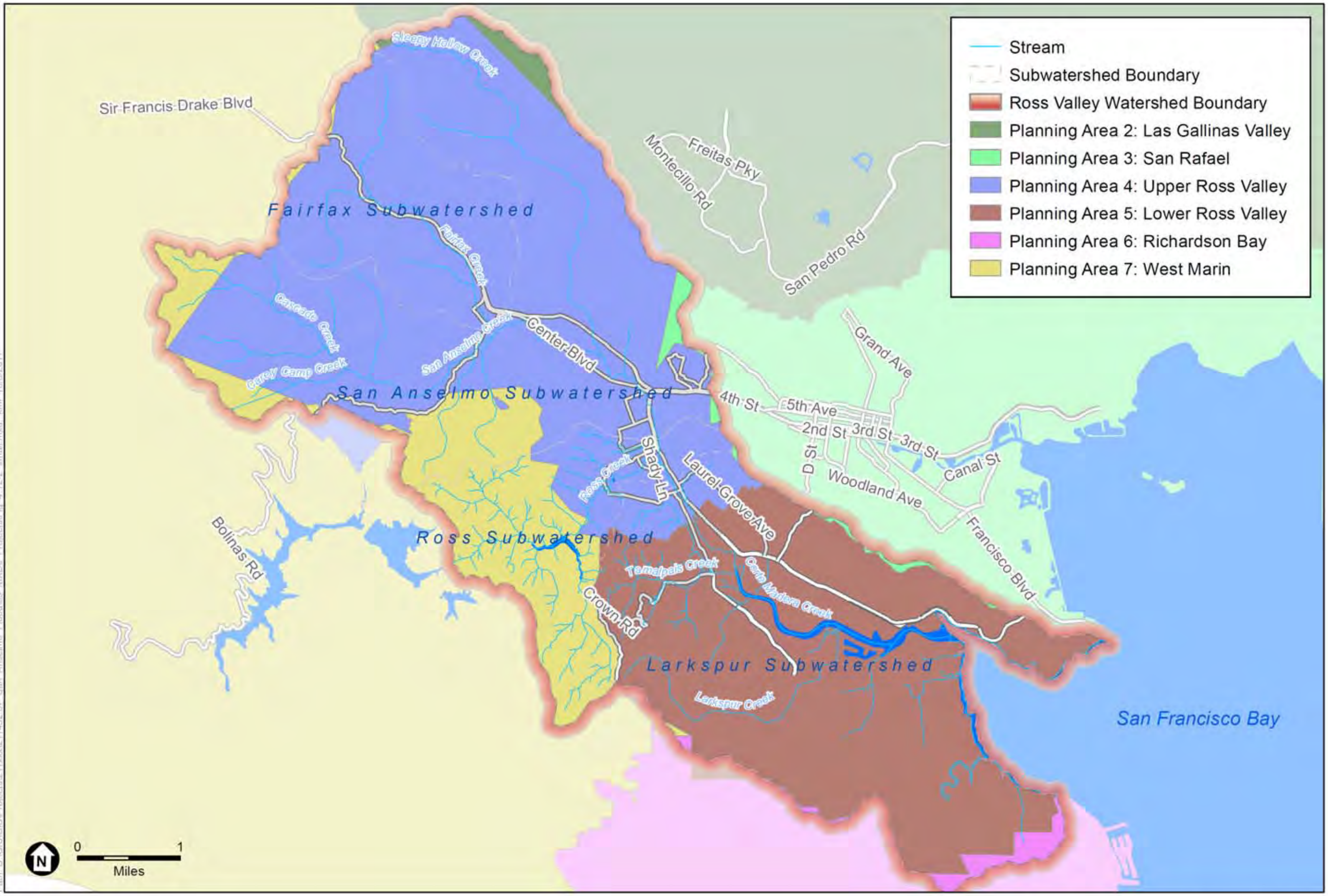
Information Category	1980 Actual	1990 Actual	2000 Actual	2010 Actual	Theoretical Buildout
Households	88,723	95,006	100,650	103,210	118,728
Average Household Size	2.43	2.33	2.34	2.36	2.36

NOTE: The Countywide Plan does not include projections that estimate the time by which a certain level of development is projected to occur. Instead, tables of statistics are presented for the county and for each of the seven planning areas; these tables identify four benchmarks by which to measure trends: U.S. Census Bureau counts of population, households, employed residents, and jobs for the years 1980, 1990, and 2000. They also include a projection of development that could occur if land vacant and underutilized in 2004 were fully developed, pursuant to the zoning designations of city and County general plans.

SOURCE: Marin County Community Development Agency, *Marin Countywide Plan*, Adopted November 6, 2007. Available online at http://www.marincounty.org/depts/cd/divisions/planning/2007-marin-countywide-plan/plans-and-documents. Accessed on October 7, 2016; U.S. Census Bureau, 1980 Census, 1980. Available online at https://www.census.gov/programs-surveys/decennial-census/decade.1980.html; U.S. Census Bureau, 1990 Census, 1990. Available online at https://www.census.gov/programs-surveys/decennial-census/decade.1990.html; U.S. Census Bureau, 2000 Census, Bay Area Census, 2000a. Available online at http://www.bayareacensus.ca.gov/counties/MarinCounty.htm. Accessed on August 31, 2017.

The former Sunnyside Nursery site is located northwest of Fairfax, California. In 2015, the Town of Fairfax's population was approximately 7,252. The estimated growth rate for 2010 to 2015 was 1.1 percent.

The Marin Countywide Plan Planning Area 4, Upper Ross Valley, encompasses the Project area (**Figure 4.12-2**). The Upper Ross Valley planning area includes the Towns of Fairfax, Ross, and San Anselmo, as well as the unincorporated neighborhoods west and southwest of the Town of Fairfax and Sleepy Hollow (Marin County Community Development Agency, 2007). **Table 4.12-3** includes the population and housing data for the Upper Ross Valley planning area.



SOURCE: Marin County, MarinMap

San Anselmo Flood Risk Reduction Project . 211432.07

Figure 4.12-2
Countywide Plan Planning Areas in Ross Valley Watershed

ESA

TABLE 4.12-3
UPPER ROSS VALLEY PLANNING AREA POPULATION AND HOUSING DEMOGRAPHICS

Information Category	1980 Actual	1990 Actual	2000 Actual	Theoretical Buildout
Population	25,623	24,196	25,297	28,838
Households	10,420	10,171	10,504	12,090
Average Household Size	2.46	2.32	2.41	2.39
Housing Units	10,836	10,565	10,823	11,514
Incorporated Area	9,692	9,323	9,631	10,035
Unincorporated Area	1,144	1,242	1,192	1,479

SOURCE: Figure 3-54 of the Marin Countywide Plan (Marin County Community Development Agency, *Marin Countywide Plan*, Adopted November 6, 2007. Available online at http://www.marincounty.org/depts/cd/divisions/planning/2007-marin-countywide-plan/plans-and-documents. Accessed on October 7, 2016.)

4.12.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.12.2.1 Federal Regulations

There are no federal regulations on population or housing that apply to the Project.

4.12.2.2 State Regulations

There are no state regulations on population or housing that apply to the Project.

4.12.2.3 Local Regulations

Marin Countywide Plan

The Marin Countywide Plan (Marin County Community Development Agency, 2007), includes the following relevant goals and policies related to population and housing.

Population

Goal CD-5: Effective Growth Management. Manage growth so that transportation, water, sewer, wastewater facilities, fire protection, and other infrastructure components remain adequate.

Policy CD-5.1: Assign Financial Responsibility for Growth. Require new development to pay its fair share of the cost of public facilities, services, and infrastructure, including but not limited to transportation, incremental water supply, sewer and wastewater treatment, solid waste, flood control and drainage, schools, fire and police protection, and parks and recreation. Allow for individual affordable housing projects to be exempted from the full cost of impact fees, subject to meeting specified criteria.

***Policy CD-5.2: Correlate Development and Infrastructure*.** For health, safety, and general welfare, new development should occur only when adequate infrastructure is available, consistent with the following findings:

a) Project-related traffic will not cause the level of service established in the circulation element to be exceeded (see TR-1e).

b) Any circulation improvements or programs needed to maintain the established level of service standard have been programmed and funding has been committed.

c) Environmental review of needed circulation improvement projects or programs has been completed.

d) The timeframe for completion of the needed circulation improvements or programs will not cause the established level of service standard to be exceeded.

e) Wastewater, water (including for adequate fire flows), and other infrastructure improvements will be available to serve new development by the time the development is constructed.

Housing

Housing Goal 1: Use Land Efficiently. Use Marin County's land efficiently to meet housing needs and to implement smart and sustainable development principles.

***Policy 1.1: Land Use*.** Enact policies that encourage efficient land use regulations which foster a range of housing types in our community.

***Policy 1.2: Housing Sites*.** Recognize developable land as a scarce community resource. Protect and strive to expand the supply and residential capacity of housing sites, particularly for lower income households.

***Policy 1.3: Development Certainty*.** Promote development certainty and minimize discretionary review for affordable and special needs housing through amendments to the Development Code.

***Policy 1.4: Design, Sustainability, and Flexibility*.** Enact programs that facilitate well designed, energy efficient development, and flexibility of standards to encourage outstanding projects.

Housing Goal 2: Meet Housing Needs through a Variety of Housing Choices. Respond to the broad range of housing needs in Marin County by supporting a mix of housing types, densities, affordability levels, and designs.

Housing Goal 3: Ensure Leadership and Institutional Capacity. Build and maintain local government institutional capacity and monitor accomplishments to respond to housing needs effectively over time.

Goal CD-2: Balanced Communities. Maintain balanced communities that house and employ persons from all income groups and provide the full range of needed facilities and services.

***Policy CD-2.8: Limit Development in Resource or Hazard Areas*.** Discourage development in areas with high natural resource value or threats to life or property, and restrict development in such areas to minimize adverse impacts.

Town of San Anselmo

The Town of San Anselmo adopted the 2015-2023 General Plan Housing Element in May 2015. The Housing Element responds to current and near-term future housing needs in San Anselmo, and contains policies and specific actions that the Town is committed to undertaking to address its housing needs. (Town of San Anselmo, 2015). The Housing Element includes the following strategy and policy relevant to the Project:

> **Strategy 2:** Maintain, protect, and enhance existing housing, and blend well-designed new housing into the community.
>
> > ***Policy H2.6: Maintenance and Management of Quality Housing and Neighborhoods.*** The Town will encourage good management practices, rehabilitation of viable older housing, and long-term maintenance and improvement of neighborhoods.

Town of Fairfax

The Town of Fairfax General Plan includes some goals and policies related to population and housing (Town of Fairfax, 2012). However, since the Project is not in the Town of Fairfax and does not involve any activities that would indirectly affect population or housing, none of those goals or policies are directly applicable to the Project; this content is provided for informational purposes.

4.12.3 Impacts and Mitigation Measures

4.12.3.1 Significance Criteria

Consistent with State CEQA *Guidelines*, Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:

a) Induce substantial population growth or concentration of population in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere;

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere; or

d) Conflict with housing and population projections and policies as set forth in the Countywide Plan.

4.12.3.2 Approach to Analysis

This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section. Impact evaluations are based on a review of the actions proposed under the Project as described in Chapter 3, *Project Description*, to determine whether these actions could potentially result in impacts on population and housing within the study area that in turn could result in physical effects on the environment.[1] The analysis considers the potential Project elements, Appendix G of the State CEQA *Guidelines*, Appendix K and N of the County's Environmental Impact Review Guidelines, current conditions, and applicable regulations, plans, and policies.

4.12.3.3 Impacts and Mitigation Measures

Impact 4.12-1: The Project would not induce substantial population growth. *(No Impact)*

The Project would increase the capacity of San Anselmo Creek and construct a flood diversion and storage basin to reduce flood risk; it would not construct housing and therefore would not directly induce growth in the watershed. In addition, the reduction in flood hazard would affect areas already developed and thus would not indirectly support population growth. Figures 3-13a-c, 3-14a-c, and 3-15a-c (in Chapter 3, *Project Description*) illustrate the areas of reduced flood occurrence after implementation of the Project; these areas are all developed with streets, buildings, and other structures. Therefore, there would be no impact.

Mitigation: None required.

Impact 4.12-2: The Project would not displace substantial numbers of existing housing units or people. *(Less than Significant)*

The Project would increase the capacity of San Anselmo Creek and construct a flood diversion and storage basin to reduce flood risk in areas already developed with housing units; it would not displace any housing and therefore would not necessitate construction of replacement housing. As discussed in greater detail in Section 4.9, Hydrology and Water Quality, multiple parcels would be affected by increased inundation. The District would mitigate these effects by either providing flow containment structures (such as floodwalls) or elevating existing structures; as a result, no displacement of housing is anticipated and the Project would not cause a measurable change in the population status and trends. Therefore, the Project's impact with respect to displacing substantial numbers of existing housing units or people would be less than significant.

Mitigation: None required.

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1 In accordance with CEQA, economic (e.g., property values) and social effects of a project are not considered environmental impacts (State CEQA *Guidelines* Section 15131) unless there would be a physical impact on the environment resulting from such effects, or if such effects result in the need for the construction of new or physically altered facilities that would result in significant physical environmental impacts.

Impact 4.12-3: The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan. *(No Impact)*

The Project would not construct housing or induce substantial population growth, as discussed above, and thus would not affect population projections and policies in the Countywide Plan. Section 4.9, Hydrology and Water Quality, discusses the hydraulic modeling conducted in support of the Project; modeling indicates that the Project could increase the extent and depth of inundation on the margins of parcels along Winship Avenue and Sir Francis Drake Boulevard. Those potential impacts are addressed in that section. Therefore, the Project has no impact with respect to conflicting with housing and population projections as set forth in the Countywide Plan.

Mitigation: None required.

4.12.4 References – Population, Housing, and Employment

Marin County Community Development Agency, *Marin Countywide Plan*, Adopted November 6, 2007. Available online at http://www.marincounty.org/depts/cd/divisions/planning/2007-marin-countywide-plan/plans-and-documents. Accessed on October 7, 2016.

State of California Department of Finance, P-2: County Population Projections (2010-2060), County Population by Age (1 year increments), 2017a. Available online at http://www.dof.ca.gov/Forecasting/Demographics/Projections/.

State of California Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State, January 2011-2017, with 2010 Benchmark, 2017b. Available online at http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/.

Town of Fairfax, Department of Planning & Building Services, Town of Fairfax 2010-2030 General Plan, Final Adoption April 4, 2012. Available online at http://www.town-of-fairfax.org/pdfs/planning_dept/general%20plan/TownofFairfax_2010-2030GeneraPlan_PDFreduced.pdf. Accessed on September 12, 2017.

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U.S. Census Bureau, 2010 Census, Bay Area Census, 2010a. Available online at http://www.bayareacensus.ca.gov/counties/MarinCounty.htm. Accessed on August 31, 2017.

U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, Fairfax town, California, 2010b. Available online at https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accessed on August 31, 2017.

U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, Marin County, California, 2010c. Available online at https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accessed on August 31, 2017.

U.S. Census Bureau, American FactFinder, DP-1 Profile of General Demographic Characteristics: 2010, San Anselmo town, California, 2010d. Available online at https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accessed on August 31, 2017.

U.S. Census Bureau, U.S. Census Bureau Population Estimates 2015 Vintage 2015 Population Estimates, 2015. Available online at https://www.census.gov/programs-surveys/popest/data.html. Accessed on August 31, 2017.

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4.13 Public Services and Utilities

This section describes existing public services, utilities and service systems in the vicinity of the San Anselmo Flood Risk Reduction Project (Project) and evaluates the potential impacts of the Project on public services (including fire and emergency, police and criminal justice, and public education services), and utilities (including water supply, wastewater management services, solid waste management services, electricity, and natural gas). Potential effects on parks as a public service are addressed in Section 4.14, Parks and Recreation. Similarly, Section 4.15, Transportation and Circulation, evaluates potential impacts regarding emergency access during construction.

4.13.1 Environmental Setting

The subsections below describe the existing conditions for the various public services and utilities in the Project area.

4.13.1.1 Public Services

Fire Protection and Emergency Services

The Ross Valley Fire Department's service area encompasses the Towns of San Anselmo, Ross, and Fairfax as well as the unincorporated Sleepy Hollow community. The Department provides fire suppression, emergency medical services, fire prevention and inspection, community education, hazardous material spill response, and vehicle collision response and disaster response to its service area and neighboring areas of Marin County (Ross Valley Fire Department, 2017b).

Fire Station 18 is located at 33 Sir Francis Drake Boulevard in Ross. The historic Ross Fire Station was built by the Town of Ross in 1926. Fire Station 18's daily on-duty emergency response personnel consist of a Captain and an engineer/firefighter. Additionally, the fire station houses the Ross Valley Paramedic Authority transport ambulance, Medic 18, staffed with two paramedic firefighters. The station houses one structural firefighting engine and a reserve fire engine, which can be staffed by off-duty and volunteer personnel as needed.

Fire Station 19 is in downtown San Anselmo and is the headquarters for the Department, housing administrative offices as well as two structural firefighting fire engines and one command vehicle. Administrative staff based at this station includes the fire chief, administrative assistant, and fire inspector. The on-duty emergency response staff includes a battalion chief, a captain, and an engineer/firefighter. Additionally, one of the fire engines can be staffed by off-duty and volunteer personnel, as needed.

Fire Station 20 is at 150 Butterfield Road in the Sleepy Hollow neighborhood. This fire station houses two structural firefighting fire engines one of which is supplied by the State of California Emergency Management Agency. The fire station's on-duty emergency response staff includes a captain and an engineer/firefighter, one of which may be a paramedic. The fire engine supplied by the State of California Emergency Management Agency can be dispatched to anywhere in the state and the Department provides the personnel for the engine (Ross Valley Fire Department, 2017a).

Fire Station 21 is located at 10 Park Road in Fairfax. The station's on-duty emergency response staff includes a captain and an engineer/firefighter, one of which may be a paramedic. The station houses one structural fighting fire engine, and one wildland fighting fire engine that is used for wildland fire response and for fires that require off-road driving (Ross Valley Fire Department, 2017a).

Police and Criminal Justice Services

The Central Marin Police Authority is a full-service police agency serving the communities of Corte Madera, Larkspur, San Anselmo and portions of Greenbrae (Central Marin Police Authority, 2017). For 2013-2014, the Central Marin Police Authority had 56 full-time staff, including 43 sworn staff and 13 non-sworn staff. **Table 4.13-1** includes a breakdown of staff for each position.

TABLE 4.13-1
THE CENTRAL MARIN POLICE AUTHORITY FULL-TIME STAFFING LEVELS (2013-2014)

Position	Number of Full-Time Staff
Chief	1
Captains	2
Lieutenants	3
Sergeants	6
Corporals	6
Officers	25
Sub-Total Sworn:	43
Dispatch Supervisor	1
Dispatchers	8
Administrative Assistant	1
Records Manager	1
Police Services Technician	1
Community Service Officer	1
Sub-Total Non-Sworn:	13
Total	**56**

SOURCE: Central Marin Police Authority. 2014. *Police Staffing Levels.* Available at: http://www.centralmarinpolice.org/130/Police-Staffing-Levels. Accessed: August 15, 2017.

The Fairfax Police Department serves the Town of Fairfax as well as the communities of Ross and the Marin Community College District. It employs 11 full-time police officers, two reserve police officers, four full-time police dispatchers, four part-time police dispatchers, and one community services technician (Fairfax Police Department, 2017).

Public Education Services

There are nearly two dozen public schools in Ross Valley (California Department of Education, 2018). Both Project sites are within the Ross Valley School District. There are three schools located within a 0.25-mile radius of the sites. White Hill Middle School is located at 101 Glen Drive in Fairfax, approximately 600 feet to the east of the former Sunnyside Nursery site (Nursery Basin site). ABC Academy Pre-School is located at 176 Tunstead Avenue in San Anselmo, and Little Sprouts Daycare is located at 150 Pine Street in San Anselmo. Although these are both private facilities, they are approximately 950 feet to the southwest of the Downtown San Anselmo site, and are mentioned here due to proximity to the Project site. There are four public libraries in Ross Valley (County of Marin, 2018).

4.13.1.2 Utilities

Water Supply

The Marin Municipal Water District (MMWD) provides drinking water to 189,900 customers over 147 square miles of urban area in Marin County (MMWD, 2017). Three-fourths of MMWD's supply comes from the local watershed and is stored in reservoirs, while the remaining water comes via pipeline from the Russian River in Sonoma County (Marin County Community Development Agency, 2007).

The water supply lines near the Nursery Basin site are those under Deer Creek Court and Sir Frances Drake Boulevard (refer to **Figure 4.13-1**). At the Downtown San Anselmo site, there is a supply line running under San Anselmo Avenue (refer to **Figure 4.13-2**). At both Project sites, the water supply pipelines are in streets that run parallel to the sites, not directly under or through them. There is no conflict with the MMWD utilities at the Nursery Basin site, but the 8-inch polyvinyl chloride pipe that runs along San Anselmo Avenue will need to be more precisely located during the detailed topography survey to be completed during subsequent design stages (CH2M, 2017).

Wastewater Management Services

Central Marin Sanitation Agency (CMSA) provides wastewater treatment for households and businesses in the Project area. CMSA was formed in 1979 after the San Rafael Sanitation District, Sanitary District No. 1 of Marin County, Sanitary District No. 2 of Marin County, and the City of Larkspur entered into a Joint Powers Agreement (CMSA, 2017). CMSA operates the largest wastewater treatment facility in Marin County, treating and discharging approximately 6 billion gallons of wastewater each year (CMSA, 2017).

The Ross Valley Sanitary District operates and maintains a system of sewer lines and pump stations throughout the Project area to collect, pump, and transport wastewater to the CMSA wastewater treatment plant for treatment and disposal (Ross Valley Sanitary District, 2017). A sewer line runs parallel to, but outside of the Nursery Basin site boundary (**Figure 4.13-3**). At the Downtown San Anselmo site, an 18-inch reinforced concrete pipe runs along and underneath San Anselmo Avenue, but is outside the Project site except for a manhole that is shown within the site (**Figure 4.13-4**). This manhole will need to be located and shown on the detailed topography survey to be completed during subsequent design stages (CH2M, 2017).

Solid Waste Management Services

Residential and commercial solid waste disposal services in the Project area are provided by Marin Sanitary Service. Redwood Landfill and Recycling Center in Novato serves as the regional waste disposal center for the North Bay, including the Project area.

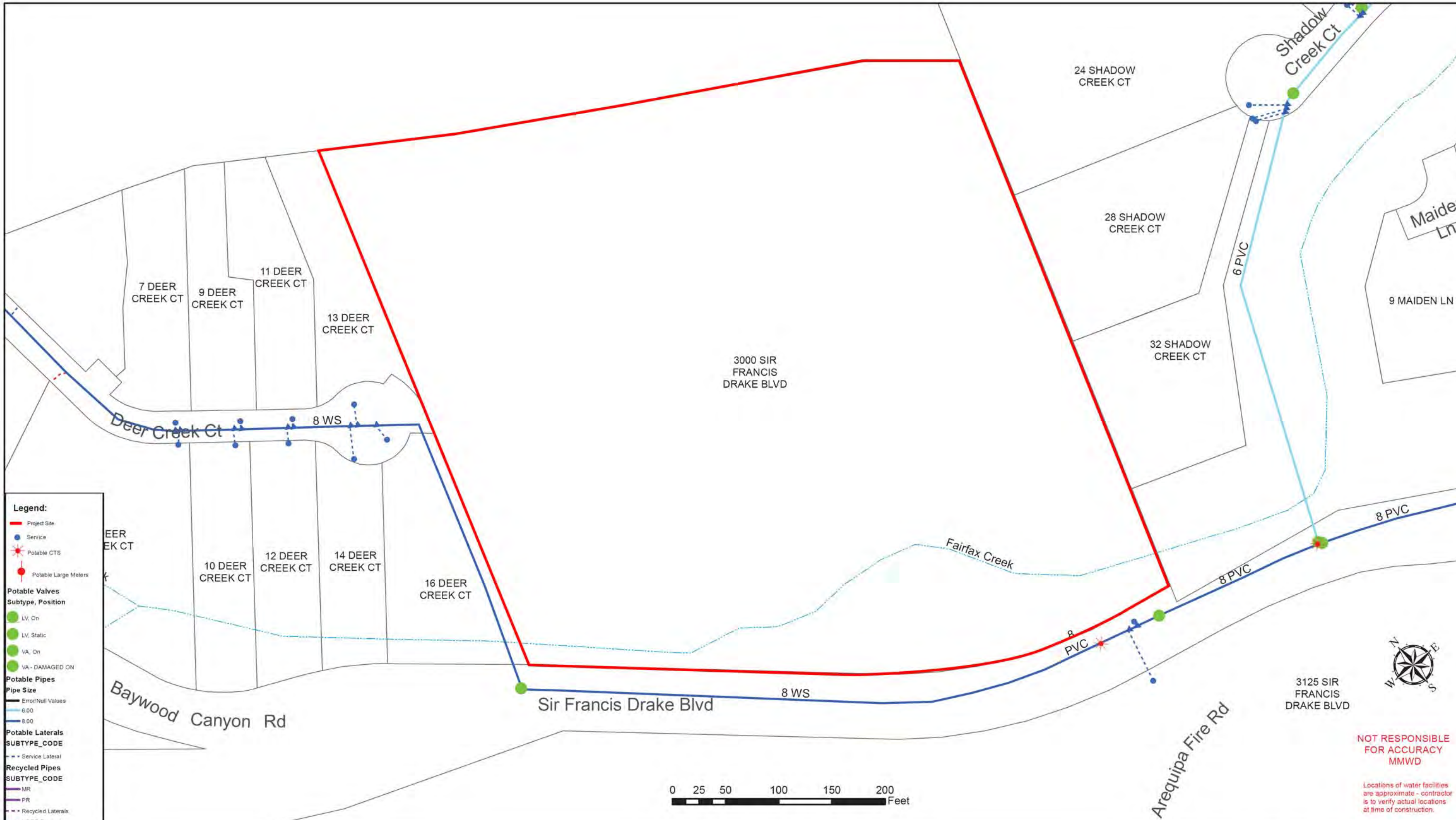
The Marin Hazardous and Solid Waste Management Joint Powers Authority, referred to as Zero Waste Marin, ensures Marin County's compliance with state recycling mandates and provides residents and businesses with information on household hazardous waste collection, recycling, composting, and waste disposal (Zero Waste Marin, 2015a). Zero Waste Marin was formed by the County of Marin and its incorporated cities and towns (Belvedere, Corte Madera, Fairfax, Larkspur, Mill Valley, Novato, Ross, San Anselmo, San Rafael, Sausalito, Tiburon). It was formed in 1996 to ensure the County's compliance with the waste diversion disposal goals mandated by California's Integrated Waste Management Act. Zero Waste Marin worked in partnership with County agencies, private waste haulers, and facility operators to develop and implement the Integrated Waste Management Plan to comply with state mandates (Zero Waste Marin, 2015b).

Electricity and Natural Gas

California's major sources of energy are petroleum products (i.e., gasoline, diesel, and oil), electricity, and natural gas. The California Energy Commission (CEC) indicates that California crude resources in 2016 came from in-state (34.10 percent), Alaska (11.41 percent), and foreign sources (54.49 percent) (CEC, 2016a). In 2015, California's in-state energy generation plus net imports totaled 295,405 gigawatt hours. Energy generation by source included hydroelectric (5 percent), nuclear (6 percent), natural gas (40 percent), and renewable (15 percent), as well as coal and other imports (34 percent) (CEC, 2016b).

In Marin County, electricity and natural gas service is provided by Pacific Gas and Electric Company (PG&E). PG&E's 2016 electric power mix consisted of renewable (33 percent), greenhouse gas-free nuclear (24 percent), natural gas (17 percent), greenhouse gas-free large hydroelectric (12 percent), and unspecified (13 percent) (PG&E, 2016). As of July 2015, solar has been installed at 4,308 sites within Marin County with a combined capacity of 26,576 kilowatts (Marin County, 2015). Within Ross Valley, there is no energy generated with the exception of residential scale solar and solar energy systems at government facilities.

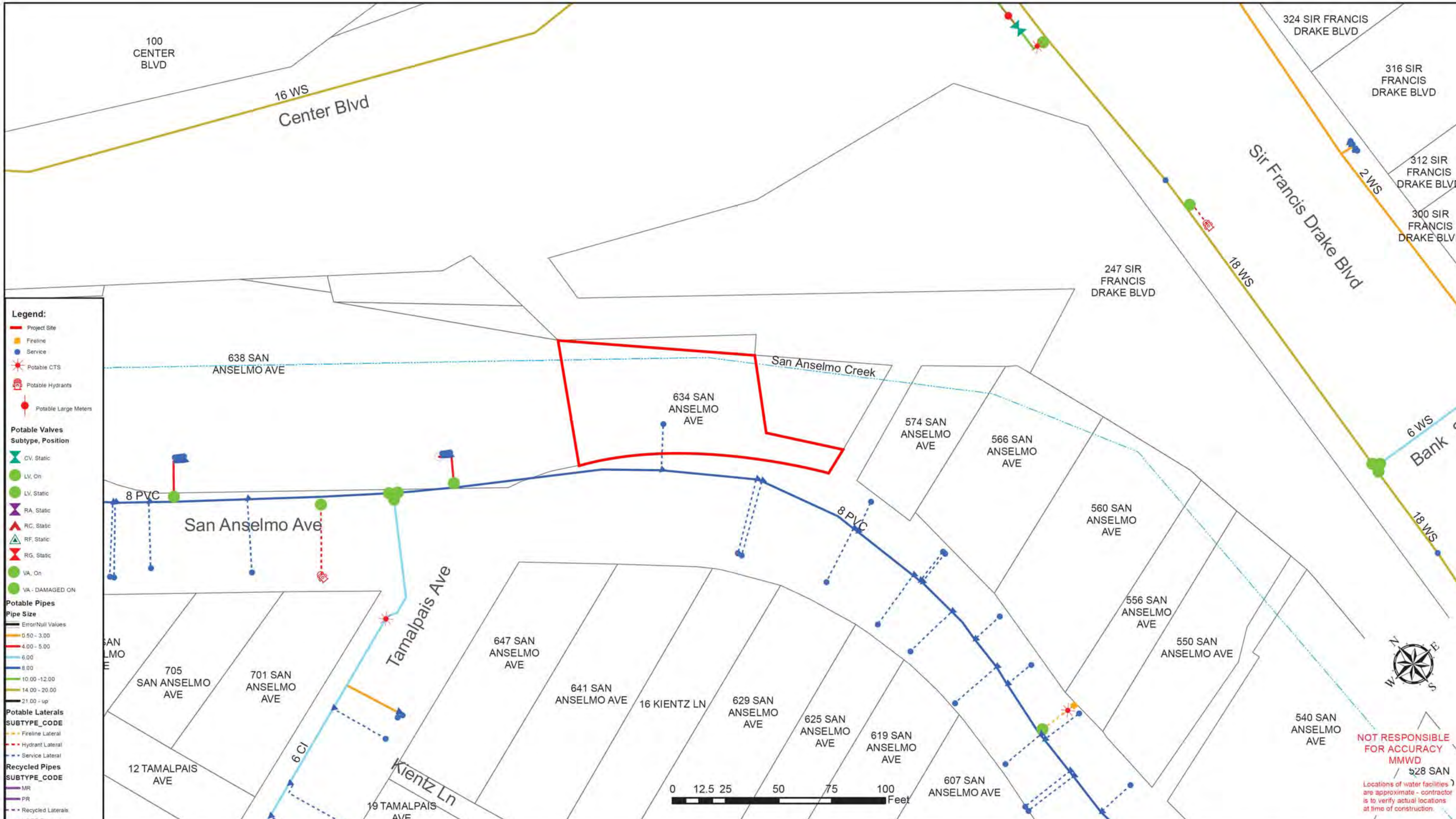
Electricity and natural gas are distributed in Marin County by PG&E. Electricity and natural gas are transported into the County through high powered electrical transmission lines and natural gas pipelines. An overhead electrical line extends across the Nursery Basin site along with overhead support structures (refer to **Figure 4.13-5**). In downtown San Anselmo, a gas main runs along San Anselmo Avenue, with lateral gas lines providing service to the property on the west side of 636 San Anselmo Avenue, outside of the Project area. There is a lateral gas line extending from the mainline to service the buildings at 634 and 636 San Anselmo Avenue along the southwest Project limits. Two electrical overhead utility lines and electrical structures are within the Project area. One electrical utility line stretches perpendicular to San Anselmo Avenue into the Project area and the second line runs parallel along San Anselmo outside of the Project area (refer to **Figure 4.13-6**).



SOURCE: Marin Municipal Water District

San Anselmo Flood Management Project . D211432.07

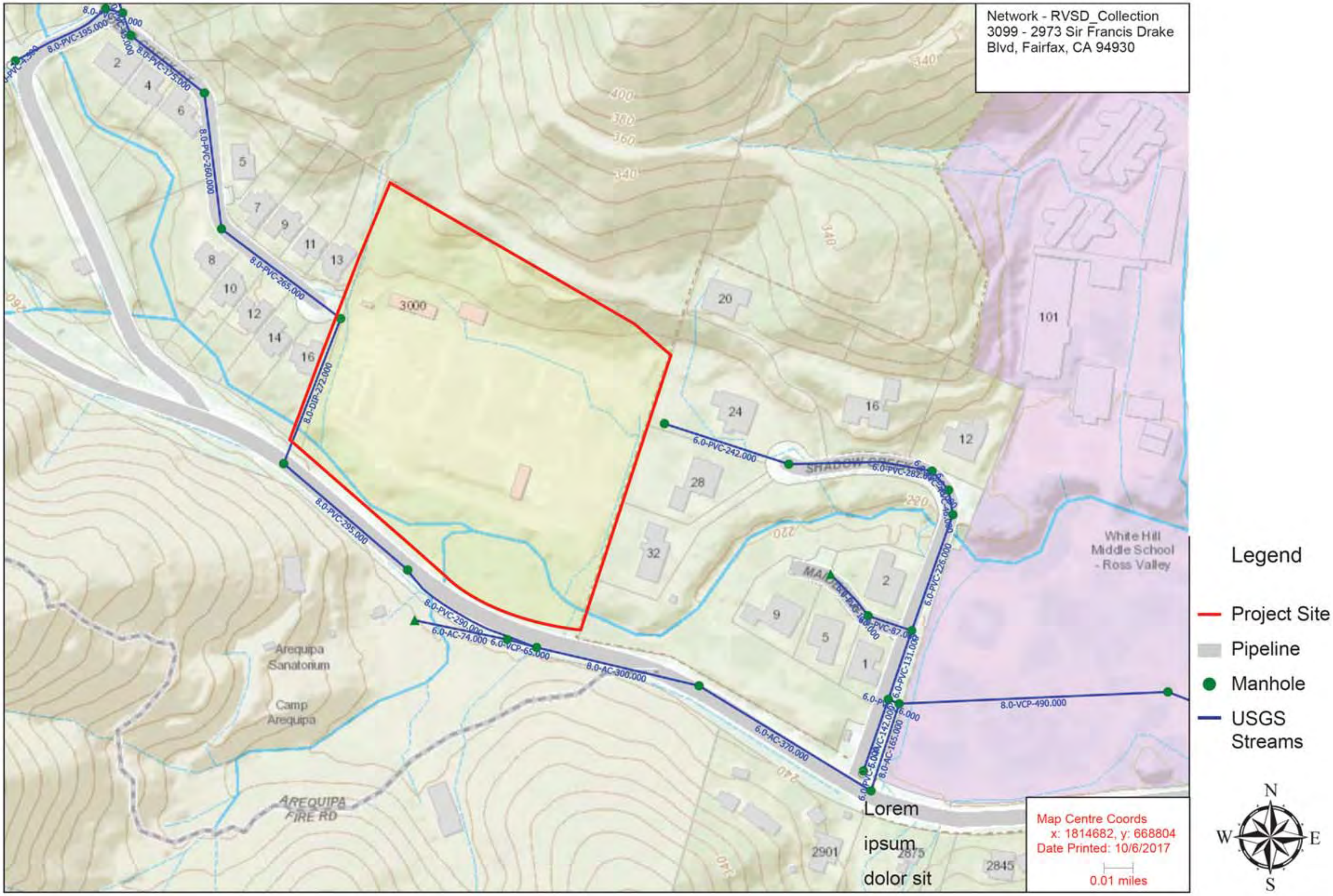
Figure 4.13-1
MMWD Water Lines near the Nursery Basin Site



SOURCE: Marin Municipal Water District

San Anselmo Flood Management Project . D211432.07

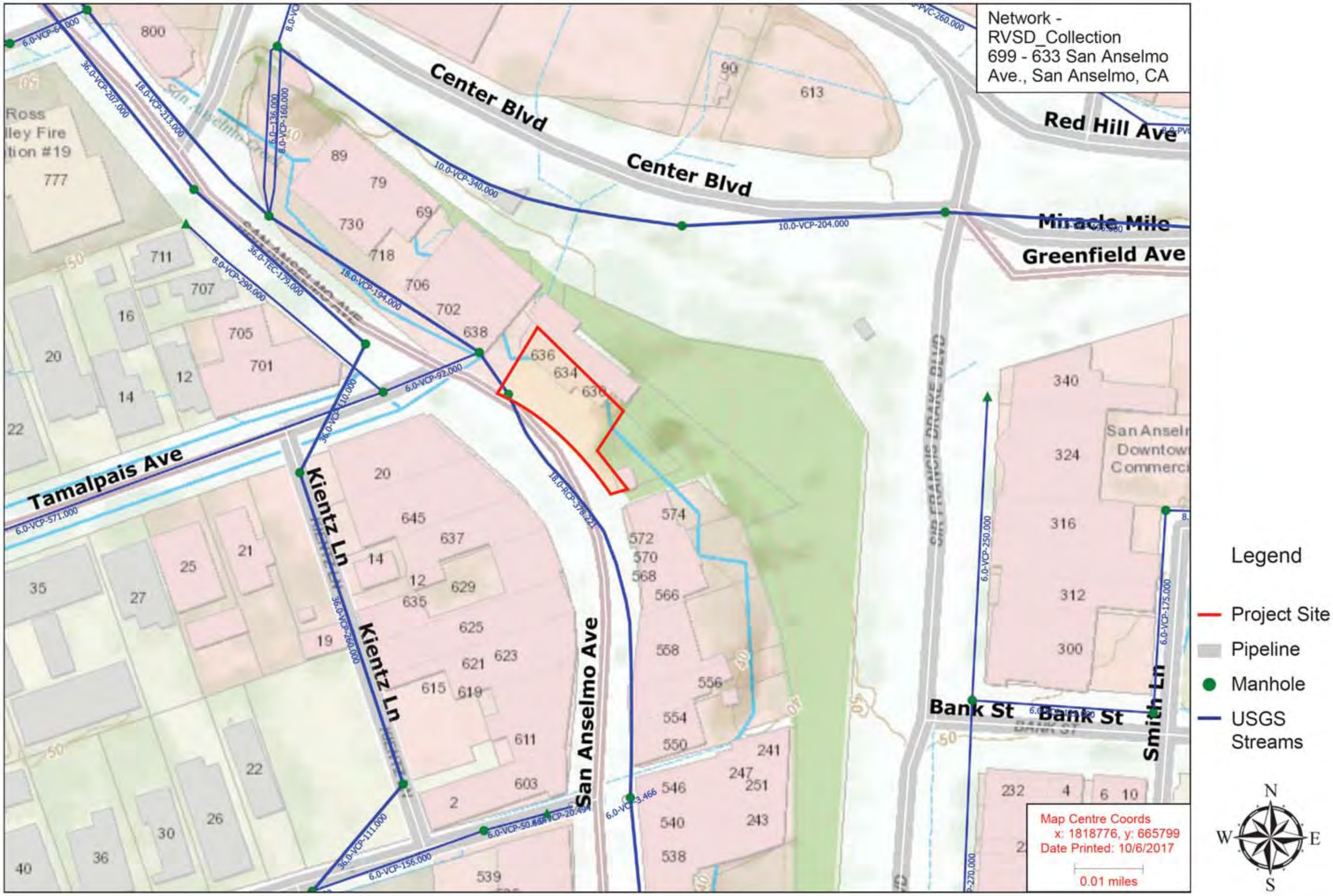
Figure 4.13-2
MMWD Water Lines near the Downtown San Anselmo Site



SOURCE: InfoNet

San Anselmo Flood Management Project . D211432.07

Figure 4.13-3
RVSD Sewer Lines near the Nursery Basin Site



SOURCE: InfoNet

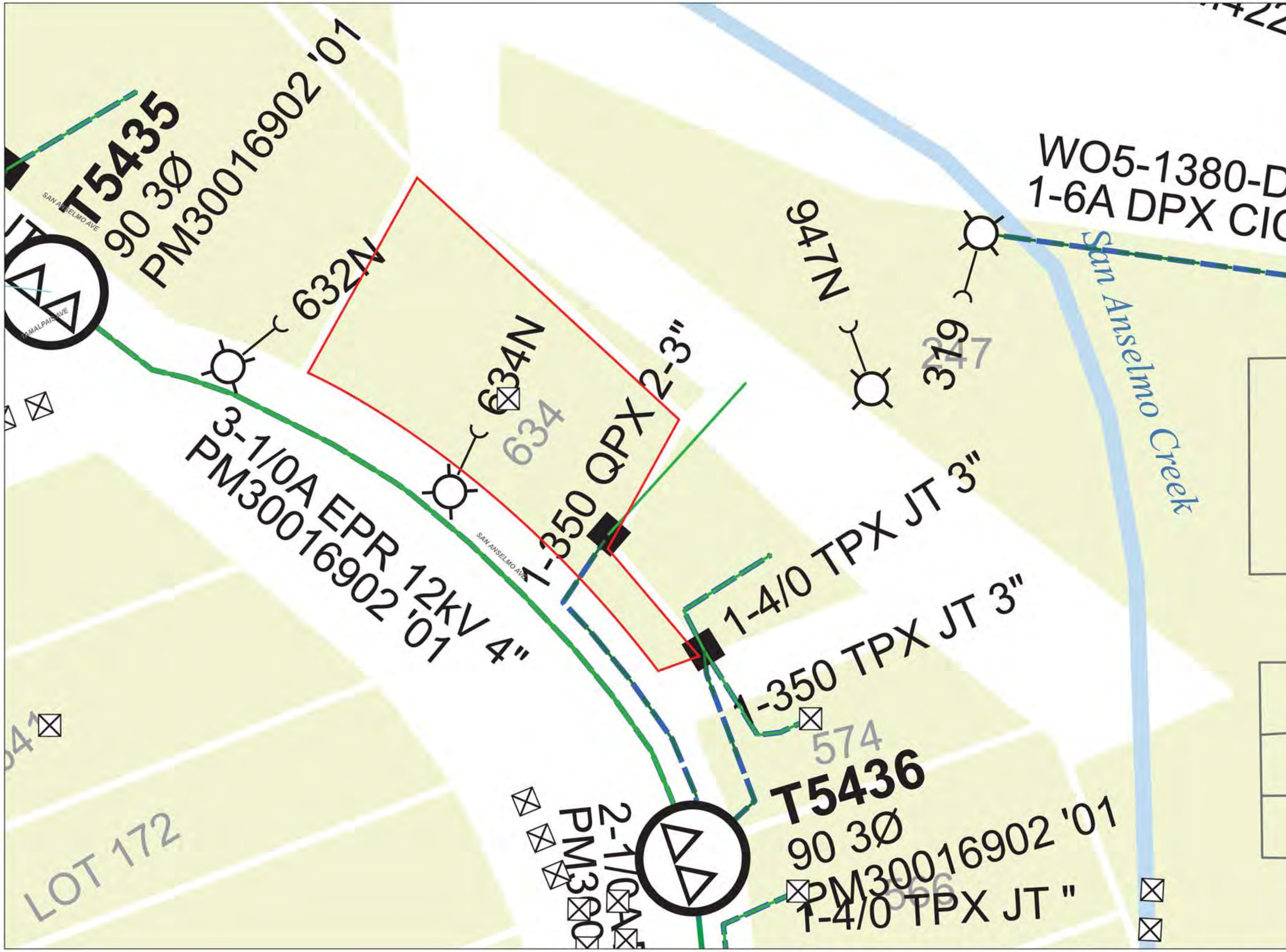
San Anselmo Flood Management Project . D211432.07

Figure 4.13-4
RVSD Sewer Lines near the Downtown San Anselmo Site

SOURCE: PG&E

San Anselmo Flood Management Project . D211432.07

Figure 4.13-5
PG&E Power Lines near the Nursery Basin Site



Legend
- Project Site
- PG&E Overhead Power Lines
- PG&E Underground Power Lines

N
W E
S

SOURCE: PG&E

San Anselmo Flood Management Project . D211432.07

Figure 4.13-6
PG&E Power Lines near the Downtown San Anselmo Site

Communication Systems

Existing communication services (including cable, telephone, and internet services) in the Project area are provided by Comcast, AT&T, and Zayo. There is a conduit adjacent to the Nursery Basin site that is owned by AT&T and used by Zayo for its utilities. The conduit runs underground alongside Sir Francis Drake Boulevard, outside of the Project site and the alignment of Fairfax Creek (CH2M, 2017). At the Downtown San Anselmo site, underground AT&T utility lines and conduits and two manholes are located within the Project disturbance limit. The AT&T conduit and underground utilities servicing 634 and 636 San Anselmo Avenue would be unnecessary following building removal.

4.13.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.13.2.1 Federal Regulations

Although there are multiple federal laws, statutes, and regulations that would generally apply to the Project, the federal government and its agencies have delegated the authority to implement and satisfy those requirements relevant to public services and utilities to the state of California and its agencies, as discussed below.

4.13.2.2 State Regulations

Public Services

California Master Mutual Aid Agreement

The California Master Mutual Aid Agreement is a framework agreement between the State of California and local governments for aid and assistance by the interchange of services and facilities, including but not limited to fire, police, medical and health, communication, and transportation services and facilities to cope with the problems of rescue, relief, evacuation, rehabilitation, and reconstruction.

California Fire Code

State fire regulations are set forth in Sections 13000, et seq. of the California Health and Safety Code, which includes regulations concerning building standards (as set forth in Title 24 of the California Code of Regulations, the California Building Code), fire protection and notification systems, fire protection devices (such as fire extinguishers and smoke alarms), high-rise building and child care facility standards, and fire suppression training.

Utilities

2016 California Green Building Standards Code

Section 5.408, *Construction Waste Reduction, Disposal, and Recycling*, of the 2016 California Green Building Standards Code requires nonresidential development to recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste, or meet a local construction and demolition waste management ordinance, whichever is more stringent. The Marin County Building Code (Municipal Code Chapter 19.04) adopts the California Green Building Code of 2016, with exceptions, additions, and deletions as provided in Marin County Municipal Code Section 19.04.110 et seq. The Marin County Municipal Code does not include revisions to California Green Building Code Section 5.408.

Pursuant to Section 5.408, a construction waste management plan must be prepared that includes the construction and demolition waste materials to be diverted and how they will be sorted, the amount of construction and demolition waste materials diverted (calculated by weight or volume), and diversion facilities where construction and demolition waste materials will be taken. In addition to requiring that a minimum of 65 percent of nonhazardous waste is diverted, 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing must be reused or recycled, unless the soil or vegetation is contaminated by disease or pest infestation.

California's Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 (Public Resources Code, Division 30), enacted through Assembly Bill 939 and modified by subsequent legislation, requires all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 and establishes the goal of diverting at least 75 percent of generated waste (based on per capita disposal rates) by 2020.[1] A jurisdiction's diversion rate is the percentage of its total waste that a jurisdiction diverts from disposal through reduction, reuse, and recycling programs.

The law requires all California counties in coordination with their respective cities to develop and implement integrated waste management plans. As part of their integrated waste management plans, counties must ensure that a minimum of 15 years of disposal capacity is available to serve the county and its cities. Since 2007, the achievement of waste diversion rates has been measured based on per capita disposal rates, expressed in pounds per person per day of wastes disposed of in landfills. To achieve the target waste diversion rates, the California Department of Resources Recycling and Recovery (CalRecycle) established a target disposal rate of 7.6 pounds per person per day in Marin County in 2015.[2]

California Energy Commission

The CEC was established by the Warren-Alquist Act in 1974 and is the State's primary energy policy and planning agency (CEC, 2015). The CEC has five major responsibilities: forecasting future energy needs and keeping historical energy data; licensing thermal power plants 50 megawatts or larger; promoting energy efficiency through appliance and building standards; developing energy technologies and supporting renewable energy; and planning for and directing state response to energy emergencies.

1 California Public Resources Code Division 30, Sections 40000-49620.

2 CalRecycle, Jurisdiction Diversion/Disposal Rate Detail for Marin County, Reporting Year 2015. Available online at http://www.calrecycle.ca.gov/LGCentral/Reports/jurisdiction/diversiondisposal.aspx. Accessed on April 12, 2018.

Administered by the CEC, the California Energy Action Plan (EAP) was adopted in 2003 and a second EAP was adopted by both the CEC and the California Public Utilities Commission (CPUC) in 2005 (CEC, 2017). The EAP established shared goals and specific actions to ensure that adequate, reliable, and reasonably priced electrical power and natural gas supplies are achieved and provided through policies, strategies, and actions that are cost-effective and environmentally sound for California's consumers and taxpayers. Also, incorporated in the EAP are specific actions reflecting the importance of transportation fuels to California's economy and the need to mitigate the environmental impacts caused by their use, as well as the importance of taking actions in the near term to mitigate California's contributions to climate change from the electricity, natural gas, and transportation sectors. In 2008, the EAP was updated to expand on the State's actions in the context of global climate change and include the passage of Assembly Bill 32, the California Global Warming Solutions Act of 2006 (CEC, 2017).

California Public Utilities Commission

The CPUC was established in 1911 as the Railroad Commission and was expanded in 1912 to regulate privately owned electric, natural gas, telecommunications, water, railroad, and marine transportation companies, including PG&E. The CPUC ensures that consumers receive safe and reliable utility services at reasonable rates, protects against fraud, and promotes the health of California's economy (CPUC, 2017).

California Independent System Operator

The California Independent System Operator was established in 1998 and is a non-profit organization that independently manages the flow of electricity in California. It provides open access to the grid, ensuring equal access and a competitive energy market. In addition, it facilitates over 28,000 market transactions each day to ensure that enough power is available to meet demands (California Independent System Operator, 2017).

4.13.2.3 Local Regulations

Marin Municipal Code

Chapter 16.16 Uniform Fire Code of the Marin municipal code establishes requirements for storage of flammable liquids and materials as well as the duties of the fire prevention bureau of the Marin County Fire Department.

Marin Countywide Plan

The following goals and policies in the Marin Countywide Plan are relevant to the Project (Marin County Community Development Agency, 2007).

Public Facilities and Services

1. Policy PFS-2.1: Conserve Water and Utilize Sustainable Sources
2. Policy PFS-2.3: Manage Water Resources Sustainably
3. Policy PFS-4.1: Reduce the Solid Waste Stream

Goal PFS-1: Adequate Public Facilities and Services. Provide basic public facilities to accommodate the level of development planned by cities and towns and the County.

Policy PFS-1.1: Require Cost-Sharing. Require new development to pay for the infrastructure it requires and the public services it receives.

Policy PFS-1.2: Plan Effectively to Minimize Costs. Plan public facilities in cooperation with service providers to minimize short- and long-term construction, operation, and maintenance costs.

Policy PFS-1.3: Discourage Privatization and Commercialization. Encourage public ownership of utilities and public service facilities by not authorizing privatization of water, sewer, law enforcement, emergency service, school, and other essential services. Consider prohibiting corporate sponsorship and commercially driven naming rights of public facilities and lands as a means to fund maintenance and improvements.

Policy PFS-1.4: Reduce Demand on Public Facilities. Reduce per capita and total demand for water and wastewater treatment, and enhance stormwater management through integrated and cost-effective design, technology, and demand reduction standards for new development and redevelopment.

Goal PFS-2: Sustainable Water Resources. Assure a reliable, sustainable water supply for existing and future development while protecting the natural environment.

Policy PFS-2.2: Mitigate Increased Water Demand in New Development. Work with local water agencies to mitigate increases in water demand due to new development by supporting water efficiency programs that decrease demand by a similar amount.

Policy PFS-2.3: Manage Water Resources Sustainably. Manage water resources to ensure equitable amounts of clean water for all users, to support wildlife habitat, and to preserve natural resources within the sustainable limits of water supplies (See also the Natural Systems and Agriculture Element, Water Resources Section of the Marin Countywide Plan).

Goal PFS-3: Reduction, Safe Processing, and Reuse of Wastewater. Continue to enhance the Alternative Onsite Wastewater Monitoring Program. This program ensures the proper operation of alternative and innovative wastewater system designs. Continue to work with manufacturers, designers, installers, end users, and the Regional Water Quality Control Board to evaluate the effectiveness and capabilities of these alternatives to traditional septic system designs. Work with stakeholders to periodically update design guidelines and regulations in light of evolving best practices.

Policy PFS-3.1: Reduce Toxics in Wastewater. Minimize the potential for pollution to water and other resources from sewage treatment.

Policy PFS-3.2: Promote Alternative Wastewater Systems. Enhance water quality through use of alternative wastewater treatment methods.

Policy PFS-3.3: Reduce Stormwater Volume. Implement appropriate upstream water-saving technologies to reduce stormwater volumes and increase percolation. Increase permeable surfaces and encourage onsite percolation to reduce stormwater volume and potential overflow of wastewater treatment facilities.

Goal PFS-4: Efficient Processing and Reduced Landfill Disposal of Solid Waste. Minimize, treat, and safely process solid waste materials in a manner that protects natural resources from pollution while planning for the eventual reuse or recycling of discarded material to achieve zero waste.

Policy PFS-4.1: Reduce the Solid Waste Stream. Promote the highest and best use of discarded materials through redesign, reuse, composting, and shared producer responsibility. Emphasize a closed-loop system of production and consumption.

Policy PFS-4.2: Protect Environmental Health. Require the use of waste processing and disposal techniques that prevent the contamination or other impairment of natural resources.

Policy PFS-4.3: Plan for Waste Transformation or Disposal. Plan for the transformation or elimination of waste materials that cannot be reduced, recycled, or composted.

Policy PFS-4.4: Promote Regulatory Efforts. Support state legislative or regulatory efforts that will aid in achieving zero waste.

Goal PS-3: Effective Emergency and Disaster Preparedness. Provide proper emergency and disaster preparedness services through effective and coordinated emergency management plans and procedures.

Policy PS-3.1: Plan Thoroughly for Emergencies. Ensure that the County, its citizens, businesses, and services are prepared for effective response and recovery in the event of emergencies or disasters.

Policy PS-3.2: Safe Public Structures. Protect public health and safety through appropriate siting and rehabilitation of public facilities.

Public Safety

Goal PS-1: Safe Neighborhoods. Ensure that county neighborhood remains safe places to live.

Policy PS-1.2: Improve Infrastructure to Discourage Crime. Remedy any public facilities with problems that might encourage criminal activity, such as low lighting and blind spots that result from landscape features or fences.

Policy PS-1.3: Analyze Implications of Sea Level Rise for Neighborhood Safety. Analyze potential safety implications from sea level rise and prepare contingency plans in consultation with the Marin Disaster Council.

Goal PS-3: Effective Emergency and Disaster Preparedness. Provide proper emergency and disaster preparedness services through effective and coordinated emergency management plans and procedures.

Policy PS-3.1: Plan Thoroughly for Emergencies. Ensure that the County, its citizens, businesses, and services are prepared for effective response and recovery in the event of emergencies or disasters.

Town of San Anselmo General Plan

The following goals and policies in the Town of San Anselmo are relevant to the Project (Town of San Anselmo, 2015).

Issue: Future Development and Public Utilities and Services

Objective 12: To maintain the current level of public services to the citizens of the Town and to continue to support improvements to public utilities as needed.

Policy 12.1: To work with the special districts that provide water, sewer, and fire protection services in order to maintain and improve the present level of service.

Town of Fairfax General Plan

The Project would be outside of the limits of the Town of Fairfax, but some content from its General Plan is provided here for informational purposes.

Goal LU-5: Manage future growth while preserving the area's natural resources.

Policy LU-5.1.2: Development shall be discouraged in areas not served by existing utilities.

Goal LU-6: Annex developed and undeveloped lands where advantageous to the Town.

Objective LU-6.1: Provide for orderly annexation within the Fairfax Planning Area where provisions for services and utilities exist.

4.13.3 Impacts and Mitigation Measures

4.13.3.1 Significance Criteria

Consistent with Appendix G of the State CEQA *Guidelines*, and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact on public services or utilities if it would:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:

   i. Fire protection

   ii. Police protection

   iii. Schools

   iv. Parks; or

   v. Other public facilities.

b) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;

c) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

d) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;

e) Have insufficient water supplies available to serve the project from existing entitlements and resources, or require new or expanded entitlements;

f) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;

g) Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; or

h) Fail to comply with federal, state, and local statutes and regulations related to solid waste.

Regarding impacts on parks, refer to Chapter 4, Section 4.14, Parks and Recreation. Chapter 4, Section 4.15, Transportation and Circulation, evaluates emergency access during construction.

The following topics are not analyzed further in this section for the reasons described below:

1. **Exceedance of Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board.** During Project construction, new sources of wastewater discharges would include wastewater resulting from sanitary needs of construction workers. As described in Chapter 3, *Project Description*, the maximum construction work force would be approximately 60 workers per day. Assuming that each worker would generate 2.81 gallons per day of wastewater,[3] the total increase in wastewater volumes would be less than 0.001 mgd, an increase well within the dry weather capacity of the existing wastewater system. The Project would not generate wastewater during operations as no staffed operational facilities are proposed as part of the Project. For these reasons, this criterion is not applicable to this Project.

2. **Require or Result in the Construction of New Water or Wastewater Treatment Facilities or Expansion of Existing Facilities, the Construction of Which Could Cause Significant Environmental Effects.** As discussed in Chapter 4, Section 4.12, Population and Housing, the Project would not induce population growth either directly (by constructing housing) or indirectly (by reducing flood risk in currently undeveloped areas into which additional housing could be built). In addition, no staffed operational facilities requiring water are proposed as part of the Project. For these reasons, this criterion is not applicable to the Project.

3. **Require or Result in the Construction of New Stormwater Drainage Facilities or Expansion of Existing Facilities, the Construction of Which Could Cause Significant Environmental Effects.** The Project consists of stormwater flood risk reduction in Ross Valley watershed, including construction of a stormwater detention basin adjacent to a diversion structure within Fairfax Creek, along with associated stormwater drainage structures connecting the detention basin drain to Fairfax Creek. Refer to other sections in Chapter 4 for a description

[3] This calculation is based on compliance with the 2013 California Green Building Code water use baseline values provided in Table 5.3003.2.2 of the code. Construction workers are assumed to flush twice per day and the water use includes 1.28 gallons per flush and use of 0.125 gallons per flush for handwashing. The total per construction worker water use for sanitary purposes is 2.81 gallons per day.

of impacts and mitigation measures associated with construction and operation of stormwater management facilities associated with this Project.

4. **Have Insufficient Water Supply Available from Existing Entitlements and Resources, or Require New or Expanded Water Supply Resources or Entitlements During Construction.** During construction, the Project would intermittently use water for dust control, pressure washing, and cement mixing. Construction would also use relatively small amounts of potable water for some site needs such as drinking water, hand-washing, and other on-site sanitary needs. The small increase in potable water use would be temporary, terminating with the completion of construction. Water supplies are planned such that short-term spikes in potable use can be accommodated and there would be no need for new or expanded water supplies or water treatment facilities. As described in Chapter 4, Section 4.12, Population and Housing, the Project would not induce growth either directly or indirectly. No staffed operational facilities requiring water are proposed as part of the Project. For these reasons, this criterion is not applicable to the Project.

5. **Result in a Determination by the Wastewater Treatment Provider that Would Serve the Project that it has Inadequate Capacity to Serve the Project's Projected Demand in Addition to the Provider's Existing Commitments.** During Project construction, new sources of wastewater discharges would include wastewater resulting from sanitary needs of construction workers. As described in Chapter 3, *Project Description*, the maximum construction work force would be approximately 60 workers per day. Assuming that each worker would generate 2.81 gallons per day of wastewater,[4] the total increase in wastewater volumes would be less than 0.001 mgd, an increase well within the dry weather capacity of the existing wastewater system. The Project would not generate wastewater during operations as no staffed operational facilities are proposed as part of the Project. For these reasons, this criterion is not applicable to this Project.

4.13.3.2 Approach to Analysis

This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations for the Project are assessed based on the existing conditions described earlier in this section.

Public Services

The Project could have a significant impact on public services if (1) it would require the construction of new or physically altered governmental facilities in order to maintain acceptable levels of public services, *and* (2) the construction or alteration of such facilities would result in one or more substantial adverse impacts on the environment.

The impact analysis below first considers whether the Project would require the construction of new or altered governmental facilities (beyond those included in the Project) in order to maintain acceptable performance standards for public services. If new or altered public service facilities are determined to be required to serve the Project, then the analysis evaluates whether construction of

[4] This calculation is based on compliance with the 2013 California Green Building Code water use baseline values provided in Table 5.3003.2.2 of the code. Construction workers are assumed to flush twice per day and the water use includes 1.28 gallons per flush and use of 0.125 gallons per flush for handwashing. The total per construction worker water use for sanitary purposes is 2.81 gallons per day.

such facilities would have a substantial adverse physical effect on the environment. For example, if the Ross Valley Fire Department determined that a new fire station would need to be constructed to maintain adequate service levels for fire protection, the impact analysis would evaluate whether construction or operation of the new fire station would have significant impacts on the physical environment.

For purposes of this impact analysis, the improvements are assumed to be designed and constructed in compliance with all applicable building and fire codes, which include requirements for fire alarms, smoke detectors, sprinkler systems, fire extinguishers, and the number and location of exits.

Utilities

This section provides an analysis of the potential for Project implementation to adversely affect landfill capacity and compliance with solid waste regulations. It also assesses whether the Project would require the construction of new utility infrastructure or relocation of existing infrastructure, the implementation of which may result in adverse environmental effects. For landfill capacity and compliance with solid waste regulations, the analysis compares the quantity of solid waste that would be generated, adjusted to reflect applicable waste diversion regulations, with available landfill capacity. The utility analysis included field surveys of the existing utility infrastructure at each of the Project sites and an assessment of the extent of relocation needed.

4.13.3.3 Impacts and Mitigation Measures

Impact 4-13-1: The Project would not result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools, or other public facilities. (*Less than Significant*)

Construction

The two Project areas currently receive services from the providers identified in Section 4.13.1, Environmental Setting. As described in Chapter 3, *Project Description*, construction of each Project element would occur over a period of several months at each site and would employ an average of 20-30 construction workers. Construction workers likely would come from within Marin County and other Bay Area counties. Construction workers who are residents of Marin County are currently being served by the existing county and individual city/town services, and thus would not represent an increase in demand for these services. While it is possible that some workers might temporarily relocate from other areas, the Project is not expected to result in a substantial increase in the local population (as described in Section 4.12, Population and Housing) and thus not expected to result in increased response times such that new or physically altered facilities would be required to maintain service. Incidents could occur during construction requiring law enforcement, fire protection, or emergency medical services. However, this analysis presumes that any incremental increase in demand for these services during construction would be temporary, could be accommodated by existing services, and would not require construction of new or physically altered facilities to maintain service. Therefore, the impact of Project construction on public services would be less than significant.

Operation

The Project does not involve the construction of residences or businesses and would not result in increased maintenance staff; consequently, the Project would not result in a permanent increase in the local population (see Section 4.12, Population and Housing). Project elements would be constructed in compliance with all applicable fire codes and public safety standards, and the Project would reduce the depth of flooding in the Project area during operation. No governmental facilities would be flooded beyond flooding that currently occurs; therefore, there would be no need for governmental facilities to be replaced. Operation of the Project thus would not result in substantial increases in demand for public services, including law enforcement, fire protection, emergency medical services, schools and other services. Therefore, operation of the Project would not require new or physically altered governmental facilities, and the impact of Project operation would be less than significant.

Because Project construction would not result in a substantial increase in the local population and Project operation would not result in any permanent increase in the local population, the impact of construction and operation of the Project on public services would be less than significant.

Mitigation: None required.

Impact 4.13-2: The Project's demand for solid waste disposal would not exceed the permitted capacity of a suitable landfill. (*Less than Significant*)

Construction

The Project would generate solid waste requiring disposal from the excavation and other earthwork activities at the Nursery Basin site. Construction activities at that site would also include tree removal and demolition of the residential structure and any remaining nursery structures at the site. At the Downtown San Anselmo site, the demolition of the building and the removal of concrete and other material from the creek channel would also generate solid waste requiring disposal. Material types to be disposed of are expected to include dirt, soil, rock, concrete, wood (trees and construction wood), and other residential and commercial construction materials.

As described in Table 3-3 in Chapter 3, *Project Description*, the total volume of materials to be off-hauled and disposed of could be as high as approximately 30,000 cubic yards. The large majority of that is soil, however, that may be suitable for beneficial reuse at one or more restoration projects. For the purpose of this analysis, the conservative assumption is that all of the materials would need to be disposed of and not reused. Under that assumption, the operating solid waste disposal facility (including landfills) that would receive these materials is the Redwood Landfill and Recycling Center. The remaining capacity of this facility is 6,641,000 cubic yards (Waste Management, 2017).

There is thus adequate permitted capacity at the facility for the volumes and types of solid waste that would be generated. The construction contractor would be responsible for making arrangements for transportation of the off-hauled solid waste material to one or more of these facilities. The impact would be less than significant.

Operation

In its operational phase, the Project would generate new solid waste in the form of sediment that would be removed from the Fairfax Creek channel following deposition upstream of the diversion structure there. Other than that, the Project would not generate measurable volumes of material above the amounts that are already removed from creek channels as part of routine maintenance. Removal of sediment and other material from creek channels in the Ross Valley are regulated by the Marin County Stream Maintenance Program and its annual maximum permitted volume of removal. *Section 4.9, Hydrology and Water Quality* addresses the removal of sediment deposited behind the Fairfax Creek diversion structure. By complying with the Stream Maintenance Program's policies regarding allowable volumes of material, the Project would not exceed permitted capacities of available landfills. Much of the removed sediment may also be beneficially reused in appropriate restoration projects, further reducing the disposal burden on landfills. Other trash and debris removed during routine channel maintenance would be taken to Redwood Landfill and Recycling Center if it is non-hazardous and to a permitted hazardous waste facility if it hazardous in nature (Marin County Flood Control and Water Conservation District, 2017). The impact would be less than significant.

Mitigation: None required

Impact 4.13-3: The Project would comply with federal, state, and local statutes and regulations related to solid waste. (*Less than Significant*)

Construction

Redwood Landfill and Recycling Center, where disposal and recycling of construction and demolition debris would be taken, is permitted for all types of waste generated by Project construction. As discussed in Section 4.13.2, the California Integrated Waste Management Act of 1989 requires municipalities to divert at least 50 percent of all solid waste generated by the year 2000 and establishes the goal of diverting at least 75 percent of generated waste (based on per capita disposal rates) by 2020. In addition, the 2016 California Green Building Code (adopted by reference by Marin County) requires all construction and demolition projects to reuse or recycle at least 65 percent of materials generated, and Zero Waste Marin ensures Marin County's compliance with state recycling mandates and provides residents and businesses with information on household hazardous waste collection, recycling, composting, and waste disposal (Zero Waste Marin, 2015a).

Recycling construction and demolition debris helps local jurisdictions meet state and local waste diversion goals. Impact 4.8-2 in Section 4.8, Hazards and Hazardous Materials, details a Soil Management Plan that would include a materials disposal plan specifying how the construction contractor shall remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. Project construction would be in compliance with state or local statutes related to solid waste, and this impact would be less than significant.

Operation

Once the Project is operational, it would generate no measurable volume of solid waste above the amounts that are already removed from creek channels as part of routine maintenance. Trash and debris removed during routine channel maintenance would be sent to permitted landfills for disposal (Marin County Flood Control and Water Conservation District, 2017). This disposal would not result in an inconsistency or violation of permit conditions at these facilities because the facilities are permitted and have adequate capacity to accept these non-hazardous wastes. Project operation would be in compliance with state or local statutes related to solid waste, and this impact would be less than significant.

Mitigation: None required

Impact 4.13-4. The Project would not require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects. (*Less than Significant*)

Construction

Implementation of the Project would require the use of energy resources for construction of the Nursery Basin and creek capacity improvements in downtown San Anselmo. This energy use would primarily be in the form of petroleum products and electricity used to operate construction equipment and consumed during vehicle trips associated with material delivery/debris hauling and commuting workers. Indirect energy use would also occur and include the extraction, production, and transportation of goods and materials needed for construction. Refer to Section 4.4, Energy, Mineral, Forest, and Agricultural Resources for further discussions related to energy use associated with the Project. Although the Project would result in increased energy usage during construction, local utilities and providers of fuel or power for construction equipment would have adequate energy supplies to serve the Project without development of new generation facilities. Impacts associated with the Project's use of energy during construction would therefore be less than significant.

Project construction would necessitate that some local utility lines be removed (e.g., the natural gas, electric, water and sewer lines serving 634-636 San Anselmo Avenue), and others may be relocated or decommissioned (e.g., the power line at the Nursery Basin site). These effects would be limited to small numbers of local utility lines serving the parcels that would be directly affected by Project construction itself, and would be taken as part of the overall Project construction. Refer to other sections in Chapter 4 of this environmental impact report for a description of impacts and mitigation measures associated with Project construction.

The Project would not necessitate any new utility infrastructure be constructed. Thus, the construction effects related to utilities would be less than significant.

Operation

In its operational phase, the Nursery Basin would provide a means to capture flows during a flood event, and the Downtown San Anselmo Element would have an increased creek capacity to allow a greater volume of water to flow in-channel. Operation of the Project elements would not result in the construction of new power, natural gas, or communication system facilities or expansion of existing facilities. Once removed or relocated during the construction phase, there would be no further utility-related effects from Project operation. The overall impact would be less than significant.

Mitigation: None required

4.13.4 References – Public Services and Utilities

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4.14 Parks and Recreation

This section presents and discusses the potential for the San Anselmo Flood Risk Reduction Project (Project) to adversely impact parks and recreational facilities and activities in the Project area. This section provides an overview of the physical and regulatory setting that applies to parks and recreation within the Project area and presents and discusses the potential Project impacts and appropriate mitigation measures, as necessary.

4.14.1 Setting

4.14.1.1 Regional Environmental Setting

The Project would take place at two locations in Marin County. The flood diversion and storage basin at the former Sunnyside Nursery site (Nursery Basin site) is in unincorporated Marin County, adjacent to the western boundary of the Town of Fairfax, and the Downtown San Anselmo site is in the Town of San Anselmo.

Both Project locations lie within the Corte Madera Creek Watershed, in which a varied range of recreational opportunities are available, including hiking, biking, picnicking, wildlife viewing, sightseeing, field sports, and other public enjoyment opportunities. While the two Project sites are specifically within the boundaries of two jurisdictional entities – the County of Marin and the Town of San Anselmo – recreational users are not restricted to using only those facilities that lie within their jurisdiction of residence. Rather, recreational users within the watershed regularly cross jurisdictional boundaries to enjoy recreational opportunities throughout the watershed. In addition, the recreational facilities within the watershed also attract a substantial number of users from other parts of the Bay Area. As such, the facilities within the watershed serve as both local and regional resources.

There are dozens of public parks in the watershed, including neighborhood parks, community parks and school playgrounds, as well as over 5,700 acres of open space including the Loma Alta Open Space Preserve and Marin Municipal Water District watershed lands. **Table 4.14-1** presents a list of parks and recreational facilities within the watershed. **Figure 4.14-1** shows the locations of the major parks, open space, and recreational facilities throughout the watershed area. It should be noted that based on the map's scale, not all of the recreational facilities within the watershed are shown on the figure.

4.14.1.2 Project-Specific Recreational Setting

Nursery Site

The Nursery Basin site is within an unincorporated portion of Marin County, immediately west of the Town of Fairfax. Recreational facilities in the immediate area consist of facilities within the Town of Fairfax to the east, as well as those within the unincorporated areas of the County to the west, north, and south. **Figure 4.14-2** shows recreational facilities within the immediate vicinity of the Nursery Basin site. Nearby facilities within the Town of Fairfax include Lefty Gomez Field, associated with White Hill Middle School, which is approximately 800 feet east of

TABLE 4.14-1
PARKS AND RECREATIONAL FACILITIES LOCATED IN THE CORTE MADERA CREEK WATERSHED

Name of Park or Facility	Park Type	Managing Agency
Adaline E. Kent Middle School	School Playground	Kentfield School District
Alto Bowl Open Space Preserve	Open Space	County Open Space District
Anthony G. Bacich Elementary School	School Playground	Kentfield School District
Bald Hill Open Space Preserve	Open Space	County Open Space District
Baltimore Canyon Open Space Preserve	Open Space	County Open Space District
Bike Path	Multi-Use Pathway (Paved)	City of Larkspur
Bike Path	Multi-Use Pathway (Paved)	City of Larkspur
Bike Trail	Multi-Use Pathway (Paved)	Town of Corte Madera
Blithedale Summit Open Space Preserve	Open Space	County Open Space District
Bolinas Park	Neighborhood Park	Town of Fairfax
Brookside School	School Playground	Ross Valley School District
Cal Park Hill	Multi-Use Pathway (Paved)	SMART
Camino Alto Open Space Preserve	Open Space	County Open Space District
Camp Bothin (Private)	Youth Center	Privately Owned
Cascade Canyon Open Space Preserve	Open Space	County Open Space District
Cibrian Subdivision Open Space	Open Space	Town of Tiburon
College of Marin	School Playground	Marin Community College District
Corte Madera Creek Path	Multi-Use Pathway (Paved)	County Parks
Corte Madera Open Space	Open Space	Town of Corte Madera
Corte Madera Railroad Row Path	Multi-Use Pathway (Paved)	County Parks
Creek Park	Neighborhood Park	Town of San Anselmo
Daycare (Private) and Multi-Use	School Playground	Ross Valley School District
Deer Park	School Playground	Ross Valley School District
Dolliver Park	Neighborhood Park	City of Larkspur
Faude Park	Neighborhood Park	Town of San Anselmo
Gary Giacomini Open Space Preserve	Open Space	County Open Space District
Granada School (Private)	School Playground	Reed Union School District
Greenbrae Redwoods	Open Space	County Parks
Greenbrae School Park	Neighborhood Park	City of Larkspur
Hal Brown Park	Community Park	County Parks
Hall Middle School	School Playground	Larkspur School District
Heatherwood Park	Neighborhood Park	City of Larkspur
Hidden Valley Elementary School	School Playground	Ross Valley School District
King Mountain Open Space Preserve	Open Space	County Open Space District
La Cresta Open Space	Open Space	Town of Tiburon
Lansdale Park	Neighborhood Park	Town of San Anselmo
Larkspur Lands	Multi-Use Pathway (Paved)	City of Larkspur

TABLE 4.14-1 (CONTINUED)
PARKS AND RECREATIONAL FACILITIES LOCATED IN THE CORTE MADERA CREEK WATERSHED

Name of Park or Facility	Park Type	Managing Agency
Loma Alta Open Space Preserve	Open Space	County Open Space District
Madera Gardens Lagoons	Boat Launch	Town of Corte Madera
Manor Elementary School	School Playground	Ross Valley School District
Marin Primary School (Private)	School Playground	Larkspur School District
Mission Pass Path	Multi-Use Pathway (Paved)	County Parks
Miwok Park	Neighborhood Park	City of Larkspur
Natalie Coffin Greene Park	Community Park	Town of Ross
Neighborhood Park	Neighborhood Park	City of Larkspur
Neil Cummins Elementary School	School Playground	Larkspur School District
Peri Park	Neighborhood Park	Town of Fairfax
Phoenix Lake and Trails	Open Space	Marin Municipal Water District
Piper Park	Community Park	City of Larkspur
Red Hill Park	Community Park	Tamalpais Union High School District
Redwood High School	School Playground	Tamalpais Union High School District
Remillard Park	Neighborhood Park	City of Larkspur
Ring Mountain Open Space Preserve	Open Space	County Open Space District
Robson-Harrington Park	Community Park	Town of San Anselmo
Ross Common Park	Community Park	Town of Ross
Ross School	School Playground	Ross School District
San Anselmo Community Center	Community Park	Town of San Anselmo
San Anselmo Memorial Park	Community Park	Town of San Anselmo
San Clemente Park	School Playground	Larkspur School District
San Rafael Open Space	Open Space	City of San Rafael
Shorebird Marsh	Community Park	Town of Corte Madera
Sir Francis Drake High School	School Playground	Tamalpais Union High School District
Sorich Ranch Park	Community Park	Town of San Anselmo
Terra Linda/Sleepy Hollow Divide	Open Space	County Open Space District
Tiburon Ridge	Open Space	County Open Space District
Town Park	Community Park	Town of Corte Madera
Wade Thomas Elementary School	School Playground	Ross Valley School District
While Hill Middle School, Lefty Gomez Field	School Playground	Ross Valley School District
White Hill Open Space Preserve	Open Space	County Open Space District

SOURCE: Town of Fairfax, 2012; Marin County Community Development Agency, 2007; Marin County Parks and Open Space Department, 2008; Town of San Anselmo, 2015; Town of Ross, 2007 the site. Park facilities in the Town of Fairfax include Bolinas Park and Peri Park, both of which are neighborhood parks on Bolinas Road immediately south of downtown Fairfax.

County recreational facilities near the Nursery Basin site include the Loma Alta Open Space Preserve, which is a 509-acre preserve to the immediate north of the site. White Hill Open Space Preserve is approximately one-half mile west of the site, and covers 390 acres of open space lands. Both of these facilities are managed by the Marin County Open Space District, and offer hiking, mountain biking, and horseback riding opportunities, while also maintaining important watershed management functions.

Downtown San Anselmo Element

The commercial building at 634-636 San Anselmo Avenue is within the Town's central commercial district in the heart of downtown. **Figure 4.14-3** shows recreational facilities within the immediate vicinity of the Downtown San Anselmo site. Parks and other facilities within the Town include Creek Park, which is a neighborhood park with grassy areas, large trees, and picnic tables and benches. Creek Park lies immediately across San Anselmo Creek from the Project site. Other parks in the Town include Faude Park, Lansdale Park, Memorial Park, Robson-Harrington Park, Sorich Ranch Park, Red Hill Park.

Faude Park is a 13.5-acre area of open space about one-half-mile northwest of downtown. Lansdale Park is a pocket park with a children's playground about one mile northwest of downtown. Memorial Park is also northwest of downtown, and is the Town's most developed park, with sports fields, grassy areas, tennis courts, outdoor facilities, and a children's playground. Robson-Harrington Park is on the grounds of the former home of an early-20th century lumber and shipping magnate, and includes extensive grounds for picnicking, and also a mansion that can be rented for events. Sorich Ranch Park is a 60-acre facility north of downtown in the San Anselmo Hills, which offers hiking trails and picnic facilities. Red Hill Park is approximately one-half mile north of the site and provides sports fields and a dog park.

In addition to the above Town-managed facilities, some of the school grounds within the Town offer recreational opportunities, such as playgrounds and sports fields.

4.14.2 Regulatory Setting

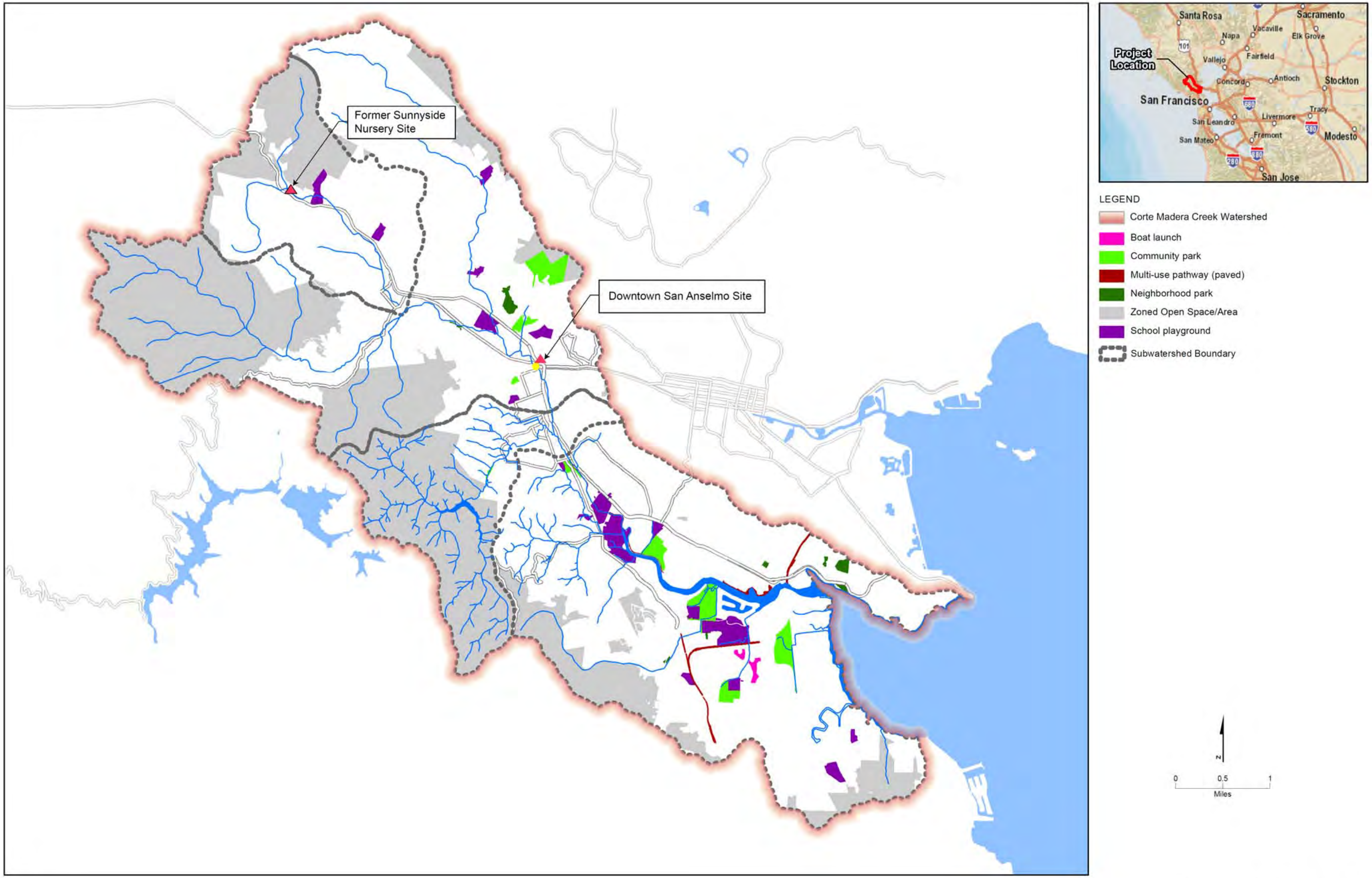
The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.14.2.1 Federal Regulations

There are no federal parks and recreation regulations applicable to the Project.

4.14.2.2 State Regulations

There are no state parks and recreation regulations applicable to the Project.



SOURCE: Ch2m

San Anselmo Flood Management Project . D211432.07

Figure 4.14-1
Parkland and Recreational Facilities in Ross Valley

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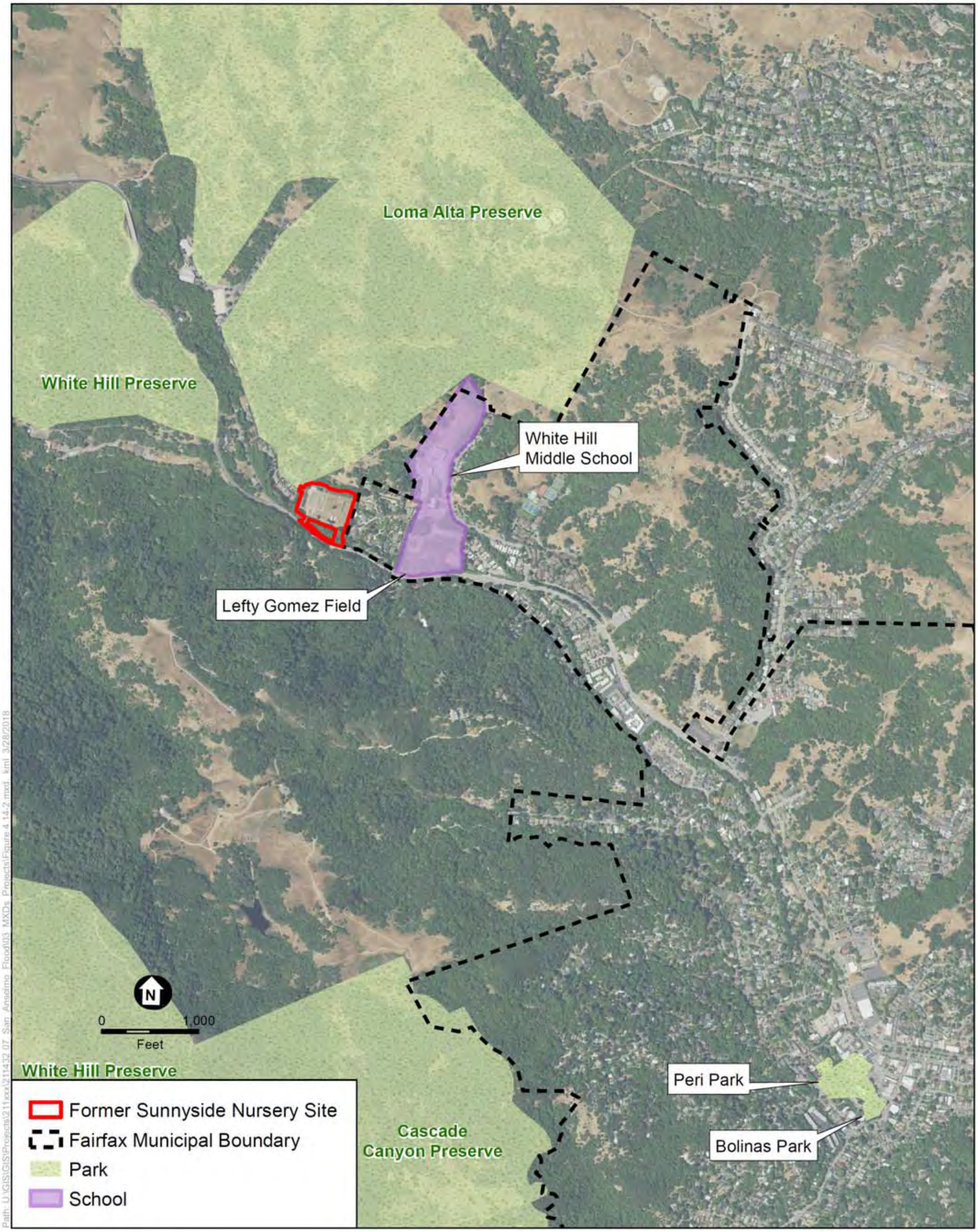


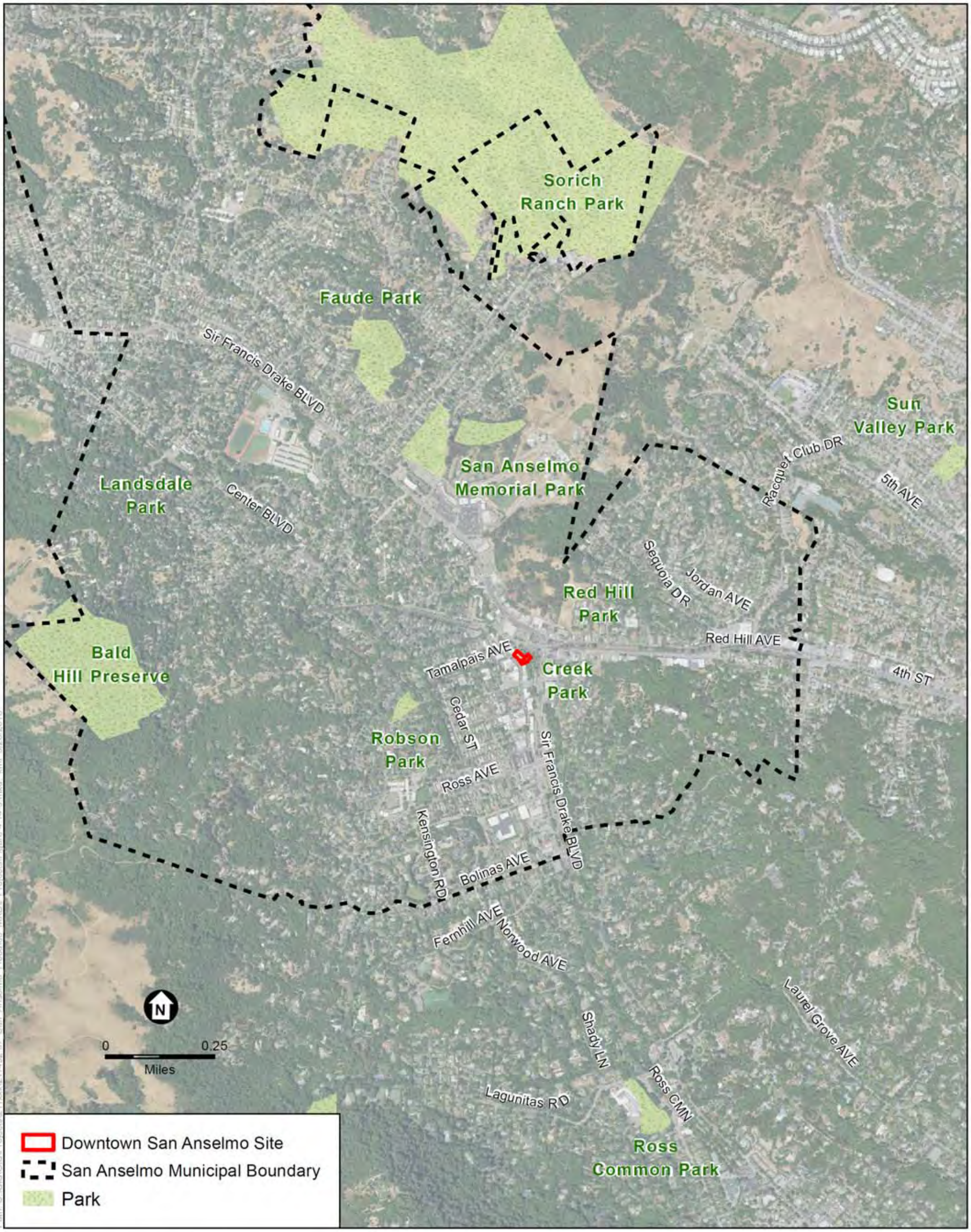
SOURCE: MarinMap, 2017

San Anselmo Flood Risk Reduction Project

Figure 4.14-2

Parkland and Recreational Facilities in the Vicinity of the Nursery Basin Site

ESA



SOURCE: MarinMap, 2017

San Anselmo Flood Risk Reduction Project

Figure 4.14-3

Parkland and Recreational Facilities in the Vicinity of the Downtown San Anselmo Site

ESA

4.14.2.3 Local Regulations

The following section details the local plans and policies set forth by Marin County and the Town of San Anselmo that are relevant to the Project. Neither of the Project sites are within the jurisdictional boundaries of the Town of Fairfax, but the Nursery Basin site is immediately adjacent to the Town's western boundary. As such, information on the Town's relevant plans and polices is presented here for informational purposes.

Marin County Parks and Open Space Department

The Marin County Parks and Open Space Department consists of two divisions, the Parks and Landscape Division and the Marin County Open Space District. Together, these divisions provide 34 open space preserves, 4 regional parks, and 27 additional park facilities;[1] three paved multi-use paths; a system of fire protection roads and trails; recreational programs; environmental education programs; and volunteer programs. Parks in Marin County receive over 2 million visitors annually (MCOSD, 2008).

County of Marin Countywide Plan

The Marin Countywide Plan sets forth the following goals and policies that may be relevant to the Project (Marin County Community Development Agency, 2007).

> **Goal PK-1: A High-Quality Parks and Recreation System.** Provide park and recreation facilities and programs to meet the various needs of all county residents.
>
> > ***Policy PK-1.1: Conduct and Coordinate Park Planning.*** Develop park and recreation facilities and programs to provide active recreation, passive enjoyment, and protection of natural resources as a complement to local, state, and national parks and open space in Marin County.
> >
> > ***Policy PK-1.2: Consider User Needs, Impacts, and Costs.*** Plan and develop any needed new park and recreation facilities and programs to meet the desires of the community and protect environmental resources.
> >
> > ***Policy PK-1.3: Protect Park Resources from Impacts of Climate Change.*** Identify strategies to protect park resources from the effects of climate change, such as violent weather, plant loss, or change due to moisture and temperature changes and sea level rise.

Town of San Anselmo General Plan

The following objectives and policies in the *Town of San Anselmo General Plan* are relevant to the Project (Town of San Anselmo, 2015).

[1] Park facilities include swimming pools, fishing piers, boat launches, tennis courts, basketball courts, volleyball courts, playgrounds, sports fields, golf courses, a skate park, batting cages, picnic areas, and trails (https://www.marincounty.org/~/media/files/departments/pk/projects/posstrategicplan_web.pdf).

Land Use

Objective 7: To protect and preserve those areas of unique natural and visual resources within the planning area.

***Policy LU-E.3*-1**: Memorial Park may not be utilized as a flood detention basin; nor may any non-recreational uses be permitted that adversely affect or reduce the recreational amenities at the Park.

***Policy LU-E.3-2*:** No public land parcel occupied by Memorial Park may be sold or transferred by the Town without approval by the citizens of San Anselmo as part of a general election.

Open Space

Objective 1: To protect from development those open space parcels which contribute directly to the Town's identity, its sense of separate place in relation to other communities, and the quality of life in the community.

Town of Fairfax General Plan

Neither of the Project sites are within the jurisdictional boundaries of the Town of Fairfax, but the Nursery Basin site is immediately adjacent to the Town's western boundary. As such, *Town of Fairfax General Plan* policies that could be relevant to the Project are presented here for informational purposes (Town of Fairfax, 2012).

Open Space

Goal OS-4: Balance the interests of public health and safety with the preservation of open space.

***Policy OS-4.1.2*:** Designated Open Space along creek channels and in flood-prone areas should be created whenever possible to mitigate flood hazards.

4.14.3 Impacts and Mitigation Measures

4.14.3.1 Significance Criteria

Consistent with State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Impact Review Guidelines, the Project could have a significant impact if the Project would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment; or

c) Require designation of additional parkland to remain in conformance with locally acceptable or adopted park standards.

4.14.3.2 Approach to Analysis

The following impact analysis discusses the potential impacts of the Project related to parks and recreation within the Project area. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described previously in this section.

4.14.3.3 Impacts and Mitigation Measures

Impact 4.14-1: Construction and operation of the Project would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (*Less than Significant*)

Nursery Basin Site

Construction and operation of the Nursery Basin would not create new housing or other development that would increase the area's population or otherwise place additional burdens on local or regional recreational facilities. As such, the net use of existing recreational facilities would not be affected, and there would be no impact.

Downtown San Anselmo Site

Construction

Some temporary impacts would occur to the adjacent Creek Park during construction, as most of the park would be used for construction access or staging. That would temporarily decrease the amount of park area available to the public. Further, improvements to the top-of-bank structures on the northern bank of San Anselmo Creek within the park would also be implemented as part of the Project, including the construction of an at-grade walkway, the improvement and expansion of existing creek viewing areas, and installation of guardrails. These areas of the park would also be unavailable for public use during the construction period.

It is likely that many potential recreational users may choose to avoid the open portions of Creek Park during construction, particularly if there are higher levels of construction noise or other factors that could diminish their experience. It is therefore possible that some recreational use that would have occurred at Creek Park during the construction period would be shifted to other recreational facilities within the Town of San Anselmo or in neighboring jurisdictions. This condition, however, would be temporary (limited to the construction period of about 4-6 months), and Creek Park would be restored to its former use and capacity following the conclusion of construction. During the construction period, the Town of San Anselmo and adjacent jurisdictions would continue to provide a variety of parklands and other recreational opportunities, and any temporary diversion of some Creek Park users to those other facilities would not create such a burden on those facilities that substantial deterioration would occur. Based on each of these considerations, the Project construction would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of those facilities would occur. Therefore, the Project's impact during construction would be less than significant.

Operation

The removal of the commercial building at 634-636 San Anselmo Avenue and the resultant increase in creek capacity would not create new housing or other development that would increase the area's population or otherwise place additional burdens on local or regional recreational facilities. As such, the net use of existing recreational facilities would not be affected by operation of the Project. The proposed improvements to the park include walkways and viewing areas within the park. These would constitute a beneficial improvement to the existing conditions of Creek Park, and would not cause deterioration of the facility. Therefore, the Project's impact would be less than significant.

Mitigation: None required.

Impact 4.14-2: Construction and operation of Project could include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment. (*Less than Significant with Mitigation*)

Nursery Basin Site

The Nursery Basin would not include recreational facilities or require the construction or expansion of recreational facilities that could have an adverse effect on the environment. As such, there would be no impact.

Downtown San Anselmo Site

Construction

The Project includes replacements of and improvements to the top-of-bank structures on the northern bank of San Anselmo Creek within the Town's Creek Park, including the following:

1. Construction of an at-grade walkway;
2. Installation of guardrails;
3. Reconstruction of existing creek viewing areas, stairway access to the creek, and other park facilities; and
4. Installation of a new sidewalk adjacent to the southern side of the Project area along San Anselmo Avenue.

These features are part of the Project; the impacts associated with implementing these features are analyzed throughout this document. Construction best management practices included in **Mitigation Measures 4.3-1** and **4.9-1** (see Impact 4.3-1 in Section 4.3.4.3, and Impact 4.9-1 in Section 4.9.3) would reduce these potential construction effects.

Operation

The proposed improvements to walkways and viewing areas within the park would constitute a beneficial improvement to the existing conditions at the park. In addition, although the Project would replace and even improve the existing public access and recreation infrastructure at Creek Park, there is no potential for the Project to necessitate construction or expansion of new facilities that may themselves have an adverse effect on the environment. The Project would not create a new attraction or amenity in Downtown San Anselmo that would draw additional visitors or otherwise increase the demand for on-site or off-site parks or other recreational facilities. Nor would it increase population or provide other services that would similarly increase that demand. Because the Project would not necessitate the construction or expansion of recreational facilities, the Project's impact would be less than significant.

Mitigation Measures 4.3-1: BAAQMD Basic Construction Mitigation Measures

Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work

Significance after Mitigation: With implementation of construction best management practices and prescribed mitigations, the dust, emissions, and runoff would be reduced and the associated construction impact from the Project's implementation would be less than significant.

Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. (*No Impact*)

Nursery Basin Site and Downtown San Anselmo Site

Neither the construction and operation of the Nursery Basin nor the removal of the commercial building at 634-636 San Anselmo Avenue would generate growth that would require the addition of new parkland to remain in conformance with local plans or policies. As discussed in the analysis for Impact 4.14-2, any impacts on the existing Creek Park during construction would be temporary, with ultimately beneficial results, and the Project would not eliminate any existing parkland. Therefore, the project would have no impact related to the need for additional parkland or conformance with park standards.

Mitigation: None required.

4.14.4 References – Parks and Recreation

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4.15 Transportation and Circulation

This section presents and discusses the transportation and circulation conditions and effects associated with the San Anselmo Flood Risk Reduction Project (Project) construction, implementation, and operation. This section provides an overview of the existing conditions and the regulatory setting that apply to transportation within the Project area. It then presents and discusses the potential Project impacts and appropriate mitigation measures, as necessary.

4.15.1 Physical Setting

The Project area is served by a roadway network of freeways (e.g., United States Highway 101 [U.S. 101]), arterials (e.g., Sir Francis Drake Boulevard), and local streets.

4.15.1.1 Regional Roadways

U.S. 101 is Marin County's primary roadway; it varies between two and five lanes in both directions and forms a north-south corridor along Marin's eastern edge, where development is most dense between the cities of Mill Valley and Novato. U.S. 101 is highly-congested, particularly during commute hours, because it is the primary surface link connecting with the City of San Francisco, which draws large numbers of workers each day. The highway also intersects with other important highways, such as Interstate 580, which provide important inter-county and inter-regional links. U.S. 101 is also vital in connecting communities within the county for everyday activities such as shopping, school, and recreation. U.S. 101 has an average daily traffic volume of approximately 172,000 vehicles south of the Sir Francis Drake Boulevard interchange, and about 196,000 vehicles north of the Mission Avenue interchange (Caltrans, 2016).

Sir Francis Drake Boulevard is an important arterial roadway of varying width (number of lanes) that runs primarily east-west, linking U.S. 101 to State Route 1 in West Marin. Much of the road is a four-lane rural highway, but widens to six lanes approaching Larkspur Landing east of U.S. 101 and narrows to two lanes as it extends west beyond Fairfax. Sir Francis Drake Boulevard is the primary east-west corridor in Marin County, and is designated a Principal Arterial in the Marin County Congestion Management Program between U.S. 101 and State Route 1. The daily traffic volume on Sir Francis Drake Boulevard varies, ranging from approximately 17,000 vehicles on the two-lane section in the Towns of Fairfax and San Anselmo to about 36,000 vehicles on the four-lane section in Kentfield (Fairfax, 2011; Marin County, 2015; ESA, 2017).

4.15.1.2 Local Roadways

Local roads that are expected to be used to access the Downtown San Anselmo site are San Anselmo Avenue, Tunstead Avenue and Bridge Avenue, all of which are two-lane roads. The Nursery Basin site would be accessed off Sir Francis Drake Boulevard at the driveway to the former Sunnyside Nursery.

4.15.1.3 Transit Service

The Project area is served by two transit agencies: The Golden Gate Bridge Highway & Transportation District, and the Marin County Transit District. Multiple Golden Gate Bridge Highway & Transportation District bus routes are provided on area roads, including Sir Francis Drake Boulevard. Marin County Transit District provides local fixed route services, including the West Marin Stagecoach Route 68, which travels on Sir Francis Drake Boulevard between San Rafael and Inverness.

4.15.1.4 Bikeways/Pedestrian Circulation

Along Sir Francis Drake Boulevard in the Project area, there are disconnected bicycle facilities (i.e., some segments with Class II bike lanes, and some segments with Class III bike routes[1]), and limited pedestrian facilities (i.e., sidewalks in built-up areas only).

4.15.2 Regulatory Setting

The following laws, statutes, regulations, codes, and policies would apply to the Project and are defined as standard conditions for the Project.

4.15.2.1 Federal Regulations

There are no federal regulations pertaining to transportation impacts that are applicable to the Project.

4.15.2.2 State, Regional and Local Regulations

Transportation analysis in California is guided by policies and standards set at the state level by the California Department of Transportation and at the regional and local level by jurisdictional agencies such as the Marin County congestion management agency (Transportation Authority of Marin) and the Towns of Fairfax and San Anselmo. Local jurisdictions regulate speed limits and other driving standards on local roadways. The California Department of Transportation and local jurisdictions generally assess the impacts of long-term (not short-term) traffic conditions. The goal of state and local plans and policies related to transportation is to prepare for future growth and the vehicular, transit, pedestrian, and bicycle travel demand associated with that growth. However, given that the Project elements would generate construction-related vehicle traffic, the goals and policies presented below are considered to have relevance to this analysis.

1 Class I Bike Path: A multi-use path providing a completely separated right of way for the exclusive use of bicycles and pedestrians with cross-flow minimized. Class II Bike Lane: A striped lane for one-way bike travel on a roadway that is also used by motor vehicles. Class III Bike Route: A signed roadway that provides for shared use with pedestrians or motor vehicle traffic, typically on lower volume roadways. There is nothing different about the roadway, only that it has signs posted identifying it as a bike route.

Marin County

Countywide Plan

The following are traffic-related goals and policies presented in the *Marin Countywide Plan* that are applicable to the Project (Marin County Community Development Agency, 2015):

> **Goal TR-1: Safe and Efficient Movement of People and Goods.** Provide a range of transportation options that meet the needs of residents, businesses, and travelers.
>
> > ***Policy TR-1.2: Maintain Service Standards.*** Establish level of service standards for vehicles on streets and highways and performance standards for transit, bicycles, pedestrians, and other modes of transportation.

Town of San Anselmo

General Plan

The following primary goals of the Circulation Element in the *Town of San Anselmo General Plan* are relevant to the Project (San Anselmo, 2015):

1. To promote a transportation network which offers strong transit, pedestrian, and bikeway alternatives to the automobile.

2. To design a roadway network which will maintain and enhance the quality of life on local residential streets in the community.

Town of Fairfax

General Plan

The following are traffic-related goals and policies from the Circulation Element of the *Town of Fairfax General Plan* applicable to the Project (Fairfax, 2012):

> **Goal C-2:** Promote the safe use of collector streets by automobiles, cyclists and pedestrians.
>
> > ***Policy C-2.6*:** Promote safe use of the collector streets for pedestrians and cyclists.
>
> **Goal C-4:** Ensure access by emergency service vehicles and public evacuation.

4.15.3 Impacts and Mitigation Measures

4.15.3.1 Significance Criteria

Consistent with the State CEQA *Guidelines* Appendix G (Environmental Checklist) and with Appendices K and N in Marin County's Environmental Review Guidelines, the Project could have a significant impact if it would:[2]

[2] Appendix N of Marin County's Environmental Review Guidelines includes "result in an insufficient parking capacity on-site or off-site" as a significance criterion. Parking capacity is no longer considered an impact under CEQA and is therefore not considered in this impact analysis.

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);

e) Result in inadequate emergency access; or

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities; or

4.15.3.2 Issues Not Evaluated Further

Due to the nature of the Project, there would be no construction and/or operational impacts related to the following criteria; therefore, no impact discussion is provided for the reasons described below:

1. **Conflicts with an Applicable Congestion Management Program, including, but not limited to LOS Standards.** Construction activities would have a temporary effect on traffic and circulation. Once constructed, flood system facilities are generally passive, generating only minimal levels of traffic for occasional operations and maintenance purposes. LOS standards established by County congestion management agencies (such as Transportation Agency of Marin) are intended to regulate long-term traffic increases or changes in traffic patterns that result from the development of facilities such as businesses and residences. Because construction activities would not generate traffic or change traffic patterns over the long term, LOS standards are not considered in this evaluation of construction traffic effects.

2. **Change in Air Traffic Patterns resulting in substantial safety risks.** Implementation of the Project would not change air traffic patterns at any airport and would not install structures that could interfere with air space.

3. **Increased Hazards Due to a Design Feature.** The Project would not include new design features for any roadways (e.g., new facilities or obstructions within public roadways) or alterations of existing features (e.g., road realignment).

4. **Conflicts with Adopted Policies, Plans, or Programs Supporting Alternative Transportation.** The Project would not directly or indirectly eliminate existing or planned alternative transportation corridors or facilities (e.g., bike paths, lanes, bus turnouts, etc.). In addition, the Project would not include changes in policies or programs that support alternative transportation, and it would not construct facilities in locations in which future alternative transportation facilities are planned.

4.15.3.3 Approach to Analysis

The following analysis discusses the potential significant impacts of the Project related to transportation. This section includes an analysis of potential short-term (construction) and long-term (operation) impacts of the Project. Impact evaluations are assessed based on the existing conditions described earlier in this section. Mitigation measures are identified, as necessary, to reduce significant impacts.

Construction-related transportation impacts are not generally considered significant because of their temporary duration and limited scope. Nevertheless, the analysis considers the potential short-term effects of construction—including those on transit, pedestrian and bicycle facilities, and emergency vehicle access. The analysis is based on the best construction-related information available at this time.

Project construction activities would result in a temporary increase in vehicle trips in the Project area over the construction period. Project construction is anticipated to generally occur on weekdays. The analysis of construction-related traffic impacts below considers daily commute trips by construction workers, and deliveries and haul trips by trucks.

4.15.3.4 Impacts and Mitigation Measures

Impact 4.15-1: Construction activity associated with the Project could temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), and could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. (*Less than Significant with Mitigation*)

Construction

The proposed improvements would generate short-term increases in vehicle trips by construction workers and construction vehicles on area roadways. Construction-generated traffic would be temporary and therefore would not result in long-term degradation in operating conditions (level of congestion / delay) on Project area roadways. The primary impacts resulting from the movement of construction trucks would include a short-term and intermittent lessening of roadway capacities due to the slower movements and larger turning radii of the trucks compared to passenger vehicles.

Traffic-generating construction activities related to Project elements would consist of the daily arrival and departure of personnel (construction work crews and supervisory staff); trucks hauling equipment and materials to the worksites; and the hauling of excavated spoils from, and/or import of new fill to, the sites. The number of construction-related trips would vary between the two Project locations, and among the tasks needed to complete construction.

Based on information from the preliminary designs as presented in Table 3-2 and Table 3-3 (Chapter 3, *Project Description*), and the anticipated use of water trucks, construction activity at the Nursery Basin site (lasting about six to eight months) would generate up to approximately

392 one-way vehicle trips per day (76 worker trips[3] and 316 truck trips [including water trucks]) during an estimated maximum of 20 days of excavation and off-hauling; Project-generated traffic would be lower on other (non-hauling) days. Construction activity at the Downtown San Anselmo site (lasting about four months) would generate up to approximately 150 one-way vehicle trips per day (76 worker trips and 74 truck trips [including water trucks]) during an estimated 10-day period; Project-generated traffic would be lower on other (non-hauling) days. Project-generated truck trips would be dispersed throughout the day, and construction workers are expected to commute to and from the work sites primarily before or after peak traffic hours. Construction-related truck traffic occurring on roadways in the peak direction on weekdays during the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. would coincide with peak-period traffic on access roadways and therefore would have the greatest potential to impede traffic flow.

As described in Chapter 3, *Project Description*, construction is expected to occur concurrently at the two Project sites. As such, the previously-described estimates of peak Project traffic for the two elements could be additive, and the analysis of potential impacts focuses on the combined peak trip-generating work over an estimated 10-day period. Construction work on other days (i.e., the 10 additional days of excavation and off-hauling at the Nursery Basin site, and non-hauling days) would have a lesser effect on traffic than would the concurrent off-hauling of excavated material from the two sites.

The percent increase in traffic volumes caused by Project-generated construction traffic on the arterials and freeways serving the Project work sites (up to about three percent) would not be substantial relative to background traffic conditions (i.e., traffic would tend to fall within the daily fluctuation of traffic volumes on those roads), and that Project traffic would not significantly disrupt traffic flow on these roadways.[4] Drivers could experience delays if they were traveling behind a construction truck. Traffic volume increases caused by Project construction would be most noticeable on local-serving roadways, but the increased traffic volumes are expected to remain at levels less than the carrying capacity of the roads.

Although the construction-period trip generation would not represent a substantial increase in daily traffic volumes on area roadways, if construction-related truck traffic were to occur on roadways in the peak direction during weekday peak hours, there would be potential impedance of traffic flow. Preparation of a Traffic Management Plan (TMP) by a qualified traffic engineer in accordance with professional engineering standards (see **Mitigation Measure 4.15-1**) would ensure that effects on traffic flow conditions in the Project vicinity would be less than significant.

Mitigation Measure 4.15-1: Traffic Management Plan.

Prior to initiation of construction, the Project contractor(s) shall use a qualified traffic engineer to prepare a TMP. The TMP shall be developed during the design phase on the basis of detailed design plans for the approved Project. The TMP shall be reviewed and

[3] Daily trips by construction workers would consist of inbound and outbound commute trips (conservatively assumed to be each worker in their own vehicle), plus midday trips (lunch or other errands) by about 25 percent of the workers.

[4] Day-to-day traffic volumes typically vary by as much as 10 percent (i.e., ±5 percent), and an increase of less than that is unlikely to be perceptible to the average motorist.

approved by the Flood Control District and agencies with jurisdiction over roadways affected by Project construction activities, prior to construction. Once approved, the TMP shall be incorporated into the contract documents specifications. The TMP shall include, but not necessarily be limited to, the elements listed below:

a) Develop truck access routes to minimize impacts on local street circulation. The route selection for movement of heavy equipment and truck traffic shall be coordinated with the Marin County Department of Public Works, Marin County Sheriff's Department, and Police Departments for applicable towns, cities, and unincorporated communities. Truck drivers shall be notified of, and required to use, the most direct route between the Project work sites and U.S. 101.

b) As needed to avoid unacceptably adverse impacts on traffic flow, schedule truck trips outside of peak morning and afternoon/evening traffic hours.

c) Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic on-site inspections.

d) Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the *California Manual on Uniform Traffic Control Devices; Part 6: Temporary Traffic Control*); flaggers would be used, when warranted, to control vehicle movements.

e) Implement a public information program to notify interested parties of the impending construction activities using means such as print media, radio, and/or web-based messages and information.

f) Comply with roadside safety protocols to reduce the risk of accidents.

g) Maintain access for emergency vehicles at all times. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways.

h) Store all equipment and materials in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction to traffic.

i) Identify locations for parking by construction workers (within the construction work site or at the designated construction staging areas, or, if needed, at a nearby location with transport provided between the parking location and the worksite).

j) Prior to Project construction, document road conditions for all routes that shall be used by Project-related vehicles. Roads damaged by construction shall be repaired to a structural condition equal to that which existed prior to construction activity.

k) Maintaining pedestrian and bicycle access and circulation during Project construction where safe to do so. If construction activities encroach on bicycle routes or multi-use paths, advance warning signs (e.g., "Bicyclists Allowed Use of Full Lane" and/or "Share the Road") shall be posted that indicate the presence of such users.

During construction, an environmental compliance manager shall monitor and complete a construction monitor environmental inspection report checklist to ensure that the contractor implements the TMP measures included in the contract documents. Any noncompliance shall be documented and reported to the Flood Control District to ensure corrective action. A final compliance report shall be prepared post-construction.

Significance after Mitigation: The TMP would provide for continuity of vehicular, pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Where Project construction activities could disrupt mobility and access for bicyclists and pedestrians, the TMP measures shall ensure safe and convenient access would be maintained. Implementation of these measures would ensure that effects on traffic flow conditions in the Project vicinity would be less than significant.

Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles. (*Less than Significant with Mitigation*)

Construction

As described previously, if construction-related truck traffic were to occur on roadways in the peak direction during weekday peak hours, the construction-period trip generation could impede traffic flow, including for emergency service providers. The construction of the floodwall at the Nursery Basin site may require construction vehicle and equipment use along Sir Francis Drake Boulevard, potentially resulting in temporary closure of the westbound travel lane, and alternate one-way traffic on the eastbound lane. Implementation of **Mitigation Measure 4.15-1**, as described previously, would also address this impact by helping to ensure that potential impacts on access, including access for emergency vehicles, in the Project vicinity would be less than significant.

Operation

The Project would not include any alterations of existing roadway features that would create a permanent change to access for emergency vehicles. Therefore, long-term operational Project impacts would be less than significant.

Mitigation Measure 4.15-1: Traffic Management Plan.

Significance after Mitigation: The TMP would provide for continuity of vehicular, pedestrian, and bicyclist traffic; including emergency service providers. Implementation of these measures would ensure that effects on traffic flow conditions in the Project vicinity would be less than significant.

Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety. (*Less than Significant with Mitigation*)

Construction

Potential conflicts could occur between Project construction traffic and bicyclists and pedestrians at the Downtown San Anselmo site. At the Nursery Basin site, other than the access from Sir Francis Drake Boulevard, there is no public access and thus no potential for conflicts with bicyclists or pedestrians. The construction of the floodwall at the Nursery Basin site may require construction vehicle and equipment use along Sir Francis Drake Boulevard. Implementation of **Mitigation Measure 4.15-1**, as described previously, would also address this impact by helping to ensure that potential changes to pedestrian and bicycle accessibility and safety in the Project vicinity would be less than significant.

Operation

The Project would not include any alterations of existing roadway features (including sidewalk) that would create a permanent change to access for bicyclists and pedestrians. Therefore, the operational long-term impact of the Project would be less than significant.

Mitigation Measure 4.15-1: Traffic Management Plan.

Significance after Mitigation: The TMP would provide for continuity of pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Where Project construction activities could disrupt mobility and access for bicyclists and pedestrians, the TMP measures shall ensure safe and convenient access would be maintained. Implementation of these measures would ensure that effects on traffic flow conditions in the Project vicinity would be less than significant.

Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear). (*Less than Significant with Mitigation*)

Construction

Construction-generated trucks on Project area roadways would interact with other vehicles. However, as described previously, traffic generated during the Project's construction period would not represent a substantial increase in traffic volumes on area roadways, and would not be incompatible with the mix of vehicle types (trucks and automobiles) currently traveling on the roads. The use of large trucks to transport equipment and material to and from the Project work sites could affect road conditions and driving safety on the designated haul routes by increasing the rate of road wear. The degree to which this impact would occur depends on the design (pavement type and thickness) and existing condition of the road. Major arterials, such as Sir Francis Drake Boulevard, are designed to handle a mix of vehicle types, including heavy trucks, and the impacts are expected to be negligible on those roads. The pavement of local streets also generally is not thick enough to withstand substantial truck traffic volumes. The wear-and-tear effects on road conditions and driving safety are considered to be a potentially significant impact.

There are potential traffic safety hazards associated with the inadequate sight distance for slower construction vehicles merging onto Sir Francis Drake Boulevard. Implementation of **Mitigation Measure 4.15-1**, as described previously, would address this impact by helping to ensure that potential traffic safety impacts in the Project vicinity would be less than significant.

Mitigation Measure 4.15-1: Traffic Management Plan.

Significance after Mitigation: The TMP would provide for a reduction in traffic safety hazards through such measures as installation of traffic control devices, scheduling trips outside of peak morning and afternoon/evening traffic hours, and repair of damaged roads after Project construction. Implementation of these measures would ensure that effects on traffic safety in the Project vicinity would be less than significant.

4.15.4 References – Transportation and Circulation

California Department of Transportation (Caltrans), California Manual on Uniform Traffic Control Devices, 2014.

Fairfax, Town of, *Town of Fairfax 2010-2030 General Plan Circulation Element*, 2012. Available online at http://www.town-of-fairfax.org/html/general_plan.html. Accessed on June 26, 2017.

Fairfax, Town of, Traffic Impact Analysis for Good Earth Market, 2011. (ESA extrapolated 2011 traffic volumes on Sir Francis Drake Boulevard by 5 percent to 2015 conditions).

Marin County, Kentfield Planning Advisory Board, Sir Francis Drake Boulevard Corridor Rehabilitation, 2015.

Marin County Community Development Agency, *Marin Countywide Plan: Transportation Element*, Adopted November, 6, 2007. Amended September, 2015.

San Anselmo, Town of, *Town of San Anselmo General Plan Circulation Element*, Adopted 1988, Amended 2015. Available online at http://www.townofsananselmo.org/DocumentCenter/View/5210. Accessed on June 26, 2017.

Transportation Authority of Marin, *Final Report 2015 Congestion Management Program Update*, September 2015. Available online at http://38.106.4.121/Modules/ShowDocument.aspx?documentid=9126.

CHAPTER 5

Growth-Inducing and Cumulative Effects

5.1 Growth Inducement Potential and Secondary Effects of Growth

Section 15126.2(d) of the State California Environmental Quality Act (CEQA) *Guidelines* requires that an environmental impact report (EIR) discuss "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). It must not be assumed that growth in any area is necessaril0079 beneficial, detrimental, or of little significance to the environment."

As discussed in Section 4.12, Population and Housing, the San Anselmo Flood Risk Reduction Project (Project) would not involve any housing construction and therefore would not induce growth directly by constructing housing that would attract people to the area. Project construction would not extend roads or other infrastructure that could indirectly induce growth. Given the size and availability of the regional workforce, Project construction would not be expected to induce demand for housing by attracting a substantial number of workers from outside the region. Nor would the Project provide new permanent employment opportunities that could attract workers to the area; long-term operation of the Project would not increase the number of workers employed by the Marin County Flood Control and Water Conservation District (Flood Control District).

In some cases, a flood risk reduction project can remove an obstacle to growth. However, in this case, the Project would reduce flood risk in existing developed areas and for growth already anticipated in the Marin Countywide Plan. The Project would not allow additional growth to occur than what has already been planned, nor would it change the locations where this growth is planned to occur. Consequently, implementation of the proposed project would not affect current and/or projected population growth patterns within Marin County as already evaluated and planned for in the Countywide Plan and, therefore, would not have a growth-inducing impact.

For these reasons, the Project would not have a substantial growth-inducing impact.

5.2 Significant Irreversible Changes

Sections 15126(b) and 15126.2(c) of the CEQA Guidelines require a discussion of the significant irreversible environmental changes of a project.

Irreversible commitments of resources are those which cause either direct or indirect use of natural resources such that the resources cannot be restored or returned to their original condition. Construction activities associated with the Proposed Project would result in an irretrievable and irreversible commitment of natural resources though direct consumption of fossil fuels and use of materials. Construction would include the short-term use of electricity and refined petroleum products during the operation of construction equipment (primarily gas, diesel, and motor oil). However, the energy consumption for construction would not result in long-term depletion of non-renewable energy resources and would not permanently increase reliance on energy resources that are not renewable. Construction activities would not reduce or interrupt existing electrical or natural gas services such that existing supplies would be constrained.

Project operations that would affect irretrievable resources would be limited to annual maintenance activities. Maintenance activities would result in irreversible and irretrievable use of energy and material resources in the following forms:

1. Energy expended in the form of electricity, gasoline, diesel fuel, and oil for construction equipment;
2. Labor;
3. Conversion of land use from commercial uses to flood management uses.

The use of the nonrenewable resources is expected to account for a minimal portion of the region's resources and would not affect the availability of these resources for other needs within the region. Similarly, the conversion of one parcel of land from its former commercial land use to a flood management facility would not affect the availability of commercially zoned parcels in Marin County, Ross Valley as a whole, or in the adjacent Town of Fairfax. Additional information on irreversible changes or resource use is available in Section 4.4, Energy, Minerals Forestry, and Agricultural Resources; Section 4.5, Biological Resources; and Section 4.10, Land Use.

5.3 Cumulative Impacts

Cumulative impacts, as defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects that, when taken together, are "considerable" or that compound or increase other environmental impacts. A cumulative impact from several projects is the change in the environment that would result from the incremental impact of each project when added to those of other closely related past, present, or probable future projects. Section 15130 of the CEQA Guidelines provides the following pertinent guidance for cumulative impact analysis:

1. An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).
2. An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR.
3. A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
4. The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.
5. The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than on attributes of the other projects that do not contribute to the cumulative impact.

CEQA Guidelines Section 15130(b)(1) provides two approaches to a cumulative impact analysis. The analysis can be based (a) on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document.

This cumulative impact analysis considers the effects of the Project together with those of other past, present, or probable future projects proposed by the Flood Control District or others. The cumulative considerations and impacts for each section are summarized below. Each analysis of cumulative impacts is based on the same setting, regulatory framework, and significance criteria as the Project-specific analysis. Additional mitigation measures are identified if the cumulative analysis determines that a significant cumulative impact could occur and the Project's contribution to a significant cumulative impact would be considerable, even with Project-level mitigation.

As provided for in CEQA Guidelines Section 15130(b)(1), the analysis in this EIR employs the list-based approach for defining projects to be considered in the cumulative impact analysis — that is, the analysis is based on a list of past, present, and probable future projects that could result in related or cumulative impacts. A probable future project is defined as one that is "reasonably foreseeable," which is generally a project for which an application has been filed with the approving agency, for which environmental review is underway, or that has approved funding. The probable future projects are subject to independent environmental review and consideration by approving agencies. Consequently, it is possible that some of the projects will not be approved or will be modified prior to approval (e.g., as a result of the CEQA process).

Projects that are relevant to the cumulative analysis include those that could have incremental effects on the same environmental resources and would have similar environmental impacts as those identified for the Project in this EIR. The following factors were used to determine an appropriate list of relevant projects to be considered in the cumulative analyses:

1. **Similar Environmental Impacts.** Whether a project contributes to effects on the same environmental resources that are also affected by the Project and would have similar or related environmental impacts as those discussed in this EIR (Sections 4.1 through 4.15).
2. **Geographic Scope of the Area Affected and Location.** Whether a project is located within the defined geographic scope for the cumulative effect. The geographic scope of cumulative projects depends on the resource affected and is identified within each section of the EIR. The geographic scope generally coincides with the physical environment described in the setting and could include the areas adjacent to the proposed construction. For some potential impacts, however, the geographic scope would extend farther, such as for the discussion of traffic in which the regional roadway network is relevant, or the evaluation of air quality effects in which the regional air basin is the appropriate geographic scope for the analysis.
3. **Timing and Duration of Implementation.** Whether the schedule of activities for a relevant project would need to coincide in timing with the effects of the Project to result in cumulative impacts. For temporary impacts such as noise and traffic, the cumulative analyses consider the short-term cumulative effects of those projects with overlapping construction schedules as well as the long-term cumulative effects of those projects that would be in operation concurrently with the Project and would affect the same environmental resources.

Table 5-1 describes the past, present, and probable future projects that are considered in the cumulative analyses (based on the factors described above), and their locations are shown on **Figure 5-1**. The list includes projects that have overlapping construction schedules with the Project (or would be completed prior to or following Project construction) and that would be constructed in the general vicinity of the Project elements. The list also includes projects that would be in operation concurrently with the Project.

The cumulative analyses presented below first consider whether there is an impact of the Project that could result in adverse physical effects on the environment. If so, the cumulative analysis considers whether any of the projects listed in Table 5-1 would result in related impacts or affect the same environmental resources as the Project, resulting in a cumulative impact. If the cumulative impact is considered significant based on the identified significance criteria, the analysis next considers whether the Project's contribution would be cumulatively considerable. If the Project's contribution would be cumulatively considerable, mitigation measures are identified to reduce the Project's contribution to a less-than-cumulatively-considerable level. If there is no feasible mitigation to reduce the Project's contribution to a less-than-significant level, the Project's contribution to the cumulative impact is considered significant and unavoidable.

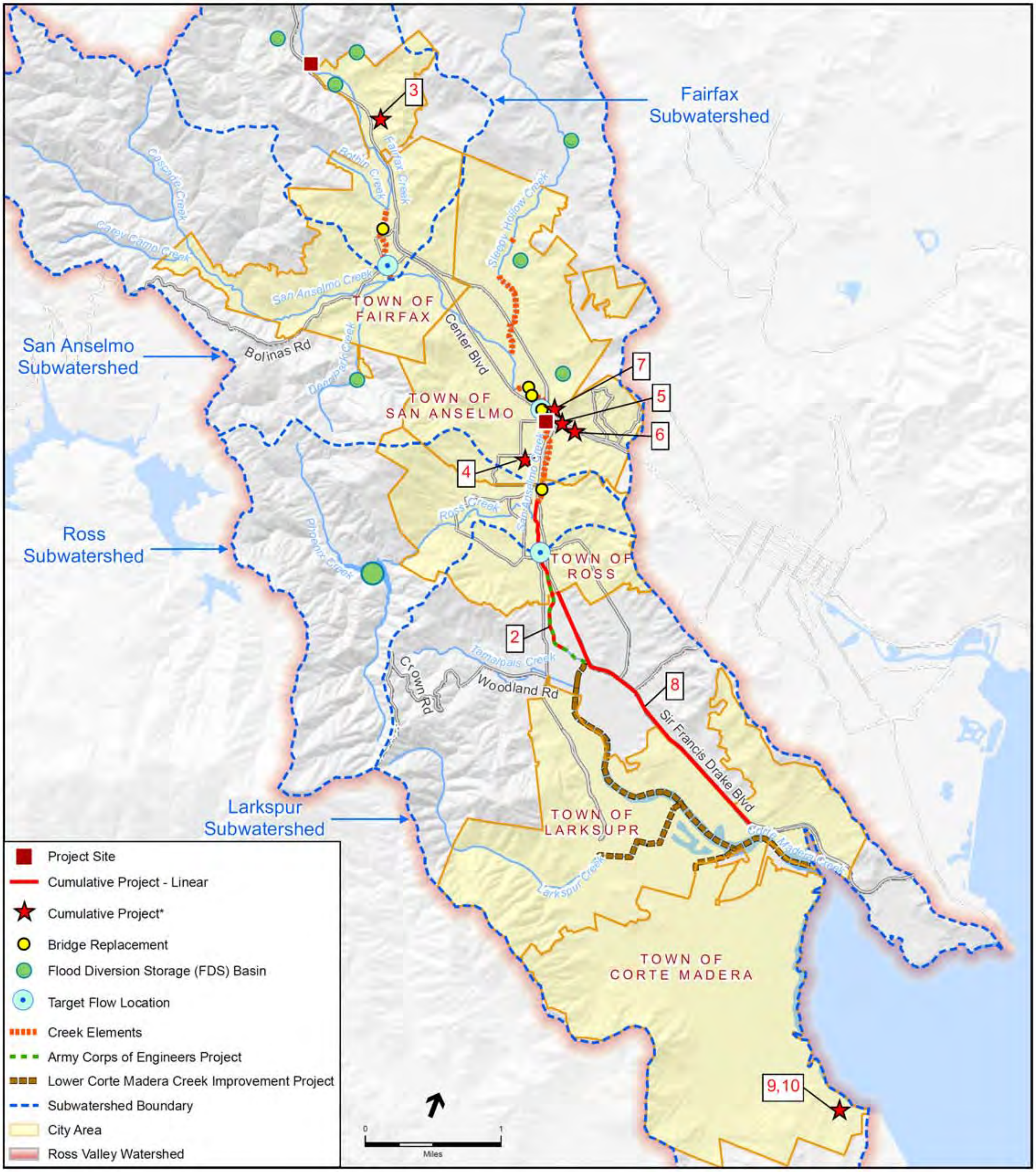
TABLE 5-1
PROJECTS CONSIDERED IN CUMULATIVE IMPACT ANALYSIS

Project No. on Map	Project Name (Project Sponsor or Jurisdiction)	Project Description	Status	Construction Dates
n/a (throughout the watershed)	Ross Valley Flood Protection and Watershed Program (Marin County)	The Ross Valley Watershed Flood Risk Reduction Program is a regional effort led by the Flood Control District in partnership with the City of Larkspur, Town of Ross, Town of San Anselmo, Town of Fairfax, and Town of Corte Madera. The program would meet the overall objective of substantially reducing the frequency and severity of flooding throughout the Ross Valley Watershed in an economically viable manner while providing multiple benefits and minimizing environmental impacts. Phase One would include use of flood diversion and storage (FDS) basins, bridge replacements and selected elements in the creeks to increase capacity. Phase Two elements of the Program would implement additional creek improvements, bridge replacements, additional FDS basins, low impact development, flood preparation and education, and creek maintenance, after implementation of Phase One.	Undergoing Environmental Review	Phase One (2017 to 2027) Phase Two (2028-2050
n/a (see yellow circles on map figure)	Ross Valley Flood Protection and Watershed Program's Bridge Replacement Projects: Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Blvd-Sycamore Avenue, and Winship Avenue Bridges (San Anselmo, Fairfax, Ross)	Several bridges in the same region of the Ross Valley as the proposed Project (i.e., on San Anselmo Creek or other tributaries in the Corte Madera Creek watershed) are planned for removal and replacement in such a way as to move their foundations out of the creek channels. These would be funded in part by the California Department of Transportation (Caltrans) under it local assistance project. The local towns (Fairfax, San Anselmo, and Ross) would share the costs and coordination to plan and implement the projects, and would be the CEQA lead agencies. The bridge replacements would include Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Blvd-Sycamore Avenue, and Winship Avenue bridges.	Undergoing Environmental Review	Within the next 5 years; some could occur contemporaneously with the Project
2	Corte Madera Creek Flood Risk Management Project (U.S. Army Corps of Engineers; USACE) (*Also known as the Corte Madera Creek Flood Control Project, Units 2, 3, and 4*)	The goal of this project would be to enhance and improve Corte Madera Creek to reduce the risk of flooding in the communities of Ross and Kentfield. The project would examine several alternatives, but would include: removal of a wooden fish ladder, widening overly narrow sections, installing flood walls adjacent to the banks, and stabilizing creek banks in Unit 4 and also downstream of the fish ladder in Units 2 and 3. Project benefits include flood reduction during large storms and ecosystem restoration.	Undergoing Environmental Review	Within the next 5 years
3	Victory Village- Affordable Housing (Fairfax)	This project, located at 2626 Sir Francis Drake Boulevard, will require the subdivision of the existing 20-acre site into three parcels, one 2-acres in size and two others that will each be 9-acres. The 2-acre parcel is proposed to be developed as a senior housing project affordable to extremely low and very low income households. Given these affordability parameters, the project applicant, Resources for Community Development, seeks a density bonus in order to construct 54 units at a density of 27 dwelling units per acre, where 20 dwelling units per acre would otherwise be permitted, and has requested density bonus waivers and/or concessions with respect to the project's proposed height (38' 7"), uncovered parking, and undergrounding of the existing above ground utility lines on Sir Francis Drake Boulevard.	Planned	January 2018-January 2019
4	45 Ross Avenue (San Anselmo)	This project involves the demolition of existing housing and construction of a 10-unit apartment/condominium development. The 10 units will have between one and four bedrooms, and 17 parking spaces total.	Planned	Uncertain; unlikely before 2019

TABLE 5-1 (CONTINUED)
PROJECTS CONSIDERED IN CUMULATIVE IMPACT ANALYSIS

Project No. on Map	Project Name (Project Sponsor or Jurisdiction)	Project Description	Status	Construction Dates
5	600 Red Hill Avenue (San Anselmo)	This project proposes for a subdivision to create a new 43,829 square feet (approximately 1 acre) lot behind an existing apartment building, with access from Spaulding Street. Four new residential townhomes are proposed. Each unit is approximately 3,000 square feet with four bedrooms and a two car garage.	Planned	Uncertain; unlikely before 2019
6	1 Lincoln Park (San Anselmo)	Rezoning of a narrow strip of land from R-1 (Single Family Residential) to C-3 (Commercial District). A 16-unit apartment building is proposed, to total approximately 15,300 square feet of floor area over an 8,000 square foot parking garage. The garage would provide 17 parking spaces, include 5 disables parking spaces. The applicant intends the project to be for senior housing, and the project includes two units that would be deed restricted for low income housing.	Planned	2018-2019
7	754 Sir Francis Drake Boulevard (San Anselmo)	The project proposes the demolition of existing 5,700 sf of commercial and office buildings, and construction of 16 apartments over 22 parking spaces on approximately a one-half acre site.	Planned	2018-2019
8	Sir Francis Drake Boulevard Rehabilitation (Ross)	The project proposes several traffic flow, pavement, safety improvements, and water main replacement along Sir Francis Drake Boulevard between Highway 101 and the Ross Town limits.	Planned	Uncertain
9	Marin County Day School Improvements, Lake or Streambed Alteration Agreement No. 1600-2015-0385-R3 (Corte Madera)	This project involves modification to an existing ephemeral stream that flows through campus. Phase 1 work was implemented along the downstream portion of the stream according to Streambed Alteration Agreement 1600-2008-0167- R3. This project (Phase 2) continues the creek modification from the upstream terminus of the previous project. Approximately 400 linear feet of stream channel will be modified. The intent of the channel design is to create a geomorphically stable channel design that represents a naturalized and enhanced creek channel.	Planned	Uncertain
10	Marin County Day School Improvements (Corte Madera)	Marin Country Day School, proposes building renovations, demolitions, and new construction of the existing campus and completion of a creek restoration program. In addition, portable classrooms would be added north of Paradise Drive temporarily during the construction period and new permanent bathrooms would be added in this same area. These portable classrooms would be removed at the end of construction. A net addition of 11,334 gsf would be added to the campus to provide classrooms, a performing arts center, and associated facilities. A total of 8,349 gsf would be demolished. The improvements would provide updated and more modern accommodations for students and more classrooms in order to reduce class sizes for more personalized instruction. No enrollment increases are proposed as part of this project.	Planned	Uncertain

SOURCES:
[a] Price, Sarah, Town of San Anselmo, personal communication with Karen Lancelle, ESA, February 15, 2018; Marin Watershed Program, USACE Corte Madera Creek Flood Risk Management Project, February 22, 2018; Town of Fairfax, Planning Commission Meeting Agenda, April 20, 2017; Town of Fairfax Planning Department, Victory Village - Affordable Housing 2626 Sir Francis Drake Blvd; Fairfax, CA 94930 Initial Study Mitigated Negative Declaration - Recirculated. March 29, 2017; Gardner, Michele, Town of Fairfax, personal communication with Alena Maudru, ESA, May 24, 2017; Scoble, Heidi, Town of Ross, personal communication with Alena Maudru, ESA, May 25, 2017; California Office of Planning and Research, CEQAnet query results for Sir Francis Drake Boulevard Rehabilitation. Available online at http://www.ceqanet.ca.gov/, accessed June 20, 2017.



*Projects without a map number in Table 5-1 have not been mapped either because they occur in several locations or because no specific location has been identified.

San Anselmp Flood Management Project . D211432.07

Figure 5-1
Cumulative Projects

5.4 Cumulative Impact Analysis

The following subsections provide detailed discussion of cumulative impacts by resource topic and, where appropriate, a description of the mitigation measures that would avoid or lessen the impacts. Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. Therefore, the following analysis includes only those impacts that would result from Project implementation of the Project.

5.4.1 Aesthetics and Visual Resources

The geographic scope for the analysis of potential cumulative aesthetic impacts includes the Project sites and surrounding areas within the publicly accessible viewsheds of the Project, as described in *Section 4.2, Aesthetics and Visual Resources*.

Concurrent construction of the Project with other projects proposed in the area (Table 5-1) located within the same viewsheds could result in short-term visual impacts during construction. The nearest projects to the Nursery Basin site (other than rehabilitation of Sir Francis Drake Boulevard) is the Victory Village Affordable Housing, and the nearest projects to the downtown San Anselmo site are 600 Red Hill Avenue, 1 Lincoln Park and 754 Sir Francis Drake Boulevard. These projects are not located in the immediate visual vicinity of either Project site and would not contribute to short-term or long-term impacts to aesthetics. Additionally, these projects would be subject to the design review requirements of the municipalities located in the Ross Valley, which ensure consistency with the goals and policies of the area General Plans regarding community and visual character.

The change in visual context of the Nursery Basin site would not have a substantial negative effect on the visual quality or character of the site, because the site would remain largely screened from publicly-accessible vantage points by existing intervening mature vegetation and topography as well as the revegetation portions of the Project. Similarly, removal of the San Anselmo structure to improve creek capacity would include restoration of the site in a manner that would not detract from the visual character of downtown San Anselmo. Therefore, the Project would not contribute to any cumulative impact on visual resources.

5.4.2 Air Quality and Greenhouse Gas Emissions

Regional air pollution is by its very nature a cumulative impact. Emissions from past, present and future projects contribute to the region's (i.e., the Bay Area Air Basin) exceedances of air quality standards on a cumulative basis. No single project by itself would be sufficient in size to result in regional non-attainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts.[1] The project-level thresholds for criteria air pollutants set by the Bay Area Air Quality District (BAAQMD) are based on levels by which new sources are not anticipated to contribute to an air quality violation or result in a cumulatively considerable net increase in criteria air pollutants. Therefore, if a project would exceed the identified construction or operational significance thresholds, its emissions would be

[1] BAAQMD, *CEQA Air Quality Guidelines*, May 2017.

cumulatively considerable, and if a project would not exceed the construction or operational significance thresholds, its emissions would not be cumulatively considerable.

The geographic scope for toxic air contaminant and odor impacts is the vicinity of the Project sites. The analysis of greenhouse gas emissions presented in *Section 4.3, Air Quality and Greenhouse Gas Emissions*, is in a cumulative context because the impact is inherently cumulative (i.e., changes that affect the global climate).

As described in *Section 4.3, Air Quality and Greenhouse Gas Emissions*, the Project's construction-related criteria pollutant emissions would not exceed the project-level thresholds for the criteria pollutants nitrogen oxides (NOx), reactive organic gases (ROG), and particulate matter (PM_{10}, and $PM_{2.5}$). Emissions of fugitive dust would be generated by construction activities associated with grading and earth disturbance, and travel on unpaved roads. However, implementation of the Bay Area Air Quality Management District's (BAAQMD) fugitive dust Basic Control Measures, which are contained in Mitigation Measure 4.3-1 (BAAQMD Basic Construction Measures), would reduce impacts associated with fugitive dust emissions to a less-than-significant level. Compliance with this mitigation measure would further minimize the potential for air quality impacts from construction activities associated with the Project. Project-related criteria pollutant construction emissions would not be cumulatively considerable and would result in a less-than-significant cumulative impact.

With regard to health risk impacts, construction of some of the projects in Table 5-1 (Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard) could coincide with the construction of the Project. In order to determine whether the Project's contributions to the excess cancer risk would be cumulatively considerable if combined with the emissions of these projects, the Project's contribution can be compared to the project-level significance thresholds for health risks. Pursuant to implementation of Mitigation Measure 4.3-4 (Tier 4 Engines for Construction Equipment), maximum incremental cancer risk associated with the Project would be mitigated to approximately 6.6 chances per million for the Nursery Basin and 5.6 chances per million for Downtown San Anselmo, which would be less than the BAAQMD's project-level significance threshold of 10.0 per million. The maximum annual average $PM_{2.5}$ exhaust concentrations would be mitigated to approximately 0.1 micrograms per cubic meter ($\mu g/m^3$) for the Nursery Basin and 0.28 $\mu g/m^3$ for Downtown San Anselmo, which would be less than the BAAQMD's project-level significance threshold of 0.3 $\mu g/m^3$. Implementation of Mitigation Measure 4.3-4 would reduce the Project's contribution of TAC emissions to the extent that the Project would not be cumulatively considerable when combined with present and reasonably foreseeable cumulative projects identified in Section 6.1 that are in the vicinity of the Project.

In addition, the BAAQMD has separate cumulative thresholds for risks and hazards from local existing "past project" emissions combined with Project emissions. In the context of cumulative projects, the category of past projects is captured within the existing setting or environmental baseline. These thresholds are a cancer risk of 100 in a million, a non-cancer Hazard Index of 10.0, and an annual average $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$. Existing nearby past project sources (e.g., within 1,000 feet of offsite sensitive receptors included in the project-level analysis, or 2,000 feet from the Project) with available BAAQMD toxic air contaminants (TACs) data for the Downtown San Anselmo site include the Gas & Shop gas station at 750 Sir Francis Drake Blvd., an emergency generator at 60 Park Way, the 76 Gas Station at 930 Sir Francis Drake Blvd, Fara's Auto Repair at 98 Sir Francis Drake Blvd, and M&R Cleaners at 90 Greenfield Avenue. (Note that these are existing sources of emissions and are not cumulative projects listed in Table 5-1.) There are no BAAQMD-identified sources within 1,000 feet of the Nursery site. There are no major roadways with substantial TAC emissions in the vicinity of the Project (the closest major roadway is Highway 101 approximately 2 miles east of the Downtown San Anselmo site). According to BAAQMD, existing health risks for receptors located at the source site are as follows (BAAQMD 2011; BAAQMD 2012a):

1. Gas & Shop gas station at 750 Sir Francis Drake Blvd. (ID G10858): 30.031 per million cancer risk and 0.027 chronic hazard index (no data available for annual average PM2.5 concentration);[2]
2. Emergency Generator at 60 Park Way (ID 15210): 0.35 per million cancer risk (no data available for annual average PM2.5 concentration or chronic hazard index);[1]
3. 76 Gas Station at 930 Sir Francis Drake Blvd. (ID G1875): 53.923 per million cancer risk and 0.049 chronic hazard index (no data available for annual average PM2.5 concentration) ;[1]
4. Fara's Auto Repair at 98 Sir Francis Drake Blvd. (ID G10710): 4.136 per million cancer risk and 0.004 chronic hazard index (no data available for annual average PM2.5 concentration);[1] and
5. M&R Cleaners at 90 Greenfield Avenue (ID 7710): 36.0 per million cancer risk and 0.096 chronic hazard index (no data available for annual average PM2.5 concentration).[1]

Note that these health risk values listed above are for receptors located at the source site, not at the maximally impacted Project sensitive receptors, and they represent risk at different locations. In order to estimate the maximum possible combined health risks from all of these sources at sensitive receptors within 1,000 feet of the Project site, the BAAQMD's distance multiplier tools for internal combustion engines and gas stations were used (BAAQMD 2012b; BAAQMD 2012c). These tools were used to calculate risk for the 76 Gas Station and the M&R Cleaners as follows. The 76 Gas Station is located 2,000 feet northwest of the Project site, so the closest sensitive receptor within 1,000 feet of the Project is also 1,000 feet from the 76 Gas Station. At 1,000 feet, the estimated cancer risk is 0.81 per million. The M&R Cleaners is located 1,300 feet southeast of the Project site, so the closest sensitive receptor within 1,000 feet of the Project is 300 feet from the M&R Cleaners. At 300 feet, the estimated cancer risk is 3.76 per million. Note that these two cancer risks occur at completely different locations; one 1,000 feet northwest of the site, and the second 1,000 feet southeast of the site. However, these health risks were combined to present a highly conservative estimate of health risk.

2 Note that these health risk values are for receptors located at the source site, not at the closest onsite project sensitive receptor. Therefore, the use of these values presents a highly conservative estimate of health risk at Project receptor locations.

The maximum possible health risks from the other three sources, located at the source sites themselves, were added to these health risks to determine the total maximum health risks from all sources combined. These values are 0.35 per million cancer risk for the Emergency Generator at 60 Park Way, 30.03 per million cancer risk and 0.027 chronic hazard index for the Gas & Shop gas station, and 4.14 per million cancer risk and 0.004 chronic hazard index for Fara's Auto Repair. Combining all these values, the total increased cancer risk is 39.08 per million and the total increased in the chronic hazard index is 0.18. Adding the maximum mitigated Project health risks of 5.61 per million cancer risk and 0.09 chronic hazard index yields a total of 44.69 per million cancer risk and a total chronic hazard index of 0.27. Note that each of these health risk values occurs at a different sensitive receptor location, so the maximum health risk values at any actual individual sensitive receptor is substantially lower than these reported values. Therefore, the use of these values presents a highly conservative estimate of health risk at Project receptor locations. Since $PM_{2.5}$ concentration data were not available for these sources, $PM_{2.5}$ concentrations were not included in this analysis.

As explained above, the total combined risks from all six of the past project emission sources listed above plus the Project are 44.69 per million cancer and 0.27 chronic hazard index. These values would not exceed BAAQMD's thresholds of significance for cumulative health risks and hazards of 100 per million cancer risk and 10 chronic hazard index (BAAQMD 2017b). Therefore, the proposed Project emissions would not combine with other past project emissions to result in a substantial cumulative effect with respect to health risk from exposure to TACs, and the potential contribution to air quality impacts associated with the Project would be less than cumulatively considerable due to implementation of Mitigation Measure 4.3-4 as identified in *Section 4.3, Air Quality and Greenhouse Gas Emissions*.

As described in Impact 4.3-5, combustion emissions from the use of diesel fuel in construction equipment could generate localized objectionable odors. If sensitive receptors are located in the immediate vicinity of these activities, odors could be perceivable and thus constitute a nuisance impact. However, any objectionable odors generated by Project construction and operational activities and perceived by sensitive receptors would occur on intermittent, short-term bases. Additionally, the California Code of Regulation Section 2485, which limits idling time of construction equipment, is incorporated into Mitigation Measure 4.3-1 and would further limit diesel odors generated by construction vehicles. Because the Project's contribution to odors would be localized and short-term in nature, the potential contribution to cumulative odor impacts would be less than cumulatively considerable.

Operational activities associated with the Project would involve the use of diesel-powered construction equipment, such as excavators or bulldozers, that would generate exhaust in the form of both criteria air pollutants and criteria air pollutant precursors. In addition, exhaust emissions would be generated from vehicle trips associated with sediment removal and commuting workers. These activities would also generate fugitive dust (including PM_{10} and $PM_{2.5}$) during excavation and vehicle travel on both paved and unpaved surfaces. Implementation of the projects identified in Table 5-1 would also have the potential to contribute criteria air pollutants and criteria air pollutant precursors. As described under Impact 4.3-3, average daily operational equipment and vehicle exhaust emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ for the Project would not exceed the

BAAQMD's significance thresholds. Therefore, operational emissions would not result in an air quality standard being exceeded or make a cumulatively considerable contribution to an existing or projected air quality violation. Therefore, the potential contribution to air quality impacts associated with the Project would be less than cumulatively considerable.

5.4.3 Energy, Mineral, Forest and Agriculture Resources

Project implementation would not result in impacts to Mineral Resources, Forest or Agricultural Resources. Therefore, the Project would not have the potential to contribute to cumulative impacts for these issues. The following discussion analyze the cumulative impacts relative to the use of energy, oil, or natural gas.

Implementation of the projects identified in Table 5-1 would involve construction activities, and some projects (Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard) could be under construction during some portions of the construction period for the Project. Construction of all cumulative projects would require the use of fuel and energy, and the amount of fuel and energy consumed during construction would vary by project. As discussed under Impact 4.4-1, implementation of the Project would require the use of energy resources for construction of the Nursery Basin and elements that increase creek capacity in Downtown San Anselmo. Mitigation Measures 4.3-1a, (BAAQMD Basic Construction Measures) in Section 4.3, Air Quality and Greenhouse Gas Emissions, include measures that would reduce energy consumption and combustion of petroleum products by construction equipment, such as reducing vehicle and equipment engine idling times. Structure demolition would be subject to California Code of Regulations, Title 24, Part 11, 2016 California Green Building Code, which would also reduce Project energy use during construction.

The projects identified in Table 5-1 would be subject to the same regulatory framework as the Project for the use of fuel and energy during construction, which includes BAAQMD Basic Construction Measures and the California Green Building Code. Compliance with the measures identified would ensure compliance with regulatory policies to minimize the potential for air quality impacts from construction activities associated with the proposed Project. Therefore, the potential contribution to cumulative energy use impacts associated with the Project would be rendered less than cumulatively considerable through implementation of Mitigation Measure 4.3-1, as identified in Section 4.3, Air Quality.

Regarding operation-phase impacts related to energy use, most of the projects presented in Table 5-1 would involve energy or fuel use once they are operational. These projects include development that is similar to the current land uses or existing adjacent land uses (i.e., residential and commercial). As described under Impact 4.4-1, implementation of the Project would require the use of minimal energy resources, i.e., fuel for operation of equipment to maintain the proposed Nursery Basin. This use would be incremental. Therefore, the project would not make a cumulatively considerable contribution to a significant cumulative impact.

5.4.4 Biological Resources

As described in Section *4.5, Biological Resources*, the Project would have no impact related to conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other Adopted Local, Regional, or State Habitat Conservation Plan.

The geographic scope for the analysis of potential cumulative biology impacts includes the Ross Valley Watershed. Direct cumulative impacts could occur if any projects within the vicinity of the Nursery Basin site or the Downtown San Anselmo site would spatially overlap with these locations and occur at the same time. Of the projects presented in Table 5-1, the Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis Drake Boulevard, and one or more of the bridge removal projects, could be under construction during some portion of the construction period for the Project. However, none of them would spatially overlap with the locations for the Project.

Disturbance from the Project would occur in Fairfax Creek and San Anselmo Creek, which are tributaries to Corte Madera Creek. Other projects within the area would affect the same biological resources as the Project, primarily streams and riparian vegetation and wildlife that use these habitats, in the short term. The proposed Ross Valley Flood Protection and Watershed Program (Ross Valley Program) would implement region-wide flood risk reduction through bridge replacement, culvert enlargement, creek improvement and additional flood diversion and storage using FDS basins. Bridges at Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Boulevard, Bridge Boulevard and Winship Avenue would be removed and replaced with clear-span bridges that increase the conveyance of the creek at these locations. Downstream of the Ross Valley Program and proposed Project, the USACE's Corte Madera Creek Flood Risk Management Project would increase channel capacity and improve make improvements to aquatic habitat, including removal of the Denil fish ladder, which obstructs steelhead passage.

Impacts to biological resources associated with construction of the overlapping projects from Table 5-1, particularly those that would directly affect creek channels and their associated riparian corridors, such as activities under the Ross Valley Program, could include adverse effects to sensitive natural communities, special-status species habitat, and individuals of special-status species, both directly and indirectly. Construction activities have the potential to injure or kill individual fish by inadvertently bringing construction equipment into contact with them, by trapping or stranding them in a dewatering area, or otherwise directly physically damaging them. Adverse effects to special-status aquatic species and habitat in the Project area could arise during in-stream construction activities or other changes, including alteration of flow or water quality, that make habitat inhospitable for survival or reproduction. Impacts to special status species plants could occur, if present, by directly impacting them or indirectly changing habitat conditions. Project activities could affect existing wetlands and other (non-wetland) waters as a result of construction in the creek bed and along the lower banks of the creek channels. Construction activities could adversely affect special-status amphibians, such as California red-legged frog, western pond turtle, and other species with low potential to occur, such as foothill yellow-legged frog.

Implementation of projects identified in Table 5-1 could adversely affect sensitive natural communities such as riparian corridors and oak woodlands, and could include the removal of heritage trees or riparian trees. Activities including clearing, grubbing, excavation, and grading using heavy equipment could carry invasive non-native plants or plant pathogens from outside sources to the Project sites. Tree and shrub removal or pruning related to construction in or along creek channels would temporarily disturb cover for and impede use of the creek as a potential wildlife movement corridor. These activities could also directly or indirectly impact nesting birds by damaging or destroying nests, causing adults to abandon nests, or directly killing or injuring nesting birds. Additionally, construction and maintenance activities have the potential to cause elevated sound levels and vibrations from heavy construction equipment that could cause adult birds to abandon nests. Similarly, these activities could directly kill or injure roosting special-status bats, and elevated sound levels from construction and maintenance equipment could cause adult bats to abandon maternity roosts.

Implementation of these projects would also have the potential to result in long-term effects to biological resources. In many instances, in-channel improvements would enhance or improve upon existing conditions through restoration of a more natural creek channel; in other instances, compensatory mitigation associated with regulatory agency permits would bring about those enhancements. One of the goals of the Ross Valley Program is channel improvement that would "substantially restore natural hydrologic and ecological functions and processes." While enhancement or restoration may not be feasible at every location within the channel system, opportunities are available and would be integrated into individual project designs. Where habitat conditions are substantially altered or lost, mitigation measures would be implemented within the watershed to provide compensatory mitigation. Implementation of individual projects would require project-specific environmental review, and regulatory permitting processes, including permit review and issuance by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and Regional Water Quality Control Board, all of which have permitting authority over projects that would impact resources under their jurisdiction. These regulatory programs require development and implementation of both project-specific and cumulative compensatory mitigation. The long-term cumulative effects of channel widening and flood risk reduction projects would include revegetation to more natural channels and removal of obstructions in the creeks. Widening channels will allow for more riparian vegetation growth, slower stream flow, and development of gravel bars, which would enhance habitat for listed species, including steelhead. Overall, over the long term, flood risk reduction would have a beneficial effect on biological resources.

As explained in Section 4.9, Biological Resources, Project implementation would result in biological resource impacts related to basin construction, in-channel work for the diversion structure, and removal of the San Anselmo structure. These impacts would be small both in terms of their size (estimated at 0.04 acres of wetlands or other waters, 0.59 acres of riparian corridor, and 0.43 acres of oak woodland) and the quality of the habitat for sensitive species presence and use. The Nursery site is adjacent to open space that provides valuable wildlife habitat, and approximately 0.21 acre of annual grassland upland habitat would be restored at the Nursery Basin Site, which would benefit terrestrial species. In the long term, Project activities at the Downtown San Anselmo Site would restore and enhance the riparian corridor and potentially enhance water flow and wildlife forage and shelter opportunities. The Project would avoid, minimize and mitigate for these impacts through implementation of Mitigation Measures 4.5-1 through 4.5-10 (identified in *Section 4.9, Biological Resources*). The Project's contribution to cumulative impacts would be less than cumulatively considerable due to the small size of the resources affected, their location within the watershed, and the presence of similar habitats within the watershed. Therefore, the Project's cumulative contribution to impacts to biological resources would be less than significant.

5.4.5 Cultural Resources

Impacts related to cultural resources are generally site-specific, and they depend on the specific localized resources affected and their potential to be found in the area. They are not typically additive or cumulative in nature. There are no known tribal cultural resources in the Project area. Therefore, there would be no impact to these resources associated with the Project. The following discussions analyze the potential for cumulative impacts to archaeological resources and human remains in the event of inadvertent discovery.

All identified current and reasonably foreseeable future projects in Table 5-1 that are within or in close proximity to the Project area that involve ground disturbance have the potential to combine with the impacts of the Project to result in cumulative impacts to unknown buried archaeological resources, human remains, or tribal cultural resources. As described in *Section 4.6, Cultural Resources*, desktop research and field exploration efforts were made to identify potential archaeological resources on the Project sites. None were found. Despite these efforts and results, the inadvertent discovery of unknown archaeological resources during construction from ground disturbing activities cannot be entirely discounted. However, the Marin County Development Code and other regulations (including the California Public Resources Code and the California Health and Safety Code; referenced in *Section 4.6, Cultural Resources*) list actions that must be taken upon encountering prehistoric or historic-era archaeological resources or other cultural resources. If such resources are encountered during construction and are determined to be significant, they would be avoided if feasible. If avoidance is not feasible, they would be appropriately treated in accordance with the requirements of those regulations. Similarly, if human remains are uncovered during construction, the County Coroner would be contacted and if the remains were found to be Native American the most likely descendent would be notified and the remains would be appropriately treated, as described in *Section 4.6, Cultural Resources*. Compliance with these requirements would reduce impacts associated with potential inadvertent discoveries during construction to a less-than-significant level. Because the Project would not impact cultural resources, and includes measures to minimize potential impact to previously undiscovered resources, its contribution to any cumulative impacts on cultural resources would not be significant.

5.4.6 Geology, Soils, Seismicity, and Paleontological Resources

The San Francisco Bay area is a seismically active region with a wide range of geologic and soil conditions that can vary greatly within a short distance. Accordingly, geologic, soils, and seismic impacts tend to be site-specific and depend on the local geology and soil conditions. For these reasons, the geographic scope for potential cumulative geologic and seismic impacts consists of the Project element locations and only the immediately adjacent areas. In general, to have a cumulative impact, two or more projects would have to spatially overlap and occur at the same time. Some of the projects shown in Table 5-1 would occur within the same timeframe as the Project; however, none of them would spatially overlap with the locations for the Project. Therefore, the Project would not contribute to impacts related to fault rupture, strong seismic shaking, ground failure or liquefaction, landslides, or unstable geologic units. Similarly, there are no paleontological resources in the Project area; therefore, the Project would not contribute to a cumulative impact.

Similar to the geographic limitations discussed above, it should be noted that geologic, seismic, and soils impacts are also generally time-specific, and could only be cumulative if two or more events occurred at the same time, as well as in the same location. The following discussions analyze the cumulative impacts related to erosion and loss of topsoil (the cumulative impacts related to erosion and scour in stream channels is addressed in *Section 5.4.8, Hydrology and Water Quality*, below).

If the projects included in Table 5-1 were constructed at the same time as the Project, the erosion effects could be cumulatively significant if appropriate measures were not taken. However, the state Construction General Permit, along with the County and City storm water management programs, would require each individual project with a construction footprint over 1 acre to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP). The SWPPPs would describe best management practices (BMPs) to control runoff and prevent erosion. Through compliance with the Construction General Permit, the potential for erosion impacts would be reduced to less than significant levels. The state Construction General Permit (National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ)) was developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, two adjacent construction sites would each be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites, including from erosion. The runoff water from both sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutant allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations below action levels and would not be cumulatively considerable (i.e., less than significant).

In regard to impacts related to causing substantial changes in topography, as described in Impact 4.7-5, the Project's largest topographic surface changes would be at the Nursery Basin, which would involve excavation to about 6 feet deep and construction of a 6- to 8-foot high levee on the southeast side. These changes would be limited to the basin site and designed to not adversely affect the surrounding area. At the Downtown San Anselmo site, there would be some regrading of the creek channel to make it more natural and to increase flow capacity, but the top of bank and bottom of the channel would not be substantially changed. These changes in topography would be localized and beneficial and would not contribute to adverse impacts on topography or drainage from other projects in the area. Therefore, combined cumulative effect of the Project's incremental effect and the effects of other projects is not significant.

As discussed in Impact 4.7-1, the Nursery Basin would be constructed in accordance with state and federal dam and levee design standards and the District is designing the Nursery Basin using US Army Corps of Engineers (USACE), Division of Safety of Dams (DSOD), Federal Emergency Management Agency (FEMA), and United States Society on Dams (USSD) guidance and design documents. Implementation of these standards consistent with state and federal dam and levee design guidance and existing regulatory requirements would ensure the impact related to seismic events would be less than significant. At the Downtown San Anselmo site, a building that straddles the creek would be removed, and improvements contributing to greater channel stability would be made within the creek channel. Therefore, the potential contribution to seismic hazard impacts associated with the Project would be less than cumulatively considerable.

As discussed in Impact 4.7-2, the bottom of the Nursery Basin would be vegetated, which would reduce erosion and the loss of topsoil. The improvements to flow within the channel would reduce the frequency of flooding the surrounding areas, which would reduce the loss of topsoil in adjacent areas caused by flooding. Therefore, the potential contribution to soil erosion associated with the Project would be less than cumulatively considerable.

5.4.7 Hazards and Hazardous Materials

The geographic area affected by the Project and its potential to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative hazardous materials impacts encompasses and is limited to the Nursery Basin and Downtown San Anselmo sites and their immediate vicinity. Many impacts related to hazardous materials are largely site-specific and depend on the nature and extent of the hazardous materials release, and existing and future soil and groundwater conditions. For example, hazardous materials incidents tend to be limited to a smaller, more localized area surrounding the immediate location and extent of the release, and could only be cumulative if two or more hazardous materials releases overlap spatially. (An exception to this is a groundwater plume of contaminants released from an otherwise isolated source.) Consequently, the hazardous materials impacts related to routine use, accidental release, or being located on a listed hazardous materials site compiled pursuant to Government Code Section 65962.5 are site specific and are not cumulative in nature. In addition, impacts relative to hazardous materials are also time-specific.

As discussed in *Section 4.8, Hazards and Hazardous Materials*, the Project would have no impact with respect to being located within 0.25 mile of a school, two miles of an airport or airstrip, or within wildland fire hazards. The Project does not include the use or installation of septic tanks or alternative water disposal systems. Therefore, the Project could not contribute to cumulative impacts related to these topics and are not discussed further. The following discussions analyze the cumulative impacts related to other hazardous materials, the creation of hazards to the public or environment, and the potential to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

The projects identified in Table 5-1 would involve construction activities equipment that would use fuels, oil and lubricants, and cleaning solvents. In addition, alteration or demolition of existing structures may release hazardous building materials. Construction and demolition activities are required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials to affect stormwater and downstream receiving water bodies, and to respond to accidental spills, if any. Existing regulations require that demolition activities that may disturb or require the removal of materials that consist of, contain, or are coated with asbestos containing material (ACM), lead based paint (LBP), polychlorinated biphenyls (PCBs), mercury, and other hazardous materials must be inspected and/or tested for the presence of hazardous materials. If present, the hazardous materials shall be managed and disposed of in accordance with applicable laws and regulations.

The only hazardous materials cleanup site close to the Project would be the ongoing investigation of the former Chevron Station at 700/750 Sir Francis Drake Boulevard. However, the Downtown San Anselmo site is in the creek bed and does not have any known hazardous materials issues that could combine with any potential gasoline release from the former Chevron Station. Project construction would involve localized ground disturbance activities and these activities could result in encountering contaminated soil or groundwater. However, implementation of Mitigation Measures 4.8-2a (Check 700/750 Sir Francis Drake Boulevard Investigation Status), 4.8-2b (Health and Safety Plan), and 4.8-2c (Soil Management Plan) would reduce impacts associated with encountering potentially contaminated soil or groundwater to less than significant levels by controlling contact with and release of these materials into the environment. Therefore, there would be no significant cumulative impact to which the Project would contribute.

The Project would include use of construction equipment. However, the project sites identified in Table 5-1 are not located within proximity of the Project sites; therefore, Project construction activities would not make a cumulatively considerable contribution to hazardous materials use or exposure. With project implementation of mitigation measures identified in *Section 4.8, Hazards and Hazardous Materials*, and compliance with existing regulations, the construction-related impact relative to hazardous materials would be less than significant and its contribution would not be cumulatively considerable.

As discussed under Impact 4.8-3, the Nursery Basin would be accessed from Sir Francis Drake Boulevard, which is a designated emergency or evacuation route. Project traffic would not substantially disrupt traffic flow on these roadways. Access to the Downtown San Anselmo site would be by San Anselmo Boulevard and possibly Red Hill Avenue or Sir Francis Drake Boulevard. Red Hill Avenue is a designated emergency or evacuation route. Implementation of projects identified in Table 5-1, including construction activities for residential and commercial development would have the potential to affect designed emergency or evacuation routes. As discussed in *Section 4.15, Transportation and Circulation*, compliance with the requirements of the Country and other local jurisdictions would include preparation of a Traffic Management Plan, which would ensure that the effect of Project traffic is reduced to less than significant. Implementation of the Traffic Management Plan would provide adequate access such that Project construction, in combination with other construction projects, would not interfere with emergency response or evacuation activities. Therefore, the potential contribution to emergency evacuation routes associated with the Project would be less than cumulatively considerable.

The Nursery Basin would be operated as a temporary flood diversion and storage basin. Operation and maintenance activities would require occasional site visits using vehicles that would use fuel and oil. Contractors, the County, and the towns would be required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials, and to respond to accidental spills, if any. With compliance with existing regulations, the operation-related impact relative to hazardous materials would be less than significant and there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.8 Hydrology and Water Quality

The Project would have no impact related to creating or contributing to runoff water that would exceed the capacity of stormwater drainage systems, place housing within 100-year flood hazard areas, or place housing in an area with potential for inundation by seiche, tsunami or mudflow. Therefore, the Project would not have the potential to contribute to a significant cumulative impact of these kinds. The following discussions analyze the cumulative impacts relative to flooding, water quality, erosion and groundwater.

The geographic scope of cumulative impacts related to existing and future drainage and flooding includes projects in close proximity to the Project sites, as well as in the larger Ross Valley Watershed and the subwatersheds within it. The geographic scope of cumulative impacts on groundwater storage includes the unconfined groundwater of the Nursery Basin site.

Flooding within the Ross Valley and Cumulative Projects

As discussed in Chapter 3, *Project Description*, flooding regularly occurs both locally within the Towns of Fairfax and San Anselmo, as well as within the Ross Valley Watershed. The Flood Control District is implementing the Ross Valley Program, and is participating with the USACE in the implementation of the Corte Madera Creek Flood Risk Reduction Project, which would also address flooding within Ross Valley. A discussion focused on the implications of each of these projects relative to hydrology and water quality is provided below, followed by a discussion of other cumulative projects in the watershed.

Ross Valley Flood Protection and Watershed Program

The Ross Valley Flood Protection and Watershed Program (the Ross Valley Program) would implement a phased program over the next 30 years to achieve designated levels of flood protection: 10- to 25-year flood event protection (Phase 1) and 25- to 100-year flood event protection (Phase 2). As shown on Figure 3-3 in the Project Description (and Figure 5-1), the Ross Valley Program includes a combination of several flood control elements that, once collectively implemented, would provide flood risk reduction on a watershed-wide scale. The elements include flood diversion and storage (FDS) basins, located in the upper reaches of the watershed to detain peak flows into the creek network during flood events, bridge replacements in Fairfax, San Anselmo, and Ross to remove impediments to flows in the creek and reduce localized flooding, and creek improvements in the lower end of the watershed to increase capacity and stability in the lower reaches to handle flood flows as they move through the watershed. In addition to the FDS basins and elements that increase creek capacity, the Ross Valley Program includes additional flood risk reduction activities, including policies to encourage low impact development (LID), flood preparedness, and educational activities throughout the lifespan of the Ross Valley Program. These elements are proposed to reduce the frequency and severity of flooding in the Ross Valley.

These proposed elements have been included after technical analysis[3] determined that they were the most suitable actions that can be taken to reduce flooding risk in the Ross Valley Watershed, given the regional topography, the existing creek network, flow bottlenecks, and the constraints on available space to develop program elements. According to hydraulic model simulations, neither increasing creek capacity alone nor developing FDS basins alone would be sufficient to prevent flooding within the Ross Valley Watershed during a 100-year flood.[4] Notably, implementing all of the creek capacity elements alone will not provide the desired level of flood risk reduction. To achieve 100-year flood protection, some volume of flood flows will need to be captured in FDS basins. There is some flexibility in the sizing, locations, and operation of the FDS basins throughout the watershed; however, they must be located strategically to assist in meeting the flow rate targets in each subwatershed. By installing both FDS basins and elements that increase creek capacity, a 100-year flood event similar to the December 2005 flood, could be contained within the banks of the stream network, thereby reducing flood risk throughout Ross Valley. Therefore, implementation of the Ross Valley Program would have a beneficial effect on cumulative flooding and flood risk within the Ross Valley Watershed.

In order to meet the Ross Valley Program's primary objective, which is to substantially reduce the frequency and severity of flooding within Ross Valley, a hydraulic analysis of the Ross Valley was undertaken to identify where flooding is occurring during various storm event scenarios.[5] Through this analysis a combination of critical reaches and flow targets was identified to support the design of the Ross Valley Program, as described below.

Critical Reaches

Based on the analysis, there are four "critical reaches" in Ross Valley where, during large floods, floodwaters overflow and escape from the creeks, and flow for extended distances on the

[3] This analysis included the *Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley* (CIP) (Stetson, 2011), the *Ross Valley Flow Reduction Study Report* (CH2M, 2015), and hydraulic modeling.

[4] The 100-year flood is the flood event that has a 1% chance of occurring or being exceeded in any year based on historical records and model projections.

[5] This analysis included the Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley (CIP) (Stetson, 2011) and hydraulic modeling.

historical floodplain as separate side-streams apart from the main channel. During very large floods, these floodwaters damage structures in the floodplain and threaten public safety. Owing to their limited conveyance capacity, these four critical reaches represent the weakest links in the creek system. Accordingly, they are the focus of the Ross Valley Program elements aimed at increasing creek capacity. The four critical reaches are:

1. Fairfax Creek critical reach, located within the Fairfax Subwatershed;
2. Sleepy Hollow Creek critical reach, located within the San Anselmo Subwatershed;
3. San Anselmo Creek critical reach, including downtown San Anselmo, located within the San Anselmo Subwatershed; and,
4. Corte Madera Creek and Ross Creek critical reach, located within the Ross Subwatershed.

Flow Targets

Increasing creek capacity in the critical reaches, while important, is not sufficient in all locations by itself to reduce flooding to protect life and property in the area. Rather, the Ross Valley Program must also reduce flows upstream of the critical reaches, an outcome that can be achieved by building FDS basins. Three locations in the watershed (one in each of the Fairfax, San Anselmo and Ross subwatersheds) have been assigned flow targets – meaning locations where flows should be reduced to specified levels in order to reduce flooding downstream in the critical reaches.

The three key flow targets are shown on Figure 5-1 and are as follows:

1. Fairfax Subwatershed: Target 100-year flow of 1,100 cubic feet per second (cfs) at the Fairfax Town Hall.
2. San Anselmo Subwatershed: Target 100-year flow of 4,540 cfs at Sycamore Bridge in San Anselmo.
3. Ross Subwatershed: Target 100-year flow of 5,540 cfs at the USGS Streamflow Gage at Ross.[6]

These targets were developed through hydraulic modeling to reflect the maximum flow rate that could be allowed at each location and still achieve containment of the anticipated flow from a 100-year flood event in the identified critical reaches, assuming all elements identified in the Ross Valley Program to increase the creek capacity are implemented.

U.S. Army Corps of Engineers Corte Madera Creek Flood Risk Reduction Project

The goal of the USACE Corte Madera Creek Flood Risk Reduction Project (also and formerly known as the Corte Madera Creek Flood control Project (Units 2, 3, and 4) is to enhance and improve Corte Madera Creek to reduce the risk of flooding in the communities of Ross and Kentfield. That project would include removal of a wooden fish ladder and increasing channel capacity in Lower Corte Madera Creek. Project benefits include flood reduction during large

[6] The flow target of 5,540 cfs at the USGS Streamflow Gage at Ross is intentionally in alignment with the proposed design flow rate for the USACE Project.

storms and ecosystem restoration. The Flood Control District is coordinating modeling of the Ross Valley Watershed with the USACE to ensure that implementation of the Ross Valley Program is integrated into the design of the project.

Development Projects

Implementation of the other projects in Table 5-1 may increase impervious surface areas associated with development. The largest of these projects is the 20-acre Victory Village Senior Housing project. Each of these development projects would be required to comply with federal, State, and local requirements regarding stormwater management, including Provision E.12 of the State Water Resources Control Board (State Water Board) under the Phase II NPDES Municipal Regional Permit. Provision E.12 of the 2013 MS4 permit includes post construction stormwater management requirements that permittees (such as Marin County) must incorporate into their land use approvals. Site design measures (such as stream setbacks and buffers, rooftop and impervious area disconnection, and vegetated swales) must be implemented for projects approved by the County that create or replace between 2,500 and 5,000 square feet of impervious surface. Projects that create and/or replace 5,000 square feet or more of impervious surface must implement measures for site design, source control, runoff reduction, storm water treatment and baseline hydromodification management as defined in the 2013 MS4 permit. These requirements have been adopted by Marin County, and are codified in Section 24.04.627 (Permanent Stormwater Controls for New and Redevelopment) of the Marin County Municipal Code. Compliance with local ordinances, design review, and Provision E.12 would reduce the contribution of these projects to flood conditions within the Ross Valley.

Cumulative Effects

Flooding

As explained in Chapter 3, *Project Description*, some projects identified as part of the Ross Valley Program are undergoing additional project-level review under CEQA because they have separate funding sources, timelines, or implementing agencies. The San Anselmo Flood Risk Reduction Project is one of these projects and has independent utility because it substantially reduces the existing levels of flood risk in the affected communities. As identified in *Section 4.9, Hydrology and Water Quality*, the Project, even with localized changes in water surface elevations, would make a meaningful contribution to the watershed-wide reduction in frequency and severity of flooding.[7]

Hydraulic modeling was conducted for the proposed Project along with the bridge replacement projects (at Winship Avenue, Azalea Avenue, Nokomis Avenue, Madrone Avenue, and Center

[7] Due to the size of the Nursery Basin, the Project's greatest reduction in flooding would occur during more frequent storms (the 10-year event), when approximately 300 fewer parcels in Fairfax, San Anselmo, and Ross would experience flooding. In addition, inundation depth would be decreased on 230 parcels. The depth of inundation associated with a 25-year event would also be reduced by the Project, although not by as much (reducing flooding depth on approximately 615 parcels; 20 parcels would be removed from the floodplain). The Project's reduction of flooding from a 100-year storm event is also limited because the basin's capacity is able to hold only a relatively small portion of that total runoff volume. With Project implementation, the depth of inundation would be reduced on approximately 470 parcels that currently experience flooding during the 100-year event, and 10 parcels would be removed from the inundated area.

Blvd-Sycamore Avenue), which are included in the near-term expected future conditions due to their funding status and construction schedule (construction planned to occur between 2019 and 2022). The model results are presented in several series of map figures and tables in reports provided in **Appendix D**. These results indicate that in the near-term expected future cumulative scenario, the floodplain extent and inundation depths would generally be reduced compared to existing conditions. In the 10-year event, the cumulative scenario would reduce the floodplain area, mostly containing the flood within the channel with the exception of a few locations in San Anselmo north of Center Boulevard. In the 25-year event, inundation depths would be reduced compared to existing conditions, and a greater area would be removed from the floodplain in upper San Anselmo. In lower San Anselmo, no new inundation in currently unaffected areas would occur, and additional areas would be removed from the floodplain. Areas where inundation depths would increase would be very limited. In the 100-year event, greater reductions in inundation depth compared to existing conditions would occur throughout San Anselmo, and increases in inundation depth would be limited (Stetson Engineers, 2017).

With Project implementation, the increased flooding in a limited area around the Winship Bridge (i.e., between Barber Avenue and the Sir Francis Drake Bridge) in the 25- and 100-year events would be avoided by placing flood barriers along the creek channel on affected properties. This would cause those flows to stay in the creek channel, increasing the volume of in-channel flow reaching the Sir Francis Drake Bridge. Downstream of the Sir Francis Drake Bridge, the creek channel has the extra capacity to contain the increased peak discharge of about 146 cfs; therefore, in the near-term cumulative scenario, implementation of the Project (along with flood barriers proposed as mitigation) would not increase flood risk in areas downstream (Stetson Engineers, 2018a and 2018b).

Implementation of the proposed Project and other elements of the Ross Valley Program would both individually and cumulatively reduce frequency and severity of flooding within the Ross Valley Watershed. Implementation of both the Ross Valley Program and the proposed Project would contribute to the reduction of peak flows to meet the 100-year flow target at the Ross Subwatershed of 5,540 cfs at the USGS Streamflow Gage at Ross.[8] The cumulative effect of the Project along with the Ross Valley Program, the U.S Army Corps Unit 4 and Unit 3 project, the bridge replacement projects, and other development projects in the watershed would be to reduce the frequency and severity of flooding in the watershed, a beneficial impact.

Levee Failure

Implementation of the Ross Valley Program would include four to six FDS basins to provide flood detention storage within the watershed. When considered cumulatively, additional detention storage of approximately 550 acre-feet would be provided within the Ross Valley. This Project includes one of the FDS basins contemplated under the Ross Valley Program. As discussed in Impact 4.9-6, the FDS basin levees, overflow weir, and the diversion structures would be designed to control and detain flood flows as their primary purpose. Modern flood control facilities are designed and constructed under conservative guidelines and criteria designed to

8 The flow target of 5,540 cfs at the USGS Streamflow Gage at Ross is intentionally in alignment with the proposed design flow rate for the USACE Project.

prevent failure. Levee failure can occur when the difference between the hydrostatic pressure on the water side and dry side of the levee leads to seepage of water beneath the levee (also called underseepage). As discussed in Section 4.7, *Geology, Seismicity, Soils, and Paleontological Resources*, the basin and its levee would also be designed and constructed in accordance with federal and state standards and regulations, which include specifications for fill composition, compaction, procedures, and slope limitations that would reduce the risk of damage or failure during or after an earthquake. Compliance with these regulations would reduce the Project's potential to contribute to the direct or indirect exposure of people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition, to levels that would not be cumulatively considerable, and therefore would be less than significant.

Water Quality and Groundwater

Projects identified in Table 5-1 would have the potential to degrade water quality due to construction activities, including discharge of sediment and potential release of fuel and other chemicals during construction. Grading and earthmoving could alter local drainage patterns and redirect or concentrate stormflows, which could increase the risk of on-site and/or off-site erosion, sedimentation, or flooding. Additionally, under certain conditions, in-stream sediment management may be required when flows are present in Fairfax Creek. The Project's sediment removal activities would have the potential to contribute sediment to downstream areas. Project construction of the creek capacity improvements in downtown San Anselmo, the Nursery Basin, and the diversion and overflow structure in Fairfax Creek could degrade water quality as a result of construction-related soil disturbance and discharge of construction stormwater, or if fuels and other chemicals used during construction are spilled and entrained into stormwater runoff or dewatering discharges. Under the Construction General Permit issued by the RWQCB, the Project would be required to prepare and implement a SWPPP that would contain BMPs to control stormwater runoff and sediment during construction. Projects in Table 5-1 within the vicinity of Project sites that are over 1 acre in size also would be required to prepare and implement a SWPPP. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain the cumulative effects of projects subject to this requirement below levels that would be considered significant. BMPs from all projects' SWPPPs that slow and control runoff to reduce erosion would be effective in reducing effects on erosion, sedimentation, and flooding caused by construction activities. Implementation of Measure 4.9-1 (Implement Dewatering BMPs for In-Water Work) would reduce potential impacts related to in-stream sediment management activities. Therefore, the potential contribution to water quality impacts associated with the proposed Project would be less than cumulatively considerable due to implementation of mitigation measures as identified in *Section 4.9, Hydrology and Water Quality*.

Construction may require groundwater pumping to manage unconfined localized groundwater levels. No other projects are located in the project vicinity that would contribute to lowering of unconfined groundwater levels. Therefore, there would be no cumulative impact on groundwater to which the Project would contribute.

Erosion and Sedimentation

Construction of the Ross Valley Program could alter sediment and erosional processes within the watershed by changing flow volumes and velocities during storm events. Installation of structures in the creek channel would alter sediment transport, resulting in new patterns of sediment deposition and erosion. The Project would cause increased sediment deposition upstream of the diversion structure. Any or all of the FDS basins upstream of the Nursery Basin proposed as part of the Ross Valley Program could also locally affect sedimentation and erosion in Fairfax Creek if they include any structures in the creek channel (such as the diversion structure). This would be a potentially significant cumulative impact. As discussed in Impact 4.9-3, the Project would include annual sediment removal in compliance with the Flood Control District's existing Stream Maintenance Program as well as additional, occasional sediment removal during very wet years. Mitigation Measure 4.9-3a (Prioritize Nursery Basin Reach for Stream Maintenance) would reduce the Project's contribution to cumulative changes in sedimentation and erosion in Fairfax Creek to less than cumulatively considerable.

Like the proposed Project, implementation of elements of the Ross Valley Program, including bridge replacements, could change flow velocities in Fairfax and San Anselmo Creeks. In combination with other projects that alter structures in the San Anselmo Creek channel, in particular the bridge replacement projects, Project implementation could alter erosion and sediment deposition processes. To evaluate this potential impact, channel bed and bank materials were inventoried in the bridge project locations and compared with modelled stream flow velocities in these areas (CH2M, 2018). The modeling included replacement of the Azalea, Madrone, Nokomis, Center, Bridge Avenue, and Winship Bridges along with the proposed Project and removal of the fish ladder structure as part of the USACE Corte Madera Creek Flood Risk Reduction Project. The near-term cumulative projects would remove existing constrictions to channel flow in locations both upstream and downstream of 634-636 San Anselmo Avenue. The model results combined with the bed and bank material information indicate that changes in mobility of channel bed materials is minor compared to existing conditions (CH2M, 2018). Therefore, implementation of the Project along with the other near-term bridge replacement projects would not make a considerable contribution to a cumulative impact and would not be significant.

5.4.9 Land Use and Planning

A cumulative land use impact would occur if the Project, in combination with the cumulative projects in Table 5-1, were to result in the physical division of an established community or conflict with applicable land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. Implementation of the Project in conjunction with the related projects listed in Table 5-1 would result in the continued development (or redevelopment) of various land uses in the Project area. The Project would have no impact related to physically dividing an established community. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts relative to conflicting with local land use plans and altering the character or functioning of a community, or present or planned use of an area.

The Project would be consistent with the General Plan policies of both the County of Marin and the Town of San Anselmo. Proposed improvements would not conflict with the land use plans for the area. The construction of the Nursery Basin would be a change in land use, but one that would not alter the existing character or function of the community. The removal of a single building in downtown San Anselmo and the resultant changes in the community's function and character would not be substantial. The Project and the past, present and probable or expected future projects identified as cumulative projects in Table 5-1 would be required to comply with applicable regulations and would not substantially change the mix of land uses in the vicinity of the two Project elements, or in the Ross Valley Watershed. Several of the other projects identified in Table 5-1, including the Ross Valley Program, may require discretionary actions such as permits and approvals by local jurisdictions. Each of these other projects would be required to demonstrate consistency with the goals, policies, and objectives of the land use plans in effect for that area, applicable regional plans, and compatibility with surrounding land uses. Due to the dispersed nature of the other planned and proposed projects, implementation of the other projects would not cumulatively interact with the proposed Project from a land use planning standpoint. Therefore, the Project's contribution to cumulative land use impacts would not be cumulatively considerable, and would therefore be less than significant.

5.4.10 Noise

The geographic context for changes in the noise and vibration environment in the vicinity of the Nursery Basin and Downtown San Anselmo sites is mainly suburban areas within the Ross Valley Watershed. To contribute to a cumulative noise impact, another project in close proximity would have to be constructed at the same time as Project construction activities. There are numerous projects in several locations in the Project areas, currently in the planning stages, that could be constructed in the foreseeable future and include similar construction activities. Cumulative projects that could occur at the same time as the Project include one or more of the bridge removal projects, the Victory Village Affordable Housing Project (2626 Sir Francis Drake Boulevard) near the Nursery Basin site and projects at 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard near the Downtown San Anselmo site.

Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. As described under Section 4.11. Noise, the Project would have no impact related to the following criteria:

1. Exposure of people to excess noise due to proximity to an airport or private airstrip.

Because the project sites would not involve locating people near or increasing use of an airport or private airstrip, there would be no significant cumulative noise impacts to which the Project would contribute. The following discussions analyze the cumulative impacts relative to an increase in noise and groundborne vibration.

Construction activities at the Nursery Basin site would result in noise levels that would be less than significant with mitigation. The only known cumulative projects that are likely to be constructed at the same time as the Project is the Victory Village Affordable Housing Project (2626 Sir Francis Drake Boulevard) near the Nursery Basin site, projects at 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard near the Downtown San Anselmo site. and elements of the Ross Valley Program, including bridge removals. Although considerable uncertainty exists regarding the construction schedules for the cumulative projects, construction noise associated with nearby cumulative projects in combination with the Project would be a temporary significant cumulative impact. The use of equipment during Project construction and maintenance activities combined with other projects in the Program area could generate noise that would affect existing ambient noise conditions and could affect the same sensitive receptors. The Project's contribution to cumulative construction and maintenance noise would be a nuisance, but would be short in duration. Implementation of the construction noise reduction plan developed pursuant to the Countywide Plan would include measures to reduce constriction noise and would reduce impacts during construction to a less-than-significant level. Therefore, the project's contribution to potential cumulative noise impacts would be less than cumulatively considerable.

Construction activities would only occur within the construction hours established by their respective jurisdictions, making them exempt from local noise standards. Therefore, residences near Project construction areas would be exposed to noise levels that would not result in violation of either the Marin County code or Town of San Anselmo municipal code. Therefore, there would be no significant cumulative impact related to exceedance of noise standards to which the Project would contribute.

As discussed in *Section 4.11, Noise and Vibration*, there are no sensitive land uses or buildings close enough to the Project construction sites to be affected by vibration from construction activities. Thus, sensitive receptors or buildings in the vicinity would not be exposed to vibration levels that would result in either building damage or human annoyance. However, if Project-related construction activities were to coincide with another development in close physical proximity, the combined effect could result in the exposure of sensitive receptors or buildings to higher vibration levels than what was projected for the Project. Because the nearest cumulative project is 300 feet from where on-site Project-related construction activities would occur, the combined vibrations generated during the construction of the Project and nearby cumulative project would not expose existing sensitive land uses or buildings to vibration levels higher than what is estimated for the Project alone. The construction vibration associated with cumulative projects in combination with the Project would result in a less-than-significant cumulative impact, and the Project's contribution would not be cumulatively considerable.

The operation and maintenance activities associated with the Project elements would be similar to those already performed on the stream channels and banks, buildings, bridges, culverts, and other activities taken by the Flood Control District, Marin County Department of Public Works, and the Town of San Anselmo. These activities may include the use of off-road equipment such as lawn mowers, backhoes, and loaders. Sensitive receptors near the Nursery Basin and Downtown San Anselmo sites would not be exposed to noise levels that would exceed the applied FTA adverse community reaction threshold of 90 dBA Leq, and there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.11 Population and Housing

The analysis is based on projects identified in Table 5-1. As discussed in Section 3.5 of the Chapter 3, *Project Description*, construction is expected to generate a maximum construction crew size of 20-30 daily during the construction period for each of the Project elements (Downtown San Anselmo, 4-6 months and Nursery Basin, 7-8 months). Project construction could occur concurrent with other construction activity within San Anselmo. The Town of San Anselmo's Current Planning Application Report for the period between January 2015 and February 2018 indicates that 21 developments have been filed with the Town and are under review. Some of these projects would be under construction at the same time as the Project, including the projects shown in Table 5-1. The size of the regional construction work force and the surrounding region is expected to accommodate the demand for construction labor. Therefore, the cumulative growth-inducing impact of Project construction in combination with other concurrent construction projects within the City would be less than significant.

As described in Impact 4.12-1 and 4.12-3, operation of the Project would have no impact associated with direct inducement of population growth because the Project would not create housing, and thus would not affect population projections and policies in the Countywide Plan. Moreover, the Project would not indirectly contribute to population growth through the extension of roads or other infrastructure into areas lacking such services. As described in Impact 4.12-2, operation of the Project would not displace any housing or necessitate construction of replacement housing. Further, this Project would reduce flood risk in existing developed areas and in areas where growth is already anticipated in the Countywide Plan or in the Town of San Anselmo's General Plan. The Project would not allow additional growth beyond that, nor would it change the locations where this growth is planned to occur. Consequently, Project implementation would not affect current or projected population growth patterns within Marin County. Therefore, operation of the Project would not contribute to a direct cumulative growth inducement impact. The cumulative growth-inducing impact of Project operation in combination with other cumulative projects would be considered less than significant.

5.4.12 Public Services and Utilities

As described in *Section 4.13. Public Services and Utilities*, the Project would have no impact related to the provision of wastewater services or water supply. The Project would have a less than significant impact on storm drain facilities because some storm drain outfalls into San Anselmo Creek may need to be modified in downtown San Anselmo. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts relative to the new or physically altered governmental facilities or increase the demand for new or increased staff, exceeding the permitted capacity of a suitable landfill, and compliance with federal, state, and local statutes and regulations related to solid waste.

Pubic Services

Some of these projects identified in Table 5-1 would be under construction at the same time as the Project (Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis

Drake Boulevard, and one or more of the bridge replacement projects). Incidents could occur during construction requiring law enforcement, fire protection, or emergency medical services. However, the Ross Valley Fire Department includes four stations to serve the area, and the Central Marin Police Authority had 56 full-time staff. As described in Impact 4.13-1, any incremental increase in demand for these services during construction would be temporary and could be accommodated by existing services. The increased need for law enforcement or fire protection services resulting from the Project and reasonably foreseeable projects is not expected to exceed levels anticipated by the Ross Valley Fire Department or the Central Marin Police Authority, or require the construction of new or physically altered governmental facilities that are not already planned. Therefore, the Project in combination with other projects in the cumulative scenario would have less than significant cumulative impacts related to public services.

Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. As described in Impact 4.13-1, operation of the Project would not cause or contribute to a potential significant cumulative impact on public services. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

Utilities

As discussed in Impact 4.13-3, Marin County Ordinance 3389 requires all construction and demolition projects to reuse or recycle at least 50 percent of materials generated, and Zero Waste Marin ensures Marin County's compliance with state recycling mandates and provides residents and businesses with information on household hazardous waste collection, recycling, composting, and waste disposal. All Marin County projects would be required to implement these or similar regulatory requirements, and there is sufficient landfill capacity as discussed in Impact 4.13-2. Recycling construction and demolition debris helps local jurisdictions meet state and local waste diversion goals. As discussed in Impact 4.13-4, implementation of the Project would require the use of energy resources for construction of the Nursery Basin element and the Downtown San Anselmo element. This energy use would primarily be in the form of petroleum products and electricity, as well as indirect energy use related to the extraction, production, and transportation of goods and materials needed for construction. Although the Project would result in increased energy use during construction, local utilities and providers of fuel or power for construction equipment would have adequate energy supplies to serve the Project and no new utility infrastructure would need to be constructed. Therefore, cumulative impacts related to exceeding landfill capacity, compliance with federal, state, or local statutes and regulations related to solid waste, and requiring or resulting in the construction of new utility infrastructure would be less than cumulatively considerable.

During operation, as discussed in Impact 4.13-3, solid waste in the form of deposited sediment removed from creek channels would be generated by operation of the Project. The volumes would be above the amounts that are currently removed from creek channels as part of routine maintenance, but the volume removed would be limited by the Marin County Stream Maintenance Program, which would ensure that removed sediment would not exceed landfill capacity. Removed sediment would either be beneficially reused in appropriate restoration projects or disposed of at a permitted landfill. Other trash and debris removed during routine channel maintenance would be sent to permitted landfills for disposal and this disposal would not result in an inconsistency or violation of permit conditions at these facilities because the facilities are permitted and have adequate capacity to accept these non-hazardous wastes. Therefore, the project's contribution to cumulative impacts related to exceeding landfill capacity and compliance with federal, state, or local statutes and regulations related to solid waste would be less than cumulatively considerable. Similarly, the operation and maintenance of the Project would not increase the demand for water supply or water treatment systems and would thus not necessitate any new utility infrastructure for these systems. Therefore, the Project's would not contribute to cumulative impacts to these resources.

5.4.13 Parks and Recreation

Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts regarding whether construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities, and if construction and operation of Project would include recreational facilities and require the construction or expansion of recreational facilities.

Some of the projects identified in Table 5-1 would be under construction at the same time as the Project (Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis Drake Boulevard, and some of the bridge removal projects), and could result in short-term disruption of recreational facilities. The Project would include temporary impacts to the adjacent Creek Park during construction (approximately 4-6 months), because most of the park would be used for construction access or staging, and would temporarily decrease the amount of park area available to the public. It is therefore possible that some of the use that would have occurred at Creek Park during the construction period would be shifted to other recreational facilities within the Town of San Anselmo or in neighboring jurisdictions. Construction of Project facilities would occur during the same time frame and in the same vicinity as some other planned and proposed projects, which could also cause temporary park closures and shift public access and recreational use to other park facilities. This increased use of those facilities could cause congestion or other adverse effects. However, given the brief construction period of the Downtown San Anselmo element, there is a low probability of other projects listed in Table 5-1 that may include park closures occurring simultaneously with this Project. Therefore, the simultaneous construction of these projects would not substantially increase the use of existing neighborhood and regional parks or other recreational facilities, and substantial physical deterioration of those facilities would not occur and cumulative impacts would be less than significant.

As described in Impacts 4.14-1 and 4.14-2, operation of the Project would not cause or contribute to a potentially significant impact on parks or other recreational facilities. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.14 Transportation and Circulation

The Project would have no impact related to congestion management programs or Level of Service standards, changes in air traffic patterns, increased hazards due to design features, or conflict with adopted policies supporting alternative transportation. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the potential for cumulative impacts with regard to whether the Project would cause temporary increases in traffic volumes during construction, in relation to the existing traffic load and capacity of the road system; could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system; could impede access to local streets or adjacent uses, including access for emergency vehicles; or could have an adverse effect on pedestrian and bicycle accessibility and safety.

Existing and probable future projects listed in Table 5-1 could contribute to cumulative impacts related to transportation and circulation. Project construction is expected to take place in a single season, probably during 2020, and construction of the Project facilities would occur in the same time frame and vicinity as other planned and proposed projects that would use the same roadways for access to the work sites during the construction period.

Of the projects included in Table 5-1, the Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard projects would overlap with construction activities of the Project. Additionally, several bridge replacement projects on San Anselmo Creek are proposed as part of the Ross Valley Program, and their planned implementation is roughly contemporaneous with the Project (ranging from 2019 through 2022).

Project construction-related truck traffic occurring on roadways in the peak direction on weekdays, during the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., would coincide with peak-period traffic on access roadways and therefore would have the greatest potential to impede traffic flow, and overlap with a number of other cumulative projects. Project construction activities could impede access to local streets or adjacent uses, including access for emergency vehicles, could have an adverse effect on pedestrian and bicycle accessibility and safety, and could temporarily increase traffic safety hazards due to incompatible uses. The Project would implement a Traffic Management Plan (TMP), which would ensure that the effect of Project traffic is minimized, and would include measures that would provide for continuity of vehicular, pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Therefore, the Project's contribution to traffic-related impacts would not be cumulatively considerable, and would therefore be less than significant.

The Project would have no impact related to any alterations of existing roadway features that would create a permanent change to access for emergency vehicles, or bicyclists and pedestrians. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

5.5 References

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CHAPTER 6
Alternatives

6.1 Introduction

This chapter presents the California Environmental Quality Act (CEQA) alternatives analysis for the San Anselmo Flood Risk Reduction Project (Project). The State CEQA *Guidelines*, Section 15126.6(a), state that an environmental impact report (EIR) must describe and evaluate a reasonable range of alternatives to the proposed Project that would feasibly attain most of the Project's basic objectives but would avoid or substantially lessen any identified significant adverse environmental effects of the proposed Project. Specifically, the State CEQA *Guidelines* (Section 15126.6) set forth the following criteria for selecting and evaluating alternatives:

1. ***Identifying Alternatives.*** The selection of alternatives is focused on identifying those that would avoid or substantially lessen any of the significant effects of the project, are feasible, and would attain most of the basic objectives of the project. Factors that may be considered when addressing the feasibility of an alternative include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the proponent can reasonably acquire, control, or otherwise have access to an alternative site. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. The specific alternative of "no project" must also be evaluated. The "No Project" analysis shall discuss existing conditions at the time the environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved (State CEQA *Guidelines*, Section 15126.6(e)).

2. ***Range of Alternatives.*** An EIR need not consider every conceivable alternative, but must consider and discuss a reasonable range of feasible alternatives in a manner that will foster informed decision-making and public participation. The "rule of reason" governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice. The lead agency (the Marin County Flood Control and Water Conservation District; "Flood Control District") is responsible for selecting a range of project alternatives to be examined and for disclosing its reasons for the selection of the alternatives.

3. ***Evaluation of Alternatives.*** EIRs are required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with a proposed project. Matrices may be used to display the major characteristics and the environmental effects of each alternative. If an alternative would cause one or more significant effects that would not result from the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

6.2 Approach to Alternatives Selection

6.2.1 Overview

Consistent with CEQA,[1] the Flood Control District incorporated consideration of environmental impacts as well as environmental benefits into conceptualization, planning and design for the Project. The screening process for alternatives to be evaluated in the EIR included reviewing the potentially significant impacts attributable to Project implementation; reviewing scoping comments received during circulation of the Notice of Preparation; evaluating the feasibility of potential alternatives; and considering the ability of potential alternatives to meet most of the basic Project objectives. The Project objectives (presented in Chapter 3, *Project Description*) are reprinted in **Table 6-1** below for ease of reference. The range of alternatives was selected to foster informed decision-making and public participation in the CEQA process.

TABLE 6-1
SAN ANSELMO FLOOD RISK REDUCTION PROJECT OBJECTIVES

1. Reduce the risks related to both frequency and severity of flooding. 2. Provide multiple public benefits including environmental enhancements and recreational enhancements. 3. Provide a flood risk reduction project in balance with available and reasonably foreseeable funding.	4. Maintain the quality of adjoining neighborhoods. 5. Ensure basin design meets community needs. 6. Comply with local, state, and federal environmental laws and regulations. 7. Protect the public's health and safety.

Section 6.3 describes the selected alternatives and the environmental impacts of each compared to the impacts of the proposed Project. Section 6.4 describes the relative ability of each to meet the Project objectives and identifies the environmentally superior alternative. Section 6.5 describes the alternatives that were considered but rejected.

6.2.2 Alternatives Considered During Project Planning

As described in Chapter 1, *Introduction* and Chapter 3, *Project Description*, the Flood Control District has been engaged in addressing flooding in the Ross Valley since the large floods in 2005 and the subsequent passage of an annual Storm Drainage Fee in 2007. That fee provides funding to meet the following goals (Flood Control District, 2007):

1. Reduce damage due to flooding
2. Offer solutions for homes and businesses
3. Aid homeowners in repairing stream banks
4. Remove bottlenecks that impede water flow
5. Maintain natural creek functions
6. Reduce pollutants entering the San Francisco Bay
7. Incorporate habitat enhancements
8. Improve fish passage

[1] Public Resources Code Section 15004(b)(1).

In addition to the Storm Drainage Fee Fund, the San Anselmo Flood Risk Reduction Project has funding from a California Department of Water Resources (DWR) grant. The funds from that grant were first awarded in 2013 to the Town of San Anselmo based on an application submitted for the Memorial Park Detention Basin Project. In response to community concerns related to that project concept, the Town of San Anselmo coordinated with the Flood Control District to reallocate the DWR grant funds to a new project as long as a number of DWR conditions could be met. These requirements included being able to achieve a comparable level of overall flood risk reductions in a publicly acceptable project while enhancing environmental conditions and recreational opportunities. The proposed replacement project must also have a similar level of feasibility, which involves availability of rights of way, regulatory permissibility, and ability to fund it as the previously proposed project had.

Numerous alternatives were considered during development of both the San Anselmo Flood Risk Reduction Project and the Ross Valley Flood Protection and Watershed Program. As described on the Program's website (http://www.marinwatersheds.org/creeks-watersheds/ross-valley-flood-protection-watershed-program), The Program identifies several types of elements to reduce flood risk:

1. Creek Capacity Elements (including creek channel improvements and bridge replacement/improvement)[2]
2. Flood Diversion and Storage (FDS) Basins
3. Low Impact Development (LID) Policies
4. Flood Preparedness and Education
5. Creek Maintenance

The Ross Valley Flood Protection and Watershed Program also includes several different FDS basin sites, including the one at the former Sunnyside Nursery site analyzed in this EIR, and over 150 different creek channel improvements and bridge replacements, including improvements in downtown San Anselmo also analyzed in this EIR.

As described in Chapter 3, *Project Description*, the San Anselmo Flood Risk Reduction Project includes two project elements: (1) an FDS basin, referred to as "the Nursery Basin" Element because of its location at the former Sunnyside Nursery site, in the upstream portion of the Fairfax subwatershed, and (2) creek channel improvements/bridge building removal in downtown San Anselmo along San Anselmo Creek, referred to as the Downtown San Anselmo Element. Through its planning efforts, the Flood Control District considered numerous alternatives before ultimately determining that the San Anselmo Flood Risk Reduction Project would meet the District's project goals for reducing flood risk and severity, satisfy the State's grant criteria, and help achieve the long-term objectives and flow-improvement targets in the Ross Valley Flood Protection and Watershed Program. Other alternatives identified during project development are listed below. As indicated, some of these were found to meet CEQA criteria for alternatives

[2] The phrase "creek capacity elements" is used in this chapter to refer to the creek capacity improvements that are part of the alternatives to the Project. This phrase is intended to differentiate them from the "creek capacity improvements" that are part of the Downtown San Anselmo Element of the proposed Project.

(ability to reduce environmental impacts, ability to meet most of the Project's basic objectives, feasibility) and were retained for evaluation in this EIR, while others were eliminated from further consideration.

1. Alternatives featuring FDS basins with different design volumes (both increased- and reduced-capacity versions) and different drainage methods (passive using gravity only and active using a pump). Two such alternatives were included for analysis in the EIR and are described and evaluated in Section 6.3.

2. The Morningside Neighborhood Alternative involved removal and/or replacement of two flow-constraining bridges over, and channel improvements to Sleepy Hollow Creek, as well as a reduced-capacity FDS basin at the former Sunnyside Nursery site. This alternative was analyzed in the EIR and is described and evaluated in Section 6.3.

3. A Raised Building Alternative involving raising the bridge building in San Anselmo and removing its foundations from the creek channel (instead of removing it entirely). This alternative was included for analysis in the EIR and is described and evaluated in Section 6.3.

4. A No-Basin Alternative involved creek improvements in both San Anselmo Creek and Sleepy Hollow Creek (removing bridge buildings and/or replacing or removing bridges, adding flood walls, and making other improvements to creek channels). This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

5. A Sleepy Hollow Creek Watershed Alternative combined a different FDS basin site (at Brookside Elementary School) with improvements to Sleepy Hollow Creek, as well as removal or replacement of one or two flow-constraining bridges in the Morningside neighborhood of San Anselmo. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

6. A Lefty Gomez Basin Alternative combined an FDS basin at the Lefty Gomez Field park with the above-described channel improvements in Sleepy Hollow Creek. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

7. A Fairfax Creek Alternative combined a very large FDS basin (65 acre-feet capacity) at the former Sunnyside Nursery site with the removal of multiple bridge buildings in downtown San Anselmo and multiple creek improvements in San Anselmo Creek. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

8. A Green Infrastructure and Flood-proofing Actions Alternative would have incorporated low-impact development policies, stormwater infiltration, rain barrels, and green infrastructure implemented at many distributed locations in the Ross Valley watershed. This alternative was eliminated from further consideration (refer to Section 6.5 for more information).

9. An Accelerated Implementation of Winship Bridge Replacement Project Alternative would accelerate the Winship Bridge replacement to ensure that the bridge replacement is complete prior to or concurrent with Project completion. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

10. A Phased Implementation/Temporary Flow-Constraining Alternative would use temporary a flow-constraining system following the removal of the building at 634-636 San Anselmo Avenue to phase full implementation of the proposed Project until the Winship Bridge could be removed. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

In addition, the original project concept was for a large FDS basin at Memorial Park along with various other flow capacity improvements. This FDS basin site was unacceptable to local residents and voters, and that alternative was eliminated from further consideration. As explained above, the DWR grant funding for a substitute project requires a comparable level of protection to the previously proposed project, which made some of the smaller FDS basins ineligible for State funding.

6.2.3 Selecting Alternatives for Analysis in the EIR

The selection of alternatives for the EIR focused on identifying alternatives capable of avoiding or reducing significant environmental impacts that would otherwise be attributable to the Project (described in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures* and Chapter 5, *Growth-Inducing and Cumulative Impacts* of this Draft EIR). Some project elements were also developed to address topics of interest to decision makers and the public, as expressed in the scoping process. The scope of alternatives reviewed also factored into consideration the fundamental purpose of the Flood Control District (to reduce the risk of flooding for the protection of life and property while utilizing sustainable practices), the goal of the Project (achieving specific targets for flood risk reduction), and its contributions to the Ross Valley Flood Protection and Watershed Program. Other factors considered included balancing impacts from construction activities against longer-term changes in flood risk.

6.3 Alternatives Selected for Analysis in the EIR

The alternatives selected for analysis in this EIR are:

1. Alternative 1: No Project Alternative
2. Alternative 2: Morningside Neighborhood/Passive Basin Alternative
3. Alternative 3: Raised Building Alternative
4. Alternative 4: Increased Capacity Basin Alternative

Table 6-2 summarizes the key similarities among and differences between the proposed Project and the “action” alternatives (i.e., excluding Alternative 1, No Project). The information contained in this EIR will be reviewed and considered by the Flood Control District Board of Directors prior to the making a decision to approve, disapprove, or modify the proposed Project. As part of its deliberations, the Board of Supervisors will decide whether to approve all or part of the proposed Project. The Board could adopt one of the alternatives, or parts of the alternatives, described in Section 6.3 in lieu of the Project as proposed.

6.3.1 Alternative 1: No Project

The State CEQA *Guidelines* require an EIR to include an evaluation of the No Project Alternative to provide decision-makers the information necessary to compare the relative impacts of approving the project and not approving the project. The No Project Alternative is defined as a continuation of existing conditions, as well as conditions that are reasonably expected to occur in the event that the proposed project is not implemented. The discussion below describes this alternative.

TABLE 6-2
SUMMARY OF ACTION ALTERNATIVES

		Alternatives		
Element	**Proposed Project**	**2. Morningside/Passive Basin Alternative**	**3. Raised Building Alternative**	**4. Increased Basin Capacity Alternative**
FDS Basin	31.6 acre-feet capacity at former Sunnyside Nursery Site	20 acre-feet capacity at former Sunnyside Nursery Site; no diversion structure	Same as Project	41 acre-feet capacity at former Sunnyside Nursery Site; pumped drainage
Creek Capacity Elements	*Downtown San Anselmo*: Remove bridge building at 634-636 San Anselmo Drive	*Downtown San Anselmo*: Retain bridge building at 634-636 San Anselmo Drive *Sleepy Hollow Creek*: Remove Morningside Bridge; remove and replace Mountain View Bridge	*Downtown San Anselmo*: Retain and raise 634-636 San Anselmo Drive, rebuilding foundation outside of creek channel	Same as Project
	San Anselmo Creek: Channel improvements in downtown San Anselmo	*Sleepy Hollow Creek*: Add limited flood barriers at bridge locations	*San Anselmo Creek*: Same channel capacity improvements as Proposed Project; reduced creek habitat improvements	

6.3.1.1 Description

Under the No Project Alternative, there would be no construction actions taken or changes to the existing flood risk management system or its current operations, maintenance, or management practices. There would be no FDS basin at the former Sunnyside Nursery site to temporarily detain peak stormwater runoff. The building at 634-636 San Anselmo Avenue would remain. The Flood Control District and the Town of San Anselmo's Public Works Department would continue to maintain creek channels, bridges, culverts, and other parts of the existing system as they do now. Many of those activities are governed by permits issued for the Flood Control District's Stream Maintenance Program.

As described in Chapter 3, *Project Description*, the San Anselmo Flood Risk Reduction Project, is consistent with the Flood Control District's objectives to reduce flood risk within the Town of San Anselmo and within the San Anselmo Creek subwatershed without also increasing downstream flood risk in the Ross Valley/Corte Madera Creek watershed. The Flood Control District continues to work on evaluating larger, basin-wide goals of the Ross Valley Flood Protection and Watershed Program, which aims to eventually provide protection against the 100-year flood event. Consequently, if the proposed Project is not approved it is reasonable to expect that the Flood Control District eventually would pursue another project to meet the Project's objectives, such as one of the alternatives characterized in Sections 6.3.2, 6.3.3, or 6.3.4 below.

6.3.1.2 Ability to Meet Project Objectives

Under the No Project Alternative, the Flood Control District's objectives for flood risk reduction in the Towns of San Anselmo and Fairfax would not be met. The grant funding that was obtained for the original flood risk reduction project at Memorial Park would be lost because there would not be sufficient time to conceive, design, and obtain environmental clearance and permitting for a new project before the funds expire. The proposed Project's potential contribution to the overall level of flood risk reduction targets in the Corte Madera Creek watershed in the Ross Valley Flood Protection and Watershed Program would not be realized, meaning that the larger program goals would need to be met in some other way.

6.3.1.3 Environmental Impacts

Under the No Project Alternative, none of the impacts (discussed in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*) attributable to the construction and operation of the Nursery Basin or of the building removal and creek channel improvements in downtown San Anselmo would occur.

Because none of the flood risk hazard reduction benefits of the proposed Project would occur under the No Project Alternative, existing flood risk in San Anselmo would persist. As described in Section 3.2 of this EIR, under current conditions, current creek capacity is at an approximately six-year level of flood protection, and several times in recent history San Anselmo Creek has overtopped its banks causing property damage and economic hardship to residents, businesses, and local governments, as well as environmental damage to resources within and near the creek.

6.3.2 Alternative 2: Morningside/Passive Basin Alternative

6.3.2.1 Description

This alternative includes a smaller and simpler version of the Nursery Basin involving limited work within the creek channel as compared to the proposed Project, and removal or replacement of two bridges along the lower portion of Sleepy Hollow Creek in the Morningside neighborhood of San Anselmo. This alternative does not include removal of the Bridge Building in Downtown San Anselmo. This alternative is based on a study performed by the Flood Control District's hydraulic engineering consultant (Stetson Engineers, 2017). Sleepy Hollow Creek is a tributary to San Anselmo Creek just upstream (about one-half mile) of Downtown San Anselmo. This alternative was selected for analysis because it would reduce the magnitude and severity of multiple impacts associated with the FDS basin, as proposed, would reduce some of the impacts at the Downtown San Anselmo site.

Site Location

This alternative would be located at the Nursery Basin site and along Sleepy Hollow Creek in the Morningside residential neighborhood of San Anselmo at the Morningside Drive and Mountain View Avenue bridges. **Figures 6-1** and **6-2** depict this alternative.

Components

FDS Basin (Nursery Basin Site)

The FDS basin considered in the Morningside/Passive Basin Alternative is a smaller version of the proposed Project's basin. It would be excavated less deeply and would have lower levees on its east and west sides. Its capacity would be 20 acre-feet as compared to a total of 31.6 acre-feet of storage for the Project (Stetson Engineers, 2018). The other primary difference with the basin under this alternative is the absence of a diversion structure and related improvements to raise side levees. Because water would not be actively redirected into the basin by a diversion structure, this component is referred to as a “passive” basin. Like the proposed Project, the side-weir along the left bank of the creek would have a crest elevation of 228 feet. At the time of incipient flooding downstream, water would begin to enter the basin over the side-weir. In contrast, in the proposed Project, an opening or openings in the diversion structure would be closed, thereby immediately reducing flows downstream, ponding water in the Fairfax Creek channel, and filling the basin more quickly.

Table 6-3 presents a systematic comparison of design, operation and construction features of the basin at the Nursery Basin site under the proposed Project, the Morningside/Passive Basin Alternative, and the Increased Basin Alternative (Alternative 4, presented below in Section 6.3.4). As shown, the dimensions of the basin would differ from the proposed Project in that the eastern embankment of the basin would be 6 feet lower and no western embankment would be needed; consequently, the capacity would be less and the maximum water surface elevation would be lower than in the proposed Project. In addition, because there would be no diversion structure, the Fairfax Creek channel would not provide the 5.6 acre-feet of flood storage capacity it would provide in the proposed Project.[3] Less sediment deposition would be expected in Fairfax Creek with the smaller, passively operated basin. The existing bridge would be the only vehicle access point to the site. The basin floor elevation, southern weir, riser outlet pipe, new stormwater drains from Deer Creek Court, floodwall, perimeter road width, and perimeter fence would be the same as described for the proposed Project.

Creek Capacity Elements

The Morningside Drive and Mountain View Avenue bridges are less than 400 feet apart along Sleepy Hollow Creek. At both locations, the creek is deeply incised, and the bridge soffits, stream banks, and retaining walls form relatively small cross-sectional areas through which normal flows can pass but that constrain high flows and cause flooding. Under this alternative, the Mountain View Avenue Bridge would be removed and replaced with a bridge with a similar vehicular carrying capacity, and the Morningside Drive Bridge would be removed but not replaced (Stetson Engineers, May 2017). **Table 6-4** presents a comparison of design, operation and construction features of the creek capacity improvements associated with the proposed Project (on San Anselmo Creek at the Downtown San Anselmo site), the Morningside/Passive Basin Alternative (on Sleepy Hollow Creek), and Alternative 3 – Raised Building Alternative (on San Anselmo Creek at the Downtown San Anselmo site), presented below in Section 6.3.3).

[3] As described in Chapter 3, *Project Description*, in the proposed Project, the total capacity of the Nursery Basin comes from storing 26.6 acre-feet in the basin itself and an additional 5 acre-feet in the channel of Fairfax Creek behind the diversion structure. In the Morningside/Passive basin Alternative, not only is the basin smaller, but no additional in-channel storage capacity would be created.

A.	**No Flood Diversion and Overflow Structure/Access Road.** *Primary difference between proposed Project and Alternative 2.*
B.	**East Levee**. *6 feet lower than proposed Project (232-foot elevation).*
F.	**Side-Weir.** *Same as proposed Project (228-foot elevation).*
G.	**Basin Floor.** *Same as proposed Project (226-223.8 foot elevation).*
H.	**Basin Drain.** *Same as proposed Project.*
I.	**Operations and Maintenance Vehicle Access.** *Only via existing or improved driveway bridge.*
J.	**Perimeter Road.** *Same width but lower elevation than proposed Project.*
K.	**West Levee.** *No berm needed on west side of basin.*
L.	**West Gate.** *Same as proposed Project.*
M.	**Deer Creek Court Stormwater Drains.** *Same as proposed Project.*
N.	**Floodwall/Road Barrier.** *Same as proposed Project.*
O.	**Perimeter Fence.** *Same as proposed Project.*
P.	**Setback – East.** *Same as proposed Project.*
Q.	**Setback – West.** *Same as proposed Project.*

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

Figure 6-1
Morningside/Passive Basin Alternative:
Nursery Basin Site Plan

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SOURCE: Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017

San Anselmo Flood Management Project . D211432.07

Figure 6-2
Morningside/Passive Basin Alternative
Creek Capacity Improvements

TABLE 6-3
COMPARISON OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Feature		Proposed Project (FDS Basin Element Only)	Alternatives (FDS Basin Element Only)	
			2: Morningside/Passive Basin	4: Increased Capacity Basin
Design and Operation				
Operational Capacity (acre feet)		31.6	20	41
Flow Diversion Structure		Structure would allow flows through one or more openings sized to allow passage of 400 cubic feet per second at all times: • ***Gated***: gate closed to reduce creek flows when overbank flooding is imminent downstream, allowing flows to pond and flow into basin via side weir. • ***Ungated***: always open for normal Fairfax Creek flows, sediment transport and wildlife movement Low point in diversion structure at 235 feet allows passage of flows from 1,000-year flood down creek.	No diversion structure. Existing creek channel passage persists. High creek flows enter basin via side-weir.	Same as proposed Project
Side-Weir		228-foot elevation segment of perimeter road. When WSE in creek exceeds 228 feet, flows enter basin.	Same as proposed Project	Same as proposed Project
Maximum Water Surface Elevation (Feet) within basin		235	230.5	Same as proposed Project
Basin Floor		226- to 223.8-feet elevation.	Same as proposed Project	Lower than proposed Project (~2.5 feet) to increase basin capacity: 223.6- to 221.3-feet elevation
Basin Drainage		Gravity via inlet in basin and pipeline draining to outlet in creek	Same as proposed Project	***Ponded water above 221.3 feet elevation***: gravity (same as proposed Project). ***Ponded water below 221.3 feet elevation***: pumped. Pumping would occur following cessation of gravity drainage operations and, absent creek overflow, following local rainfall events. Requires pump, pipe to discharge point into creek.
Levee Elevations	East	238 feet (1.5 feet above potential maximum WSE)	~6 feet lower than proposed Project: 232 foot elevation	Same as proposed Project
	West	238 feet (contains temporary peak volume storage under detention operations)	No levee needed	Same as proposed Project
Setbacks	East	50 feet between toe of levee and property line	25 feet	25 feet
	West	50 feet between top of basin cut slope and property line	25 feet	25 feet
O&M Vehicular Access		Two access roads: existing (potentially improved) access road plus access over diversion structure	Existing (potentially improved) access road only	Same as proposed Project

TABLE 6-3 (CONTINUED)
COMPARISON OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Feature	Proposed Project (FDS Basin Element Only)	Alternatives (FDS Basin Element Only)	
		2: Morningside/Passive Basin	4: Increased Capacity Basin
Design and Operation (cont.)			
Perimeter Road, Fencing	15-feet wide, 1.5 feet above maximum WSE; security fencing.	Similar to proposed Project but 4.5 feet lower	Same as proposed Project
Floodwall/Road Barrier	Floodwall adjacent to Sir Francis Drake Boulevard to prevent overflow onto roadway.	Same as proposed Project	Same as proposed Project
Bank Erosion Protection / Rock Protection	Vegetated rip-rap, other biotechnical bank erosion protection and stabilization on both banks of creek	Only at basin outfall discharge points	Same as proposed Project
Deer Creek Court Stormwater Drains and rip-rap energy dissipation structure	Ensure gravity drainage from Deer Creek Court cul-de-sac under potential maximum basin WSE.	Same as proposed Project	Same as proposed Project
Construction			
Project Disturbance Area	As shown on Figure 3-16 in Chapter 3 (approximately 5.4 acres)	Reduced area of disturbance in southeastern portion of site because no diversion structure/new access road would be constructed; otherwise similar to proposed Project	Same as proposed Project (deepening of basin to increase capacity would not increase areal extent of construction disturbance)
Staging Area and Construction Access	Within basin	Same as proposed Project	Same as proposed Project
Duration	8 months	2 months shorter than proposed Project	1-2 months longer than proposed Project
Construction Hours	8:00 a.m. to 5:00 p.m.	Same as proposed Project	Same as proposed Project
Estimated Maximum Construction Crew Size	20-30	Assumed to be incrementally less than proposed Project	Same
Temporary Road Closure	Temporary closure of westbound travel lane(s) of Sir Francis Drake Blvd. during floodwall construction	Same as proposed Project	Same as proposed Project
Construction Haul Routes	As described in Chapter 3	Same as proposed Project	Same as proposed Project
Demolition	Two onsite structures	Same as proposed Project	Same as proposed Project
Tree Removal	Removal of numerous trees as shown on Figure 3-16 in Chapter 3.	Fewer trees removed in the southeastern portion of the site compared to the proposed Project because there would be no diversion structure and less bank protection	Same as proposed Project
Construction Methods	As described in Table 3-4 in Chapter 3	Similar to activities, sequencing described in Table 3-4 but work in creek (stream diversion, clearing and grubbing, earthwork) substantially less (because no diversion structure/access road would be constructed)	Same as proposed Project plus installation of pump and pipeline to discharge point

NOTES: WSE = water surface elevation FDS = flood diversion and storage

SOURCE: Stetson Engineers Inc., San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

TABLE 6-4
COMPARISON OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Feature	Proposed Project (Creek Capacity Elements Only)	Alternatives (Creek Capacity Elements Only)	
		2: Morningside/Passive Basin	3: Raised Building Alternative
Site Characteristics			
Location	San Anselmo Creek in Downtown San Anselmo	Sleepy Hollow Creek at Mountain View Avenue and Morningside Drive	Same as proposed Project
Existing and neighboring Land Uses	Buildings house commercial uses above creek surrounded by commercial and recreational uses	Bridges are within low-density residential area	Same as proposed Project
Proximity to Sensitive Receptors	235 feet	Approximately 20 feet from Morningside Drive Bridge and 25 feet from Mountain View Avenue Bridge	Same as proposed Project
Design and Operation			
In-channel flood flow capacity	Removes flow-constricting bridge building and regrades removes structures from creek channel to increase flow capacity	Removes two flow-constricting bridges from the Sleepy Hollow Creek channel in Morningside Neighborhood	Same as proposed Project
Area benefiting from reduction in severity and magnitude of flooding	As shown in Figures 3-13a through 3-15c	Morningside neighborhood of San Anselmo	Same as proposed Project
Removal of existing structures restricting creek flow	Removal of 634-636 San Anselmo Avenue and building supports	Removal of Morningside Drive and Mountain View Avenue Bridges	Reinforced concrete abutment walls; 634-636 San Anselmo Avenue to be retained
Proposed design features	Improvements to channel (flood wall, bioengineered slope, etc.) as shown in Figure 3-11	Construct replacement bridge at Mountain View Drive; Morningside Bridge would not be replaced	Structural supports (new concrete wall, piers) for 634-636 San Anselmo Avenue building.
Floodwalls	Construct upper bank retaining wall as shown in Figure 3-11	In immediate vicinity of bridges only	Upper bank retaining wall similar to but at a reduced length relative to the proposed Project
Construction			
Project Disturbance Area	As shown on Figure 3-11 (approximately 0.3 acres)	Less than proposed Project (estimated at 0.1 acre for both bridges)	Less than Project (because floodwall and bioengineered slope construction would be less extensive)
Staging Area and Construction Access	As shown on Figure 3-11	Staging assumed to occur in a parking lot on Sir Francis Drake Boulevard; construction access via roadway.	Same as proposed Project
Duration	8 months	Assumed to be Same as Project. Bridge demolition/construction would occur in sequence (not concurrently)	13 months
Construction Hours	7:00 a.m. to 7:00 p.m.	Same as proposed Project	Same as proposed Project
Estimated Maximum Construction Crew Size (includes both management and contractor staff)	20-30	Less than proposed Project	Same as proposed Project

TABLE 6-4 (CONTINUED)
COMPARISON OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Feature	Proposed Project (Creek Capacity Elements Only)	Alternatives (Creek Capacity Elements Only)	
		2: Morningside/Passive Basin	3: Raised Building Alternative
Construction (cont.)			
Temporary Road Closure	None	Morningside Drive and Mountain View Avenue closed during construction; projects would be construction in sequence. Morningside Drive permanently closed at Sleepy Hollow Creek.	Same as proposed Project
Construction Haul Routes	As described in Chapter 3	Routes to access Sir Francis Drake Boulevard: Broadmoor Avenue and Mountain View Avenue	Same as proposed Project
Demolition	Onsite structures as shown on Figure 3-11 including 634-636 San Anselmo Avenue	Existing bridge structures	Reinforced concrete abutment walls; excluding 634-636 San Anselmo Avenue (to be retained)
Tree Removal	8 trees to be removed (as shown on Figure 3-11)	Fewer than proposed Project (approximately 4 trees on Morningside Drive and 1 tree at Mountain View Avenue)	Fewer than proposed Project (because floodwall would not be extend as far)
Construction Methods	As described in Table 3-4 in Chapter 3	Similar to activities and sequencing described in Table 3-4 but work in creek (stream diversion, clearing and grubbing, earthwork) increased to two locations instead of one	Hydraulic jacks to raise building; construction of new concrete support piers outside of the channel and a new building-deck; and saws and other equipment to break up and remove old building foundation from creek channel

SOURCE: Geomorph Design, Memorandum from Matt Smeltzer to Flood Control District regarding Modifying Bridge-Building 2 – Summary Feasibility Evaluation, February 28, 2018; Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017; Stetson Engineers Inc., San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

Mountain View Avenue Bridge Removal and Replacement

The Mountain View Avenue Bridge is currently built on earthen fill that is placed over an inverted half-pipe culvert. The initial conceptual designs prepared as part of a Ross Valley-wide feasibility study of flood risk reduction options) for removing this bridge involve removing the road surface and decking and excavating the earthen fill and embankment out of the stream channel. The stream channel bottom would not be lowered from its current elevation, but it would be widened by several feet. Basic construction activities (mobilization, erosion control and stream diversion, demolition, clearing and grubbing as well as demobilization/clean-up) would be similar to that described for Downtown San Anselmo in Table 3-4 (in Chapter 3, *Project Description*). Concrete bridge footings would be placed on either side of Sleepy Hollow Creek, outside of the stream channel to allow for maximum flow capacity following construction. The span between the two bridge footings would be about 33 feet. To span that distance, a new roadway would be built atop the footings, and the new road decking and surface would be slightly higher than the existing road. The width of the bridge (approximately 30 feet, carrying two lanes of traffic, one in each direction) would be unchanged from the current condition, and there would be a 3-foot-wide sidewalk on the northern side of the bridge.

There is an existing sewer line under Rivera Street (east of Sleepy Hollow Creek) that crosses Sleepy Hollow Creek at a southeast-northwest angle to meet another existing sewer line on the northwest side of the existing bridge. That sewer line would be abandoned and replaced and new sewer manholes would also be installed along the new pipeline for maintenance.

Morningside Drive Bridge Removal

Under this alternative, the Morningside Drive Bridge would be removed to eliminate flow constrictions, but the bridge would not be replaced. Construction activities would consist of demolishing the road bed and underlying bridge structures, and installing permanent barriers on either side of Morningside Drive. Basic construction activities (mobilization, erosion control and stream diversion, demolition, clearing and grubbing as well as demobilization/clean-up) would be similar to that described for the Downtown San Anselmo Element in Table 3-4 (in Chapter 3, *Project Description*). The roadway and fill material would be excavated and transported offsite.

Other Creek Channel Improvements

Improvements to existing floodwalls and construction of new floodwalls would be limited to the immediate vicinity of the Mountain View Avenue and Morningside Drive bridges to help contain flows within the channel at these locations.

6.3.2.2 Ability to Meet Project Objectives

The Morningside/Passive Basin Alternative would meet some of the basic objectives of the project. Compared to the proposed Project, the lower-capacity basin would allow more of the peak flows in Fairfax Creek to remain in the channel and pass to the downstream communities of Fairfax, San Anselmo, and Ross. Like Downtown San Anselmo, the Morningside neighborhood (part of the Town of San Anselmo) has a recurring flood problem, so reductions in flood risk there would count toward the overall level of flood risk reduction intended for the Project. This alternative would result in substantial reductions in flood extent and in inundation depth to the Morningside neighborhood in the lower extent of Sleepy Hollow Creek, where reductions in inundation of up to 28, 24, and 7 inches would be realized in the 10-, 25-, and 100-year flood events, respectively (Stetson Engineers, 2018a).

On the whole, however, preliminary hydraulic modeling indicates that this alternative would provide less flood risk reduction benefit than the proposed Project. This alternative's FDS basin system is smaller and would not provide as much flood protection as the proposed Project. Further, as discussed in more detail in the Environmental Impacts section below, removing the flow-constraining bridge foundations on Sleepy Hollow Creek would pass those flows into San Anselmo Creek, where there is an existing flood risk that could be exacerbated, depending on the size of the flood event.

1. The Morningside neighborhood around the lower end of Sleepy Hollow Creek would receive substantial benefits from reduced flood extent and depth in the 10- and 25-year flood events; the benefits in the 100-year event would be lower. In all of these cases, there would be increases in flooding of varying sizes downstream in San Anselmo Creek, as discussed in the Environmental Impacts discussion below.
2. In downtown San Anselmo, there would be almost no reductions in flood extent or inundation in the 10-, 25-, or 100-year event.
3. The portions of Fairfax that would be subject to reduced flood inundation in the 10-year flood would benefit from this alternative, but the magnitude of those reductions would be less in both extent and depth. In the 25- and 100-year event, there would be little to no reductions in flood extent or depth of inundation in the Town of Fairfax.

The objective of providing multiple public benefits (environmental and recreational enhancements) would be reduced under this alternative because creek and riparian habitat enhancement would be less than the proposed Project, and the alternative would not add or enhance public access and recreational opportunities. The following objectives would be met: maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting public health and safety. Because the roadway network has sufficient redundancy in the Morningside neighborhood to fully meet the existing demand with only one of them carrying motor vehicles, this alternative would maintain the quality of the nearby neighborhoods and continue to provide public safety. The local Public Works Department, Fire District and the neighbors are supportive of this alternative.

6.3.2.3 Environmental Impacts

Table 6-5 and **Table 6-6** present side by side comparisons of the impacts associated with the proposed Project and those associated with the Morningside/Passive Basin Alternative's Nursery Basin Element (Table 6-5) and its substitute for the creek capacity improvements in downtown San Anselmo (Table 6-6). A summary of the impacts associated with these two elements of this alternative is provided below, followed by a description of the effect of the alternative on the only significant and unavoidable adverse impact expected from the Project, which is the extent and depth of flooding (Impact 4.9-4).

Note that because the passive basin and one of the Morningside neighborhood bridge projects could be constructed at the same time, some of the construction-phase impacts described below would be additive to each other. Refer to Tables 6-5 and 6-6 for systematic consideration of individual environmental impacts.

Nursery Basin Element

As shown in Table 6-5, many of the impacts attributable to the Nursery Basin Element of the proposed Project would be the same or similar under this Morningside/Passive Basin Alternative. Overall, as indicated in Table 6-3, construction of the passive basin would involve less earthwork and other construction activities than the proposed Project. Notable exceptions are discussed below.

Air Quality/Greenhouse Gases (Impacts 4.3-1, 4.3-3, 4.3-4, 4.3-6). This alternative would have an increased average daily emissions because of its shorter schedule and greater volume of material for off-haul. There would also be a reduction in air quality emissions and greenhouse gas emissions associated with annual sediment removal operations anticipated for the proposed Project,

Biological Resources (Impacts 4.5-1 through 4.5-10). Because this alternative does not include building a diversion structure in Fairfax Creek, it would reduce the potential adverse effects on several biological resources in the construction and operation phase. There would be less tree removal. The lack of a diversion structure means that there would be less fill in waters and any wetlands that may be present, as well as in the riparian corridor. Together, these reductions reduce impacts on special-status species and habitats, including fish, amphibians, nesting birds, and others. The basin's operation would be passive, so the basin would fill on its own based on design elevations and not because water was actively directed into it through the use of a diversion structure. The lack of a diversion structure would result in a reduction in the expected volumes of sediment deposited and then needing to be removed from the Fairfax Creek channel, thus avoiding repeated disturbance or risk of direct effect from in-channel work.

Hydrology and Water Quality (Impacts 4.9-1, 4.9-2, 4.9-3). Because this alternative would not have a diversion structure, the passive basin would reduce hydrological and water quality-related impacts during the construction and operational phases, especially those associated with turbidity and in-water construction, and on hydrologic conditions such as sediment transport and deposition. By avoiding the need for repeated annual (or even more frequent) disturbances due to sediment removal, this alternative would reduce impacts on the aquatic resources and water quality conditions in the stream channel.

Transportation and Circulation (Impacts 4.3-1, 4.15-1, 4.15-2, 4.15-3, 4.15-4). Because this alternative would involve greater off-haul of excavated material, it could generate traffic congestion effects, impediments to local streets, pedestrian and bicycle accessibility, and traffic safety hazards that could be incrementally worse under this alternative.

TABLE 6-5
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Aesthetics	**Impact 4.2-1:** The Project could have a substantial adverse effect on a publicly-accessible scenic vista. (Less than Significant)	**LTS=** Because the Nursery Basin site is barely visible from publicly accessible viewpoints, changes in the site's appearance (described under Impact 4.2-3, below) would not be noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.	**LTS=** Because the Nursery Basin site is barely visible from publicly accessible viewpoints, changes in the site's appearance (described under Impact 4.2-3, below) would not be noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.
	Impact 4.2-2: The Project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway. (Less than Significant)	**LTS—** Because the proposed Project involves less tree removal and construction adjacent to Sir Francis Drake Boulevard, this alternative's effects on scenic resources would be incrementally less than with the proposed Project.	**LTS=** This alternative's effects on scenic resources would be the same as the proposed Project.
	Impact 4.2-3: The Project could substantially degrade the existing visual character or quality of the site and its surroundings, including alteration of the built environment or land use patterns. (Less than Significant)	**LTS—** Because the proposed Project involves less tree removal and would not open up views to the interior of the site adjacent to Sir Francis Drake Boulevard associated with the proposed discharge structure and new access road, this alternative's effects on the visual character of the site would be incrementally less than with the proposed Project.	**LTS=** This alternative's effects on the existing visual character of the site when viewed from off-site locations similar to the proposed Project's (the pump station and deepened basin are unlikely to be visible).
	Impact 4.2-4: The project could create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area. (Less than Significant)	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.
Air Quality (a)	**Impact 4.3-1:** Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation. (Less than Significant with Mitigation)	**LSM+** Alternative 2 has 20% less off-road equipment hours and 14% more heavy-duty truck trips, but construction work would occur over fewer workdays (23% fewer than proposed Project); consequently, there would be 38-55% higher daily criteria pollutant emissions. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.	**LSM—** Alternative 4 has 12% more off-road equipment hours and 29% more heavy-duty truck trips, but the total number of workdays is 12% greater, resulting in 2-5% lower average daily criteria pollutant emissions. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.
	Impact 4.3-2: Construction of the Project elements would result in emissions that could conflict with the 2017 Clean Air Plan. (Less than Significant with Mitigation)	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.
	Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that could exceed air quality standards and conflict with the 2017 Clean Air Plan. (Less than Significant)	**LTS—** This alternative has the same operational activities as the proposed Project but with slightly reduced frequency and extent, resulting in the somewhat reduced average daily and annual average criteria pollutant emissions.	**LTS+** This alternative has the same operational activities as the proposed Project but with slightly increased frequency and extent, resulting in incrementally increased average daily and annual average criteria pollutant emissions.
	Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions. (Less than Significant with Mitigation)	**LSM—** This alternative has 20% less off-road equipment hours and 14% more heavy-duty truck trips, resulting in 4% lower total DPM emissions, 36% lower cancer risk, 7% lower chronic hazard risk, and 2% lower maximum annual average PM2.5 concentrations. Like the proposed Project, implementation of Mitigation Measures 4.3- and 4.3-4 could reduce this impact to a less-than-significant level.[a]	**LSM+** Alternative 4 has 12% more off-road equipment hours and 29% more heavy-duty truck trips, resulting in 13% greater total DPM emissions, 21% greater cancer risk, 33% greater chronic hazard risk, and 3% greater maximum annual average PM2.5 concentrations. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.
	Impact 4.3-5: Construction of the Project could result in objectionable odors. (Less than Significant)	**LTS=** This alternative has the same odor-generating activities as the proposed Project.	**LTS=** This alternative has the same odor-generating activities as the proposed Project.
	Impact 4.3-6: Construction and operation of the Project would result in GHG emissions that could have a significant impact on the environment and conflict with applicable plans and policies in place to reduce GHG emissions. (Less than Significant)	**LTS—** Alternative 2 has 20% less off-road equipment hours, 14% more heavy-duty truck trips, and slightly reduced operational activities, resulting in 1% lower annual average greenhouse gas emissions.	**LTS**+ Alternative 4 has 12% more off-road equipment hours, 29% more heavy-duty truck trips, and the slightly increased operational activities, resulting in 24% higher annual average greenhouse gas emissions.
Energy, Mineral, Forest and Agricultural Resources	**Impact 4.4-1:** Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources. (Less than Significant with Mitigation)	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource.	**LSM+** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and to a lesser extent during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. This alternative's operation-phase energy consumption would be incrementally greater than the proposed Project because of pumping. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource.

Table 6-5 (continued)
Comparison of Environmental Impacts of FDS Basin Elements: Proposed Project and Alternatives 2 and 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Biological Resources	**Impact 4.5-1:** Project implementation could have a substantial adverse effect on special-status aquatic species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to aquatic species and habitats would be similar to those in the proposed Project. However, the absence of a diversion structure would lead to reduced construction and operational impacts from reductions in in-stream construction, work in the riparian corridor, rock protection, and the degree of tree removal and periodic sediment removal needed. The same mitigation measures would be implemented.	**LSM+** Under this alternative, most impacts to aquatic species and habitats would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect aquatic resources. However, there would also be an increased area of ground disturbance and bank protection for the second outflow pipe, which would slightly increase the effect on aquatic species and habitats. The same mitigation measures would be implemented.
	Impact 4.5-2: Project implementation could have a substantial adverse effect on special-status plant species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to special-status plants would be similar to those in the proposed Project. However, the reduced area of tree removal and work in the riparian corridor would reduce the chance of adversely affecting a rare plant. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to rare plants would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect plants. The same mitigation measures would be implemented.
	Impact 4.5-3: Project implementation could have a substantial adverse effect on special-status amphibians and terrestrial species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to amphibians and other special-status terrestrial species and habitats would be similar to those in the proposed Project. However, the absence of a diversion structure would lead to reduced construction and operational impacts from reductions in in-stream construction, work in the riparian corridor, rock protection, and the degree of tree removal and periodic sediment removal needed. The same mitigation measures would be implemented	**LSM+** Under this alternative, most impacts to amphibians and other terrestrial species and habitats would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining. These could have incrementally increased effects on amphibians, which might be more attracted to a deeper basin that would contain groundwater more often and in higher quantities. However, there would also be an increased area of ground disturbance and bank protection for the second outflow pipe, which would slightly increase the effect on amphibians and their habitats. The same mitigation measures would be implemented.
	Impact 4.5-4: Project implementation could have a substantial adverse effect on special-status nesting birds. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to nesting birds would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting a nesting bird. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to nesting birds would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect nesting birds. The same mitigation measures would be implemented.
	Impact 4.5-5: Project implementation could have a substantial adverse effect on Northern spotted owls. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to Northern spotted owls would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting individuals of this species. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to Northern spotted owls would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect Northern spotted owls. The same mitigation measures would be implemented.
	Impact 4.5-6: Project implementation could have a substantial adverse effect on special-status bats. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to special-status bat species would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting roosting bats. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to special-status bat species would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect bats. The same mitigation measures would be implemented.
	Impact 4.5-7: Project implementation could adversely affect sensitive natural communities. (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in sensitive natural communities such as the riparian corridor and oak woodlands than the proposed Project would because there would be no diversion structure and less earthwork to build the levees on the east and west sides of the basin. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite replanting and offsite replacement mitigation as required by permits) would be implemented.	**LSM+** This alternative would involve a slightly increased amount of work in sensitive natural communities such as the riparian corridor and oak woodlands as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these communities than the proposed Project would. The same mitigation measures would be implemented.
	Impact 4.5-8: Project activities could adversely affect wetlands and other waters (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in wetlands and other waters than the proposed Project would because there would be no diversion structure in Fairfax Creek. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite restoration and offsite replacement mitigation as required by permits) would be implemented.	**LSM+** This alternative would involve a slightly increased amount of work in wetlands and other waters as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these habitats than the proposed Project would. The same mitigation measures would be implemented.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Biological Resources (cont.)	**Impact 4.5-9:** Project construction could adversely affect riparian wildlife movement corridors. (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in the riparian corridor than the proposed Project would because there would be no diversion structure. Though the proposed Project would not completely impair riparian wildlife movement around or through that diversion structure, its absence in this alternative would further reduce the potential effects on those species' ability to move through the corridor. The impacts would therefore be lessened. The same mitigation measures would be implemented.	**LSM+** This alternative would involve a slightly amount of work in the riparian corridor as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these communities than the proposed Project would. The same mitigation measures would be implemented.
	Impact 4.5-10: Project construction would require tree removal. (Less than Significant with Mitigation)	**LSM—** This alternative would remove fewer trees than the proposed Project would because there would be no diversion structure built in the riparian area that currently has many trees. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite replanting and offsite replacement mitigation as required by permits) would be implemented.	**LSM=** This alternative would remove a similar number of trees as the proposed Project would, and in the same locations. The impacts would be approximately the same, and the same mitigation measures would be implemented.
Cultural Resources	**Impact 4.6-1:** The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance. (No Impact)	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.
	Impact 4.6-2: The Project could cause a substantial adverse change in the significance of an archaeological resource. (Less than Significant)	The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be similarly addressed through implementation of the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.	The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-3: The Project could disturb human remains, including those interred outside of dedicated cemeteries. (Less than Significant)	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is the same as that of the proposed Project, and could be addressed through implementation of Mitigation Measure 4.6-2.	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-4: The Project could cause a substantial adverse change in the significance of a tribal cultural resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is the same as the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
Geology, Seismicity, Soils, and Paleontological Resources	**Impact 4.7-1:** The Project could expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides. (Less than Significant)	**LTS=** Like the proposed Project, the FDS basin under this alternative would be built to applicable standards related to seismic safety.	**LTS=** Like the proposed Project, the FDS basin under this alternative would be built to applicable standards related to seismic safety.
	Impact 4.7-2: The Project could result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill. (Less than significant)	**LTS=** Like the proposed Project, construction of this alternative has the potential to result in substantial soil erosion. Implementation of best management practices, pursuant to the Construction General Permit, would address this issue.	**LTS=** Like the proposed Project, construction of this alternative has the potential to result in substantial soil erosion. Implementation of best management practices, pursuant to the Construction General Permit, would address this issue.
	Impact 4.7-3: The Project could cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability. (Less than Significant)	**LTS=** Because no unstable geologic units or soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.	**LTS=** Because no unstable geologic units or soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.
	Impact 4.7-4: The Project could cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures. (Less than Significant)	**LTS=** Because no expansive soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.	**LTS=** Because no expansive soils are present at the Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Geology, Seismicity, Soils, and Paleontological Resources (cont.)	**Impact 4.7-5:** The Project could cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features. (Less than Significant)	**LTS—** Topographic changes at the Nursery Basin site associated with this alternative would be less than with the proposed Project (e.g., no levee would be required on the western side of the basin and the levee on the eastern side of the basin would be six feet lower than the proposed Project, and none of the earthwork associated with construction of the diversion structure/new access road would be required – refer to Table 6-3 for details). Like the proposed Project, design features of the basin (cut slopes, bottom) would incorporate features (e.g., erosion control blankets, plantings along the outer toe of the eastern levee) to avoid impacts to the surrounding area.	**LTS=** Topographic changes at the Nursery Basin site associated with this alternative would somewhat greater that with the proposed Project in that the basin would be excavated to about 2.5 feet deeper that with the proposed Project to increase basin capacity. Like the proposed Project, design features of the basin (cut slopes, bottom) would incorporate features (e.g., erosion control blankets, plantings along the outer toe of the eastern levee) to avoid impacts to the surrounding area.
	Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (No Impact)	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.
Hazards and Hazardous Materials	**Impact 4.8-1:** The Project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard. (Less than Significant)	**LTS=** Like the proposed Project, construction of the basin under this alternative would involve the use of hazardous materials such as fuels and the removal of structures potentially containing hazardous building materials; compliance with existing regulations would mitigate address this impact.	**LTS=** Like the proposed Project, construction of the basin under this alternative would involve the use of hazardous materials such as fuels and the removal of structures potentially containing hazardous building materials; compliance with existing regulations would mitigate address this impact.
	Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. (No Impact for FDS basin)	**NI=** As indicated in Impact 4.8-2 in Section 4.8, the former Sunnyside Nursery site is not listed as a hazardous material site.	**NI=** As indicated in Impact 4.8-2 in Section 4.8, the former Sunnyside Nursery site is not listed as a hazardous material site.
	Impact 4.8-3: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan, and preparation of a Traffic Management Plan would ensure that the effect of construction traffic is less than significant.	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan, and preparation of a Traffic Management Plan would ensure that the effect of construction traffic is less than significant.
Hydrology and Water Quality	**Impact 4.9-1:** Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. (Less than Significant with Mitigation)	**LSM—** Similar to the proposed Project, the passive basin would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. Once operational, since there would be no diversion structure, no sediment removal from Fairfax Creek channel would be required; therefore, the water quality impact of this alternative would be reduced compared with the proposed Project.	**LSM=** Similar to the proposed Project, the increased capacity basin would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality This alternative's basin would also result in similar amounts of sediment accumulation upstream of the diversion structure; as a result, this alternative would have similar water-quality impacts to those of the proposed Project.
	Impact 4.9-2. The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (Less than Significant)	**LTS—** Because there would be less excavation (for the basin as well as the diversion structure) there would be incrementally less dewatering during construction. Similar to the proposed Project, no groundwater extraction would occur during operations. This alternative would have groundwater effects similar to those of the proposed Project because the Basin floor depth would be the same as the proposed Project.	**LTS+** Because there would be more excavation (e.g., for the deeper basin), there would be incrementally more dewatering during construction. Similar to the proposed Project, no groundwater extraction would occur during operations. While there would be more water stored in the basin relative to the proposed Project, the same seepage control would be installed at the Basin site and excavation would extend into the same layers as evaluated for the proposed Project; this alternative would thus have similar impacts on unconfined groundwater during Basin operation as the proposed Project.
	Impact 4.9-3. The Project could alter existing drainage patterns, potentially causing new erosion or siltation. (Less than significant with mitigation)	**LSM—** Because the passive basin would not include a diversion structure in Fairfax Creek, the volume of sediment deposited in Fairfax Creek would be reduced compared with the proposed Project. Little or no new sediment removal from the creek channel would be required, but similar protections against bank and channel erosion and scour would need to be implemented, also in reduced locations. Implementation of Mitigation Measure 4.9-3b Scour Analysis and Protection Measures would still be required.	**LSM=** Like the proposed Project, the increased capacity basin in this alternative would capture sediment upstream of the diversion structure, and potentially erode downstream of the diversion structure. Similar amounts and extents of erosion protection would be implemented as in the proposed Project. The potential effects from erosion or siltation would be similar and would require implementation of Mitigation Measures 4.9-1 and 4.9-2.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Hydrology and Water Quality (cont.)	**Impact 4.9-4:** The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite. (Significant and Unavoidable) [*WHOLE PROJECT; the alternative analysis for this impact alone considers both the FDS basin and creek capacity elements acting together.*] For this impact, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Tables summarizing the changes in flood extent and inundation depth for all of the alternatives are presented as an addendum to Appendix D.	**SU+** The Morningside/Passive Basin alternative would increase flooding near the Sorich Creek confluence with San Anselmo Creek, but otherwise would have no effect on flooding throughout San Anselmo during the 10-year event (whereas the proposed Project would reduce flooding in San Anselmo). Flooding depth would be reduced in Fairfax, similar to the proposed Project. Flooding extent and depth would also be reduced in the Morningside neighborhood along Sleepy Hollow Creek. In the 25-year event, this alternative would result in slight increases in flooding depth in the area below the Mountain View replacement bridge, in the area between Sleepy Hollow Creek and Sorich Creek, and between the Sorich Creek confluence and downtown San Anselmo. Slight increases in flooding depth would also occur between Belle Avenue and Ross Creek. Otherwise this alternative generally would not decrease flood extent or inundation levels in Fairfax and San Anselmo, whereas the Sleepy Hollow/Morningside neighborhood would experience reductions in inundation depths of up to 24 inches. In the 100-year event, this alternative has no effect in Fairfax or downtown San Anselmo and only a minimal reduction in inundation extent or depth. Slight increases in inundation depth would occur downstream of the Mountain View bridge. Many of the effects of this alternative are due to the pairing of the passive basin with the removal of the two bridges in the Morningside neighborhood. To assess the effectiveness and potential for adverse impacts of the passive basin with the removal of the building at 634-636 San Anselmo Avenue, the passive basin with the removal of 634-636 San Anselmo Avenue was modeled. Those results indicated similar changes (both positive and negative) in the extent and depth of flooding as would be realized in the proposed Project. Those results are presented in full in Appendix D. In general, this modification of the alternative brings no adverse effects during the 10-year event. The areas where the proposed Project would result in new inundation or increased inundation depths during the 25-year and 100-year events (i.e., from Barber Avenue, past the Winship Bridge, and downstream to the Sir Francis Drake Bridge) would see similar, though slightly larger increases. The same areas that would be beneficially affected by the proposed Project would be benefitted by this alternative, but with less reduction inundation depth (typically by less than six inches) and fewer parcels removed from the flood plain. This alternative does avoid the risk of backwater flooding upstream of the Nursery Basin site along Fairfax Creek because the sediment-deposition effects arising from the diversion structure would not take place.	**SU=** The Increased Capacity Basin alternative would remove more area from the 10-year floodplain and would reduce the depth of inundation more than the proposed Project. During the 25-year event, it would reduce depth of inundation over a larger area in Fairfax and in much of downtown San Anselmo. However, in the vicinity of the Winship Bridge, it would have similar effects as the proposed Project in increasing inundation extent and depth. During the 100-year event, similar to the proposed Project, this alternative would not substantially affect inundation extent in Fairfax or San Anselmo; however, this alternative would reduce the depth of inundation over a larger area. Like the proposed Project, the diversion structure component of this alternative would bring a risk of backwater flooding from Fairfax Creek upstream of the project area if a large storm and flood event followed the deposition of substantial amounts of sediment in the creek channel behind the diversion structure. Mitigation Measure 4.9-4 would address the possible adverse effects related to increased flood risk or severity, which would be slightly reduced in this alternative relative to the proposed Project.
	Impact 4.9-5. The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows. (Less than Significant)	**LTS=** Like the Project, the passive basin would not be built in the 100-year flood hazard area, but would redirect flood flows into the basin during operations to reduce downstream flood risk.	**LTS=** Like the Project, the increased capacity basin would not be built in the 100-year flood hazard area, but would redirect flood flows into the basin during operations to reduce downstream flood risk.
	Impact 4.9-6. The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition. (Less than Significant)	**LTS=** Like the Project, the passive basin would be designed to avoid water-related hazards in the vicinity of the basin by building the levees and structures to modern engineering and design standards.	**LTS=** Like the Project, the increased capacity basin would be designed to avoid water-related hazards in the vicinity of the basin by building all levees and structures to modern engineering and design standards.
	Impact 4.9-7 The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow. (No Impact)	**NI=** This alternative's basin is in the same location as the proposed Nursery Basin. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.	**NI=** This alternative's basin is in the same location as the proposed Nursery Basin. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.
Land Use and Planning	**Impact 4.10-1:** The Project would not physically divide an established community (No Impact)	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.
	Impact 4.10-2: The Project would not conflict with local land use plans. (Less than Significant)	**LTS=** For reasons identified for the proposed Project in Table 4.10-3 (in Section 4.10), this alternative is not expected to conflict with policies contained in the Marin Countywide Plan.	**LTS=** For reasons identified for the proposed Project in Table 4.10-3 (in Section 4.10), this alternative is not expected to conflict with policies contained in the Marin Countywide Plan.
	Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or present or planned use of an area. (Less than Significant)	**LTS=** Similar to the proposed Project, development of this alternative at the Nursery Basin site would not adversely alter the character or functioning of the community.	**LTS=** Similar to the proposed Project, development of this alternative at the Nursery Basin site would not adversely alter the character or functioning of the community.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Noise and Vibration	**Impact 4.11-1:** Project construction could result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity. (Less than Significant)	**LTS—** Like the proposed Project, construction of this alternative could expose nearby sensitive land uses to noise levels substantially higher than ambient conditions; through implementation of a noise reduction plan, this impact would be less than significant. Because construction would be two months shorter than with the proposed Project, residual noise impacts under this alternative also would be shorter.	**LTS+** Like the proposed Project, construction of this alternative could expose nearby sensitive land uses to noise levels substantially higher than ambient conditions; through implementation of a noise reduction plan, this impact would be less than significant. Because construction would last 1-2 months longer than with the proposed Project, residual noise impacts also would last longer.
	Impact 4.11-2: Project construction could expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction. (Less than Significant)	**LTS=** Like the proposed Project, construction of this alternative would occur within hours allowable under the County's municipal code and this impact would be less than significant.	**LTS=** Like the proposed Project, construction of this alternative would occur within hours allowable under the County's municipal code and this impact would be less than significant.
	Impact 4.11-3: Project construction could expose people to or generate excessive groundborne vibration during construction. (Less than Significant)	**LTS=** Because the same types of construction equipment would be used under this alternative as with the proposed Project, this impact is anticipated to be less than significant.	**LTS=** Because the same types of construction equipment would be used under this alternative as with the proposed Project, this impact is anticipated to be less than significant.
	Impact 4.11-4: The Project could cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations. (Less than Significant)	**LTS—** Maintenance activities for this alternative would be expected to be slightly reduced relative to the proposed Project because the frequency and extent of sediment removal would be reduced. This impact would be less than significant.	**LTS+** Maintenance activities for this alternative would be expected to be slightly increased relative to the proposed Project because the frequency and extent of sediment removal would be greater and because a pump would occasionally operate to drain the basin. This impact would be less than significant.
Population and Housing	**Impact 4.12-1:** The Project would not induce substantial population growth. (No Impact)	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.
	Impact 4.12-2: The Project would not displace substantial numbers of existing housing units or people. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.
	Impact 4.12-3: The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan. (No Impact)	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.
Public Services and Utilities	**Impact 4.13-1:** The Project could result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools or other public facilities. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not induce growth (refer to discussions above under population and housing).	**LTS=** Similar to the proposed Project, this alternative would not induce growth (refer to discussions above under population and housing).
	Impact 4.13-2: The Project's demand for solid waste disposal could exceed the permitted capacity of a suitable landfill. (Less than Significant)	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.
	Impact 4.13-3: The Project would comply with federal, state, and local statutes and regulations related to solid waste. (Less than Significant)	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.
	Impact 4.13-4: The Project could require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects. (Less than Significant)	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.	**LTS+** Operation of the pump associated with this alternative would use electrical power accessed from the existing local distribution system and would not substantially increase overall demand from the existing systems. Thus, the provision of electricity for the pump would not require the construction of new or expansion of existing facilities.
Parks and Recreation	**Impact 4.14-1:** Construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (Less than Significant)	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Parks and Recreation (cont.)	**Impact 4.14-2:** Construction and operation of the Project would include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment. (Less than Significant for FDS basin)	**LTS=** Like the proposed Project, development of the FDS basin at the Nursery Basin site under this alternative would not include recreational facilities or require the construction or expansion of recreational facilities that could have an adverse effect on the environment.	**LTS=** Like the proposed Project, development of the FDS basin at the Nursery Basin site under this alternative would not include recreational facilities or require the construction or expansion of recreational facilities that could have an adverse effect on the environment.
	Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. (No Impact)	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.
Transportation	**Impact 4.15-1:** Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), but would not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. (Less than Significant with Mitigation)	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project – refer to Appendix B) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project – refer to Appendix B) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).
	Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles. (Less than Significant with Mitigation)	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles. Similarly, implementation of Mitigation Measure 4.15-1 would address issue.	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles. Similarly, implementation of Mitigation Measure 4.15-1 would address issue.
	Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety. (Less than Significant with Mitigation)	**LSM+** For reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** For reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear). (Less than Significant with Mitigation with Mitigation)	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.

NOTES:

[a] ESA quantified air emissions associated with the FDS basin elements of Alternatives 2 and 4; those results are presented in Table 6-5. Refer to Appendix B for detailed air quality calculations.

LTS = Less than Significant
LSM = Less than Significant with Mitigation
SU = Significant and Unavoidable

\+ Impact would be greater under this alternative than under the proposed Project.
— Impact would be less under this alternative than under the proposed Project.
= Impact would be the same (or similar) under this alternative as under the proposed Project

TABLE 6-6
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Aesthetics	**Impact 4.2-1:** The Project could have a substantial adverse effect on a publicly-accessible scenic vista. (Less than Significant)	**LTS=** The location (at the Morningside Drive Bridge and Mountain View Avenue Bridge in the Morningside neighborhood of San Anselmo) and scale of the bridge replacement projects and resulting degree of visual change in the character and quality of the sites (described under Impact 4.2-3, below) are such that they would not be a noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.	**LTS—** Changes to the site, described below under Impact 4.2-3, likely would be imperceptible (and less noticeable that under the proposed Project because the building at 634-636 San Anselmo Avenue would be preserved) when observed within the context of broader scenic vistas.
	Impact 4.2-2: The Project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway. (Less than Significant)	**LTS—** Unlike the Downtown San Anselmo Element of the proposed Project, the bridge replacement sites associated with Alternative 2 are not visible from nearby designated scenic roadways or corridors (Sir Francis Drake Boulevard, Red Hill Avenue, or Center Boulevard).	**LTS=** As indicated for the proposed Project, limited views of the site would be available from motorists, bicyclists and pedestrians passing by on Center Street. Like the proposed Project, temporary and long-term effects on scenic resources (trees and vegetation that would be removed for construction) visible from designated scenic routes would be less than significant given the scope of the proposed changes (described in the next impact) and their limited visibility.
	Impact 4.2-3: The Project could substantially degrade the existing visual character or quality of the site and its surroundings, including alteration of the built environment or land use patterns. (Less than Significant)	**LTS=** This alternative would remove several trees and other vegetation adjacent to the existing bridges as well as the bridges themselves (which are not visually prominent). With revegetation of disturbed areas following construction, implementation of this alternative would not be expected to detract from the visual character of the area.	**LTS—** Unlike the proposed Project, this alternative would retain and elevate by 2 feet the building at 634-636 San Anselmo Avenue. Like the proposed Project, this alternative would involve disturbance within the creek channel (e.g., removal of trees and vegetation for the access road). In sum, the degree of visual change from existing conditions would be less under this alternative when compared to the proposed Project because the building would be preserved and less creek disturbance and restoration would occur. (Because this alternative does not involve as much restoration as the proposed Project, it would not enhance the visual linkage with Creek Park; consequently, this aspect of its aesthetic benefit would also be somewhat less than those of the proposed Project.)
	Impact 4.2-4: The Project could create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area. (Less than Significant)	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.
Air Quality	**Impact 4.3-1:** Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation. (Less than Significant with Mitigation)	**LSM=** The overall magnitude of daily construction activities is expected to be similar to the proposed Project (e.g., less ground disturbance and earthwork resulting in fewer truck trips, but work on two existing bridges rather than on one bridge building); consequently, daily criteria air pollution emissions would be less. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.	**LSM=** The overall magnitude of daily construction activities is expected to be similar to the proposed Project (i.e., while less ground disturbance and earthwork might occur with more limited restoration; raising the bridge building would be more involved and take longer than removing it). Consequently, daily criteria air pollution emissions would be be similar. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.
	Impact 4.3-2: Construction of the Project elements would result in emissions that could conflict with the 2017 Clean Air Plan. (Less than Significant with Mitigation)	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.
	Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that could exceed air quality standards and conflict with the 2017 Clean Air Plan. (Less than Significant)	**NI=** This alternative has the same operational activities as the proposed Project, resulting in the same average daily and annual average criteria pollutant emissions.	**NI=** This alternative has the same operational activities as the proposed Project, resulting in the same average daily and annual average criteria pollutant emissions.
	Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions. (Less than Significant with Mitigation)	**LSM—** Because the overall magnitude of construction activities is expected to less under this alternative (e.g., less ground disturbance and earthwork resulting in fewer truck trips), toxic air contaminant emissions would likely be incrementally less with this alternative. Like the proposed Project, implementation of Mitigation Measures 4.3-and 4.3-4 could reduce this impact to a less-than-significant level.	**LSM=** Because the overall magnitude of construction activities is expected to be similar to the proposed Project, toxic air contaminant emissions would likely be similar with this alternative. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.
	Impact 4.3-5: Construction of the Project could result in objectionable odors. (Less than Significant)	**LTS=** This alternative has the same odor-generating activities as the proposed Project.	**LTS=** This alternative has the same odor-generating activities as the proposed Project.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Air Quality (cont.)	**Impact 4.3-6:** Construction and operation of the Project would result in GHG emissions that could have a significant impact on the environment and conflict with applicable plans and policies in place to reduce GHG emissions. ((Less than Significant)	**LTS—** Because the overall magnitude of construction activities is expected to be similar to the proposed Project (e.g., less ground disturbance and earthwork resulting in fewer truck trips but work on two bridges rather than on one bridge building), annual average greenhouse gas emissions would likely be similar with this alternative.	**LSM+** Because the overall magnitude of construction activities (as opposed to daily) is expected to increase relative to the proposed Project, annual average greenhouse gas emissions would be slightly higher with this alternative.
Energy, Mineral, Forest and Agricultural Resources	**Impact 4.4-1:** Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources. (Less than Significant with Mitigation)	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource as none of these resources are present near the bridges.	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative (which affects the same site as the proposed Project) would have no effect on mineral, forest, or agricultural resource.
Biological Resources	**Impact 4.5-1:** Project implementation could have a substantial adverse effect on special-status aquatic species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, this alternative could adversely affect aquatic species, but the extent of stream affected would be less than with the proposed project: estimated disturbance of about 600 square feet of aquatic and riparian habitat at both bridge sites compared to over 5,000 square feet (0.12 acre of temporary and permanent) of aquatic and riparian habitat at the Downtown San Anselmo site (see Table 4.5-3 in Section 4.5). The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. There would less stream channel enhancement and thus incrementally less long-term benefit to aquatic species.	**LSM=** This alternative would have generally similar adverse impacts on aquatic species as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. The reduced extent of improvements to San Anselmo Creek and its riparian corridor would mean that aquatic species and habitats would not receive the same benefits as in the proposed Project.
	Impact 4.5-2: Project implementation could have a substantial adverse effect on special-status plant species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, rare plants (if present in the riparian areas affected by the project) could be adversely affected under this alternative. As stated above, the extent of riparian habitat affected at the two bridge sites is less than that associated with the Downtown San Anselmo Element of the proposed Project. The construction approach to protecting resources would be the same and the same mitigation measures would be applied. There would also be less stream channel enhancement and thus less long-term benefit to aquatic species.	**LSM=** This alternative would have similar impacts on rare plants as the proposed Project would. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.
	Impact 4.5-3: Project implementation could have a substantial adverse effect on special-status amphibians and other terrestrial species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, this alternative could adversely affect special-status amphibians and other terrestrial species although the extent of stream reach affected would be less (see discussion under Impact 4.5-1, above). The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. There would also be less stream channel enhancement and thus less long-term benefit to these species.	**LSM=** This alternative would have generally similar adverse impacts on amphibians and other special-status terrestrial species as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. The reduced extent of improvements to San Anselmo Creek and its riparian corridor would mean that these species would not receive the same benefits as in the proposed Project.
	Impact 4.5-4: Project implementation could have a substantial adverse effect on special-status nesting birds. (Less than Significant with Mitigation)	**LSM-** This alternative would have incrementally less impact on nesting birds as the proposed Project, because somewhat fewer trees may need to be removed; the same mitigation measures for pre-construction surveys and buffer areas would be applied.	**LSM=** This alternative would have similar impacts on nesting birds as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative. Raising the building instead of removing it would have similar potential to affect bird nests. The same mitigation measures would be applied.
	Impact 4.5-5: Project implementation could have a substantial adverse effect on Northern spotted owls. (Less than Significant with Mitigation)	**LSM=** Similar to the Downtown San Anselmo site, the areas around the two bridges are likely too developed and disturbed to provide suitable habitat for Northern spotted owls, although the potential for disturbance of nesting owls cannot be discounted. The same mitigation measures would be applied.	**LSM=** This alternative would have similar impacts on Northern spotted owls as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative, and downtown San Anselmo is not suitable habitat for this species in any case. The same mitigation measures would be applied.
	Impact 4.5-6: Project implementation could have a substantial adverse effect on special-status bats species. (Less than Significant with Mitigation)	**LSM** This alternative would have generally similar adverse impacts on special-status bats as the proposed Project, because it also includes removal of structures (the bridges) and tree removal. The same mitigation measures for pre-construction surveys to protect roosting bats would be applied.	**LSM=** This alternative would have similar impacts on bats as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative. Raising the building instead of removing it would have similar potential to affect roosting bats. The same mitigation measures would be applied.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Biological Resources (cont.)	**Impact 4.5-7:** Project implementation could adversely affect sensitive natural communities. (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on sensitive natural communities including riparian corridor would be less than with the proposed Project. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied.	**LSM=** This alternative would have similar adverse impacts on sensitive natural communities such as riparian corridor or oak woodlands as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor, which would be a benefit that is slightly reduced in this alternative relative to the proposed Project.
	Impact 4.5-8: Project activities could adversely affect wetlands and other waters (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on jurisdictional wetlands and other waters would be less than with the proposed Project. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.	**LSM=** This alternative would have similar adverse impacts on jurisdictional waters as the proposed Project would because the building would be raised instead of demolished. There are no wetlands at the downtown San Anselmo site. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.
	Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors. (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on riparian wildlife movement corridors would be less than with the proposed Project. The construction approach to protecting resources during work in that community would be the same, and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor for species that use it, which would be a benefit that would be in this alternative relative to the proposed Project.	**LSM=** This alternative would involve a similar amount of work in the riparian corridor as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor for species that use it, which would be a benefit that would be slightly reduced in this alternative relative to the proposed Project.
	Impact 4.5-10: Project construction would require tree removal. (Less than Significant with Mitigation)	**LSM-** Although no tree counts were conducted in the areas around the bridges, as indicated in Table 6-4, this alternative is assumed to require removal of fewer trees, based on the areal extent of construction disturbance of riparian habitat. The same mitigation measures regarding replanting, replacement, and additional mitigation as needed.	**LSM=** This alternative would have similarly minor impacts related to tree removal as the proposed Project would (fewer than 10 trees to be removed). The same mitigation measures regarding replanting, replacement, and additional mitigation as needed.
Cultural Resources	**Impact 4.6-1:** The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance. (No Impact)	**Cannot be Determined (presumed significant)** Residences in the immediate vicinity of the Morningside Drive and Mountain View Avenue are greater than 50 years old; upon further review, these buildings could be determined to be historic resources. Construction would occur as close as 15-20 feet from these structures. Refer to the Noise and Vibration below.	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.
	Impact 4.6-2: The Project could cause a substantial adverse change in the significance of an archaeological resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-3: The Project could disturb human remains, including those interred outside of dedicated cemeteries. (Less than Significant)	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is the same as that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-4: The Project could cause a substantial adverse change in the significance of a tribal cultural resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is the same as the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
Geology, Seismicity, Soils, and Paleontological Resources	**Impact 4.7-1:** The Project could expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides. (Less than Significant)	**LTS=** This alternative would improve the stability of the Morningside Bridge and channel banks at the bridges relative to existing conditions (thereby lessening exposure of people and structures to adverse effects from geologic hazards).	**LTS=** This alternative would improve the stability of the structure relative to existing conditions (thereby lessening exposure of people and structures to adverse effects from geologic hazards).

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Geology, Seismicity, Soils, and Paleontological Resources (cont.)	**Impact 4.7-2:** The Project could result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill. (Less than Significant)	**LTS—** Because this alternative would involve a smaller area of disturbance (roughly 0.1 acre) the potential for soil erosion and siltation during construction would be incrementally less when compared to the proposed Project.	**LTS—** Because this alternative would involve a slightly reduced amount of disturbance in the creek the potential for soil erosion and siltation would be similar to the proposed Project.
	Impact 4.7-3: The Project could cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability. (Less than Significant)	**LTS=** This alternative would remove constrictions on Sleepy Hollow Creek instead of San Anselmo Creek but would include the same construction best management practices, regulatory permits, and types of protections against slope instability, subsidence, and other geological and soil-related effects as the proposed Project.	**LTS=** Like the proposed Project, this alternative would include the same construction best management practices, regulatory permits, and types of protections against slope instability, subsidence, and other geological and soil-related effects as the proposed Project
	Impact 4.7-4: The Project could cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures. (Less than Significant but NI for Downtown San Anselmo)	**NI=** This section of Sleepy Hollow creek does not have expansive soils.	**NI=** This section of San Anselmo Creek does not have expansive soils.
	Impact 4.7-5: The Project could cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features. (Less than Significant)	**LTS=** This alternative would not result in a substantial adverse change to the topography of the Sleepy Hollow Creek channel.	**LTS=** Like the proposed Project, no substantial adverse change to the topography of the creek channel.
	Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (No Impact)	**NI=** Construction of the creek capacity improvements along Sleepy Hollow Creek would occur in the same geologic units as the Downtown San Anselmo Element of the proposed Project and thus would not be expected to affect paleontological resources or unique geologic features.	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.
Hazards and Hazardous Materials	**Impact 4.8-1:** The Project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard. (Less than Significant)	**LTS—** The potential for hazardous building materials to be encountered during removal of the bridge structures is less than with the proposed Project because the likelihood that such materials would be present in the bridges to be demolished (e.g., lead-based paint) is lower.	**LTS—** This alternative would involve less demolition than the proposed Project: i.e., 634-636 San Anselmo Avenue, which potentially contains hazardous building materials would not be demolished.
	Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. (Less than Significant with Mitigation)	**LTS—** Construction at the bridges would not occur near any sites on the referenced hazardous materials list.	**LSM=** Like the proposed Project, this alternative would involve ground disturbance and potentially dewatering at a site that is included on a list of hazardous materials sites.
	Impact 4.8-3: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant)	**LTS=** Neither Morningside Drive nor Mountain View Avenue are designated as emergency or evacuation routes.	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan.
Hydrology and Water Quality	**Impact 4.9-1:** Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. (Less than Significant with Mitigation)	**LSM=** Similar to the proposed Project, the removal or replacement of flow-constraining bridges on Sleepy Hollow Creek would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. As a result, this alternative would have similar water-quality impacts to those of the proposed Project.	**LSM=** Similar to the proposed Project, raising the building at 634-636 San Anselmo Avenue would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. As a result, this alternative would have similar water-quality impacts to those of the proposed Project.
	Impact 4.9-2. The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (Less than Significant)	**LTS=** In this alternative, removing two flow-constraining bridges and replacing one of them with a similarly sized bridge with foundations that would not be in the creek channel would not add impervious cover or otherwise interfere with groundwater recharge or flows or otherwise substantially deplete groundwater supplies or interfere with groundwater recharge.	**LTS=** Similar to the proposed Project, the elevation instead of demolition of the building at 634-636 San Anselmo Avenue under this alternative would not add impervious cover or otherwise interfere with groundwater recharge or flows or otherwise substantially deplete groundwater supplies or interfere with groundwater recharge.
	Impact 4.9-3. The Project could alter existing drainage patterns, potentially causing new erosion or siltation. (Less than Significant with Mitigation)	**LTS / Cannot be determined** Similar to the proposed Project, this alternative would remove flow-constraining structures and thus increase flow velocities through the stream reaches upstream and downstream, which could increase scour and erosion. These effects are expected to be similar to those of the proposed Project; Mitigation Measure 4.9-3b would reduce these impacts; however, they were not directly analyzed, so their effects cannot be quantified or directly compared to those in the proposed Project.	**LTS=** Similar to the proposed Project, raising the building would improve channel capacity and allow flood waters to remain in the creek channel and reduce overflow of the creeks banks onto and around nearby streets and buildings. The increase in flow volume and velocity could result in increased scour around existing structures in the creek and along creek banks and erosion of the channel bed. The impact would be similar to the proposed Project.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Hydrology and Water Quality (cont.)	**Impact 4.9-4:** The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite. (Significant and Unavoidable) [*WHOLE PROJECT; the alternative analyses for this impact consider both the FDS basin and creek capacity element acting together.*] For this impact, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Tables summarizing the changes in flood extent and inundation depth for all of the alternatives are presented as an addendum to Appendix D.	**SU+** Refer to Table 6-5.	**SU=** This alternative would neither increase nor decrease the extent or depth of flooding under any of the various flood events included in the modeling. The impact would be the same as the proposed Project. Mitigation Measure 4.9-4 would address the possible adverse effects related to increased flood risk or severity, which would be somewhat reduced in this alternative relative to the proposed Project.
	Impact 4.9-5. The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not place a new structure within a 100-yr flood hazard area; this alternative would also remove flow-impeding structures.	**LTS=** Similar to the proposed Project, this alternative would not place a new structure within a 100-yr flood hazard area; this alternative would also remove flow-impeding structures.
	Impact 4.9-6 Impact 4.9-6. The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition. (Less than Significant)	**LTS=** This alternative would remove or replace existing bridges from the special flood hazard area and would not construct levees or other flood control or water detention facilities. For this reason this alternative would have effects similar to those of the proposed Project.	**LTS=** This alternative would raise an existing commercial building in the special flood hazard area and would not construct levees or other flood control or water detention facilities. For this reason this alternative would have effects similar to those of the proposed Project.
	Impact 4.9-7 The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow. (No Impact)	**NI=** The bridges that would be modified in this alternative are in very close proximity to the proposed Project (less than one-half mile away) and is similarly not subject to these hazards. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.	**NI=** This alternative would take place in the same location as the proposed Project. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.
Land Use and Planning	**Impact 4.10-1:** The Project would not physically divide an established community (No Impact)	**LTS+** While the removal of the Morningside Bridge would permanently disrupt vehicular, pedestrian and bicycle travel currently using that bridge to cross Sleepy Hollow Creek, nearby Mountain View Bridge would continue to provide this function. Consequently, removal of the Morningside Bridge is not considered a substantial division of an established community.	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.
	Impact 4.10-2: The Project would not conflict with local land use plans. (Less than Significant)	**LTS=** There would be no change in land uses associated with this alternative. Like the proposed Project, this alternative would not conflict with local land use plans.	**LTS=** Like the proposed Project this alternative would not conflict with local land use plans. This alternative would involve less change in land use than the proposed Project because 634-636 San Anselmo building would be retained.
	Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or present or planned use of an area. (Less than Significant)	**LTS=** There would be no change in land use associated with this alternative.	**LTS—** This alternative would involve less change in land use than the proposed Project because 634-636 San Anselmo building would be retained, thereby lessening the degree of change in the character and functioning of the community.
Noise and Vibration	**Impact 4.11-1:** Project construction could result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity. (Less than Significant)	**LTS+** Under this alternative, off-road construction could operate as close as 15-20 feet from residences along Morningside Drive. The two loudest pieces of construction equipment that are expected to be operating during the demolition and construction of the Morningside Bridge is a concrete saw and excavator. According to the Federal Highway Administration's (FHWA) *Roadway Construction Noise Model*, a concrete saw and excavator operating at the same time and place would expose the nearest residences to a noise level of 96 dBA L_{eq}. Demolition and construction activities would expose nearby residences to noise levels that would exceed the applied adverse reaction threshold of 90 dBA L_{eq}. However, as part of the Project design, a construction noise reduction plan will be prepared and submit to the Town for approval. Through the implementation of measures in the construction noise reduction plan, it is anticipated that construction-related noise levels would be reduced by requiring the Project to implement best management practices. Through implementation of a noise reduction plan, this impact would be less than significant.	**LTS=** Given that (a) the overall intensity of construction activities under this alternative generally would be similar to that of the proposed Project and (b) the distance to sensitive receptors (235 feet), this impact would be expected to be less than significant.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Noise and Vibration (cont.)	**Impact 4.11-2:** Project construction could expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction. (Less than Significant)	**LTS+** Demolition and Construction of the Morning Side Drive bridge would occur entirely within the Town of San Anselmo. As previously discussed under Impact 4.11-1 (above), this alternative could expose residences to construction noise levels of 96 dBA L_{eq}. Although the proposed demolition and construction activities would occur within the allowed construction hours identified in the Town of San Anselmo municipal code, noise levels generated during demolition and construction activities would exceed the Town's construction noise standard of 80 dBA L_{eq} from a distance of 50 feet from the construction equipment. Given noise levels associated with equipment expected to be used for bridge removal and construction and proximity to residences, this alternative is expected to generate noise levels in excess of standards established in the City of San Anselmo's municipal code. However, this impact is assumed to be less than significant after the implementation of a Project design measure that includes the development and implementation of a Town approved construction noise reduction plan, which would be reduce construction-related noise by requiring the Project to implement best management practices.	**LTS=** For reasons stated in the preceding discussion, this impact would be expected to be less than significant.
	Impact 4.11-3: Project construction could expose people to or generate excessive groundborne vibration during construction. (Less than Significant)	**LSM+** The residential buildings located near the Morningside Bridge are at least 50 years old and are considered historic. According to the Caltrans' *Transportation and Construction Vibration Guidance Manual*, historic buildings exposed to a vibration level of 0.12 in/sec PPV could result in building damage. Construction of the Morningside Bridge could require the use of a hoe ram. According to the Federal Transit Administration's (FTA) *Transited Noise and Vibration Impact Assessment Manual*, the operation of a hoe ram could generate vibration levels of 0.19 in/sec PPV from a distance of 15 feet. Given (a) vibration levels associated with equipment expected to be used for bridge removal and construction (such as hoe rams), (b) proximity to residences, and (c) the age of structures closest to construction (all residences surrounding the bridges are more than 50 years old), this alternative could generate vibration levels in excess of Caltrans' applied historic building damage threshold. This alternative would require mitigation (e.g., vibration control plan with performance standards) to reduce this impact to a less-than-significant level.	**LTS=** Given expected vibration levels from construction equipment and distance to sensitive receptors, this impact is expected to be less than significant.
	Impact 4.11-4: The Project could cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations. (Less than Significant)	**LTS=** The bridge would not generate new noise increases following completion of construction. However, stream maintenance activities on Sleepy Hollow Creek in this alternative associated would be expected to be similar to the proposed Project.	**LTS=** Maintenance activities for this alternative would be expected to be similar to the proposed Project.
Population and Housing	**Impact 4.12-1:** The Project would not induce substantial population growth. (No Impact)	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.
	Impact 4.12-2: The Project would not displace substantial numbers of existing housing units or people. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.
	Impact 4.12-3: The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan. (No Impact)	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.
Public Services and Utilities	**Impact 4.13-1:** The Project could result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools or other public facilities. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not induce growth and thus would not increase the demand for or impact from public services or utilities (refer to discussions above under population and housing).	**LTS=** Similar to the proposed Project, this alternative would not induce growth and thus would not increase the demand for or impact from public services or utilities (refer to discussions above under population and housing).
	Impact 4.13-2: The Project's demand for solid waste disposal could exceed the permitted capacity of a suitable landfill. (Less than Significant)	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Public Services and Utilities (cont.)	**Impact 4.13-3:** The Project would comply with federal, state, and local statutes and regulations related to solid waste. (Less than Significant)	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.
	Impact 4.13-4: The Project could require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects. (Less than Significant)	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.
Parks and Recreation	**Impact 4.14-1:** Construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (Less than Significant)	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).	**LTS=** Similar to the proposed Project, construction of this alternative would temporarily use Creek Park for construction staging but the park would be restored following construction. In the long term, implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).
	Impact 4.14-2: Construction and operation of the Project would include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment. (Less than Significant with Mitigation)	**NI=** This alternative would not include addition, removal, or improvement of any public access and recreational facilities or require the construction of other facilities that would have an adverse physical effect on the environment.	**LSM=** Like the proposed Project, this alternative would remove (to accommodate construction staging and access) and then replace the deck and stairway features at the bridge building. The impacts of this change are analyzed under the other topics in this table, and the same construction practices and mitigation measures would apply.
	Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. (No Impact)	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.
Transportation	**Impact 4.15-1:** Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), but would not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. (Less than Significant with Mitigation)	**LSM+** Like the proposed Project, construction would temporarily generate increased traffic volumes, potentially increasing traffic congestion, particularly on small residential streets near the bridges. Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. This impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).
	Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles. (Less than Significant with Mitigation)	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles, as would the temporary closure of Mountain View Avenue and permanent closure of Morningside Drive. Implementation of Mitigation Measure 4.15-1 would address issue for construction-phase access. During the operational phase, the existing redundancy of the surface roads would provide adequate emergency vehicle access across Sleepy Hollow Creek.	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles as described for the proposed Project. Similarly, implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety. (Less than Significant with Mitigation)	**LTS+** Bridge removal would temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LTS=** Similar to the proposed Project, for reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear). (Less than Significant with Mitigation)	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.

NOTES:

LTS = Less than Significant
LSM = Less than Significant with Mitigation
SU = Significant and Unavoidable

\+ Impact would be greater under this alternative than under the proposed Project.
— Impact would be less under this alternative than under the proposed Project.
= Impact would be the same (or similar) under this alternative as under the proposed Project

Creek Capacity Element

Table 6-6 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the creek capacity element of the Morningside/Passive Basin Alternative. As shown in Table 6-6, many of the impacts attributable to the Downtown San Anselmo Element of the proposed Project would be the same or similar under this alternative, though some would take place in different locations. Notable differences are as discussed below.

Biological Resources (Impacts 4.5-1, 4.5-3, 4.5-7, 4.5-8, 4.5-9, 4.5-10). Bridge removal at the two locations on Sleepy Hollow Creek would have the same types of construction impacts on water quality and biological resources as the Downtown San Anselmo Element of the proposed Project, largely because the nature of the work (removing structures from a creek channel) would be similar and thus use of the same or similar construction approaches and environmental protection measures would be warranted. Compared to the proposed Project, there would be less in-stream construction and fewer trees removed at the two bridge sites; consequently, the magnitude of impacts to aquatic and riparian habitat and associated special status species, jurisdictional wetlands and other waters of the U.S., and to nesting birds would be less. The long-term operational impacts to aquatic habitats and habitats in lower Sleepy Hollow Creek are not expected to be substantially different than they would be to San Anselmo Creek and would be beneficial to the stream and its habitats and species. The same types of standard stream maintenance program activities would be performed as take place currently and as would under the proposed Project.

Hydrology and Water Quality. With regard to hydrology and water quality, the potential for scour and erosion in Sleepy Hollow Creek was evaluated qualitatively based on hydraulic and geomorphologic principles. Removing flow-constraining bridges increases flow velocities and thus increases erosive potential. The proposed Project's potential increase on scour potential in San Anselmo Creek was not substantial. In this alternative, a similarly small effect is expected because the same types of design, monitoring, and mitigation strategies to assess and protect against potential increases in scour and erosion in San Anselmo Creek under the proposed Project would be employed as needed in Sleepy Hollow Creek to manage that potential and reduce it to a less than significant impact. Operations and maintenance activities for bridge removal and replacement would similar or less involved than for the proposed Project because comparatively little habitat restoration would occur.

Land Use (Impact 4.10-1). Removal of the Morningside Bridge would permanently modify vehicular, pedestrian, and bicycle travel. The presence of nearby Mountain View Bridge would continue to provide this function, so this impact would be less than significant but would be greater than in the proposed Project.

Noise and Vibration (Impacts 4.11-1, 4.11-1, 4.11-2, 4.11-3). Because construction would take place very close to residential structures, it would generate larger increases over ambient noise levels at sensitive receptor locations and could also have greater impacts from groundborne vibrations during construction. Unlike the Downtown San Anselmo site, the Morningside Drive and Mountain View Avenue bridges are surrounded by single family homes, and this alternative would relocate many of the impacts associated with the Downtown San Anselmo site from a commercial area to a residential area. Consequently, the severity of some construction-phase impacts would be greater than with the proposed Project. Residences are substantially closer (within 15-20 feet) to the bridges than the commercial structures that would be affected by the proposed Project. The effects of construction-phase noise and vibration impacts would thus be greater than with the proposed Project. Given the age of neighboring homes (the closest homes are all more than 50 years old), vibration from demolition of the bridges could adversely affect potential historic resources. Refer to discussions under Impacts 4.6-1 and 4.11-1 through 4.11-3 in Table 6-6. Because this alternative involves removing and replacing (in the case of Mountain View Avenue) two bridges less than 400 feet apart, as well as installation of a new pipeline, there would also be disruption to vehicular, pedestrian and bicycle travel. On the whole, compared to proposed changes at the Downtown San Anselmo site, the effects of implementation of the bridge projects under this alternative would be more disruptive to a greater number of residents.

Transportation and Circulation (Impacts 4.15-1, 4.15-2, 4.15-3, 4.15-4). Because construction would take place on smaller local roads, it could generate traffic congestion effects, impediments to local streets, pedestrian and bicycle accessibility, and traffic safety hazards that could be incrementally worse under this alternative.

Severity and Frequency of Flooding for the Morningside/Passive Basin Alternative (Impact 4.9-4)

This chapter has provided separate discussions of the impacts of the different basin designs and creek channel improvements options to allow full flexibility in mixing and matching the options for the two different Project elements. For this impact, however, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Appendix D presents the results of the hydraulic modeling conducted for each of the alternatives to the proposed Project; it contains figures and tables showing the changes in flood extent and inundation depth.

Implementation of the Morningside/Passive Basin Alternative would slightly increase flooding (approximately 1-4 inches) near the Sorich Creek confluence with San Anselmo Creek, but otherwise would have no effect on flooding in San Anselmo during the 10-year event (whereas the proposed Project would reduce flooding in San Anselmo). Flooding extent and depth would be reduced in Fairfax, similar to but slightly less than the proposed Project, and would also be reduced in the Morningside neighborhood along the lower portion of Sleepy Hollow Creek.

In the 25-year event, this alternative would result in almost no changes to flood extent or depth in Fairfax. In the Morningside neighborhood, along Sleepy Hollow Creek, this would cause slight increases (1-6 inches) in a few locations between the Mountain View replacement bridge and Sir Francis Drake Boulevard but would reduce depth by up to 24 inches over a large area of flooding in this neighborhood. Further downstream, in the area along San Anselmo Creek from its confluence with Sleepy Hollow Creek, past Sorich Creek, and into downtown San Anselmo, there would be slight increases in inundation depth of 1-2 inches. A similar increase in inundation depth would occur in lower downtown San Anselmo upstream of the Ross Creek confluence.

In the 100-year event, this alternative would have no substantial effect in Fairfax or downtown San Anselmo. In the Morningside neighborhood, there are reductions of 3-5 inches in areas upstream of the Mountain View replacement bridge and increases in flooding of up to 3 inches in the area below the Mountain View replacement bridge.

Importantly, the Morningside/Passive Basin Alternative would avoid the risk of increased backwater flooding upstream of the diversion structure because of increased sediment deposition in the Fairfax Creek channel. This risk is fully described in the Impact 4.9-4 discussion in Section 4.9, Hydrology and Water Quality and discussed in some detail in a later section of this chapter regarding the identification of an environmentally superior alternative.

Modified Alternative: Passive Basin with Removal of 634-636 San Anselmo Avenue

As described above, many of the adverse effects of the Morningside/Passive Basin Alternative are associated with removal of the two bridges on Sleepy Hollow Creek. The intent of this modified alternative is to pair the passive basin (which reduces many environmental impacts compared to the other FDS basin options evaluated) with the Downtown San Anselmo Element of the proposed Project. The trade-off of this modified alternative, however, is that this alternative's effectiveness in reducing flood extent or inundation depth is less than the Project as proposed.

The Flood Control District conducted modeling for a combined Passive Basin/Downtown San Anselmo alternative. Those results, summarized herein and presented in full in Appendix D, indicated similar results (both positive and negative) regarding changes in the extent and depth of flooding as would occur with the proposed Project. In general, this modified alternative would reduce the adverse effects on biological resources, water quality, noise, and traffic. However, all of these reductions would be to impacts that were determined to be less than significant, although some would be less than significant only with implementation of mitigation measures. This alternative would create no new significant adverse impacts. This alternative would reduce the area in which flood extent or inundation depth would occur in a 10-year event. These would be the same locations that would benefit from the proposed Project, but the reductions in depth under this alternative would be somewhat lessened.

With regard to the one significant and unavoidable impact of the Project (small areas of increased flooding), it is important to note that this modified alternative would eliminate it in one area but would not reduce it in the other. It would avoid the risk of backwater flooding from Fairfax Creek from sediment deposition upstream of the diversion structure, which would eliminate one form of a significant and unavoidable impact. The other areas that would have increased flooding in the 25-year event under the proposed Project (i.e., from Barber Avenue, past the Winship Bridge, and downstream to the Sir Francis Drake Bridge) would have a similar increase (several inches) for the 25-year event under this modified alternative. In the 100-year event, the depth and extent of inundation would be similar to that of the proposed Project.

6.3.3 Alternative 3: Raised Building Alternative

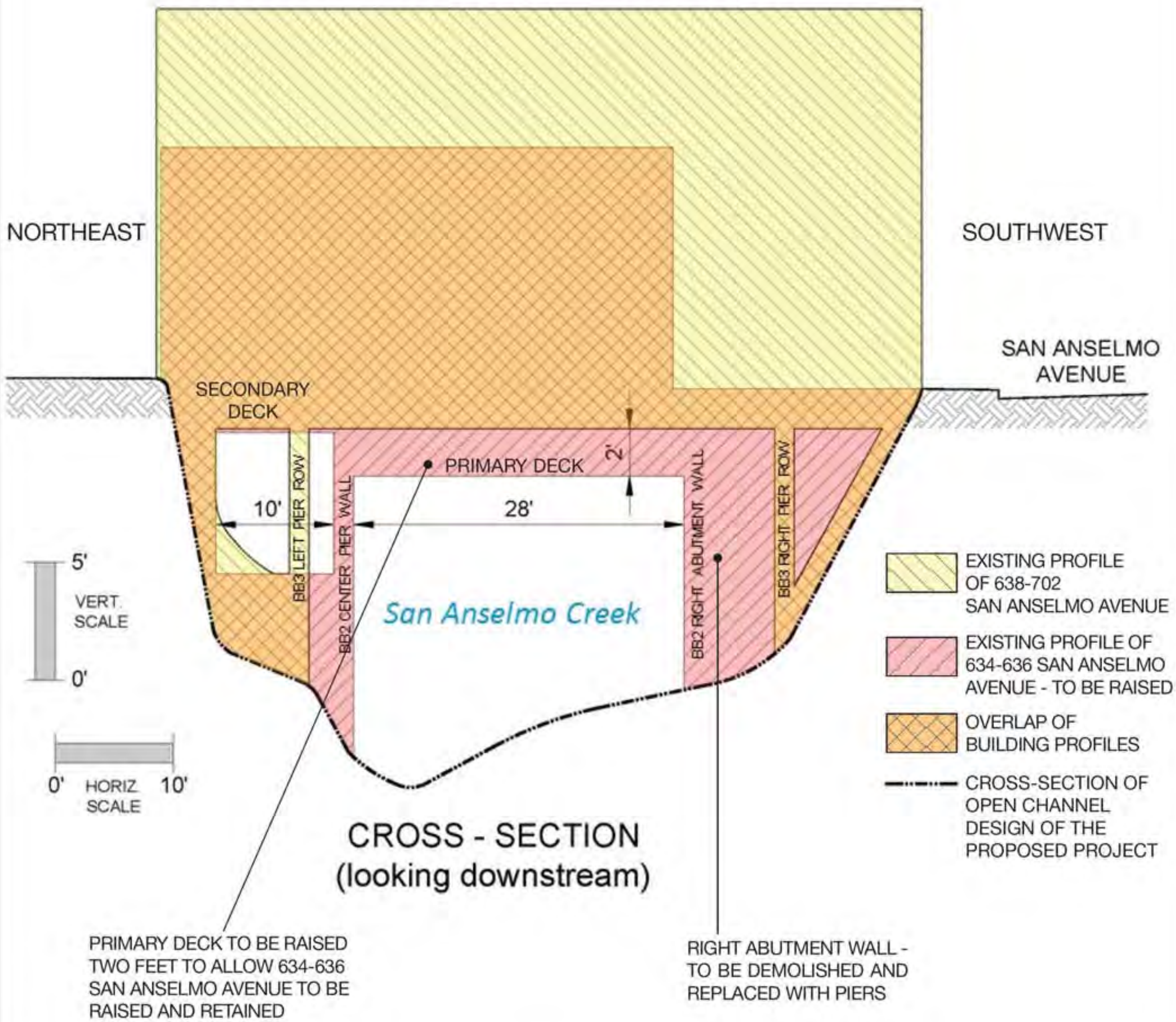
6.3.3.1 Description

The Raised Building Alternative was developed in response to community interest in preserving rather than removing the bridge building at 634-636 San Anselmo Avenue (refer to scoping comments presented in Appendix A). This alternative fosters public participation, consistent with State CEQA *Guidelines* Section 15126.6(a). This alternative would achieve a comparable level of flood risk reduction as the proposed Project by raising the bridge building at 634-636 San Anselmo Avenue out of the creek channel (Geomorph Design, 2018). This alternative would use the same design for the Nursery Basin as the proposed Project, which is described in *Chapter 3, Project Description*. That element would be unchanged in this Raised Building Alternative and is discussed only minimally hereafter.

The existing single-story wood-framed commercial building at 634-636 San Anselmo Avenue would be raised to a higher elevation. Its supporting bridge deck and abutments would be modified or replaced as needed to support the building provide a large enough culvert to reduce or eliminate the current flow impairment. It is the bridge deck and abutments/foundations that cause the hydraulic channel restriction. To be acceptable for flood protection, the modified building would need to be configured to better match the alignment and dimensions of the foundation and deck of the building immediately upstream (638-702 San Anselmo Avenue).

The existing bridge structure consists of two reinforced concrete decks (see **Figure 6-3**, below). The primary deck spans 28 feet across the creek. The secondary deck is higher, and it spans 10 feet from a pier wall in the creek channel to an abutment retaining wall on the northeastern bank. The primary deck needs to be raised about two feet; the secondary deck does not need to be raised for flood risk reduction purposes, but it may need to be raised as one unit with the primary deck to avoid separating the building above both decks.

It is not likely to be feasible to raise the wood-framed building independent from the bridge decks without damaging the building itself. Rather, it is likely the building and decks would be raised as one unit. This may be done by placing hydraulic jacks on temporary foundations on the creek channel. These foundations would support closely-spaced rows of steel girders under the existing deck. Construction crews would then saw-cut through the tops of the existing abutment and pier walls and lift the building-deck as one unit. With the existing building-deck unit supported by the jacked girders, the existing left abutment wall and pier wall would be extended by constructing an 18-inch-wide, 24-inch-deep beam running along the top of each wall the length of the building-deck unit. The failing right abutment would be demolished, and a row of 24-inch-diameter concrete piers supporting a 24-inch-wide, 24-inch-deep beam running the length of the building-deck unit would be constructed in its place. The building-deck unit would be lowered onto the beams and fastened in place. Existing fill (landward of the former right abutment wall) would be removed, and an engineered slope and upper bank retaining wall would be constructed. Finally, a new deck spanning between the raised building-deck unit and the new upper bank retaining wall would be constructed, and this new deck area would be fitted with an Americans with Disabilities Act (ADA)-compliant step-up (with lift) or ramp from the neighboring sidewalk level. The finished floor would be about



Note: Cross-Section of San Anselmo Creek looking downstream from the 638-702 San Anselmo Avenue culvert outlet to the 634-636 San Anselmo Avenue culvert inlet. The 638-702 San Anselmo Avenue bridge-building structure (yellow) provides substantially larger culverts than the 634-636 San Anselmo Avenue bridge-building structure (red/orange). The red area indicates the portion of the 634-636 San Anselmo Avenue bridge-building structure that is more constrictive to flood flows than the 638-702 San Anselmo Avenue structure immediately upstream. Note that the 634-636 San Anselmo Avenue culvert has a 2-ft lower ceiling than 638-702 San Anselmo Avenue. Also note that the 634-636 San Anselmo Avenue culvert substantially fills the right side of the channel. Removing 634-636 San Anselmo Avenue under the proposed project would allow construction of the open channel design cross-section indicated by the bold dashed line. To be comparable hydraulically to removal, the Modify Alternative would need to substantially revise the 634-636 San Anselmo Avenue bridge structure to raise the culvert ceiling and remove the fill on the right side of the channel.

SOURCE: Geomorph Design, Memorandum: Modifying Bridge-Building 2 - Summary Feasibility Evaluation, February 28, 2018.

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Figure 6-3
Concept of Raised Building Alternative

2 feet higher than sidewalk level. Note that this proposed construction method for raising this building carries with it an unknown risk of damage to the building frame, concrete deck, or both due to the building's age and the unknown condition of the existing concrete and steel reinforcement in the bridge deck. Raising and modifying an existing building that spans a creek is not commonly done. Further inspection is needed to determine if the existing building and deck have adequate strength for this alternative. The process described here to raise the building deck and add a new foundation structure is one technique for raising and reconstructing the building. Variations of this technique are possible but the general process is similar to what is described. Because this alternative would preserve and replace the building supports, this alternative would not include the extensive restoration improvements to San Anselmo Creek described in Chapter 3, *Project Description* (i.e., regrading and sloping portions of both banks of the channel with bio-stabilization protection methods and vegetating the slopes with riparian woodland shrubs).

6.3.3.2 Ability to Meet Project Objectives

This Raised Building Alternative has the same design as the Nursery Basin for the proposed Project. As explained above, there is some chance the building at 634-634 San Anselmo Avenue could be damaged during its raising. Assuming the building is undamaged during its raising, the flood risk reduction benefits would have a similar effect on the creek capacity in downtown San Anselmo as the proposed Project would; therefore, its ability to meet the project objectives associated with reducing flood risk would be similar. However, the retention of the bridge building at 634-636 San Anselmo Avenue would not allow the same degree of stream channel habitat and riparian corridor improvements as would full removal. Moreover, keeping the building in place would not allow for the same degree of planned public access improvements that would be part of the proposed Project, including increased visibility of the creek and the new sidewalk and patio area above the restored creek channel. Nor would it facilitate future improvements to Creek Park. Raising the building would take longer (Geomorph Design, 2018 estimated it would take at least 66% longer) and be costlier than removing it. The existing tenants would have to be temporarily relocated during construction. It is thus unclear whether this alternative would provide flood risk reduction in balance with available and reasonably foreseeable funding, as intended by the grant. The other objectives include maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting the public health and safety. These would all be met. Therefore, this Raised Building Alternative would partially meet project objectives.

6.3.3.3 Environmental Impacts

Table 6-6 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the creek capacity element of Alternative 3. As stated above, the Nursery Basin Element of the Raised Building Alternative is unchanged from that in the proposed Project; consequently, the impacts would be as characterized throughout Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*. As shown in Table 6-6, most of the impacts attributable to the Downtown San Anselmo Element of the proposed Project would be the same or similar under this alternative. Notable exceptions include the following:

1. ***Aesthetics, Land Use and Planning (Impacts 4.2-1, 4.2-3, 4,10-2 and 4.10-3)***. Retaining the building at 634-636 San Anselmo Avenue would diminish the degree of change, in terms of visual resources (an Aesthetics impact) and community character (a Land Use and Planning impact), at this location in comparison to the proposed Project. Both of these were evaluated as less-than-significant impacts in the proposed Project, so reducing them would not change any significance determinations. Some aesthetic benefits, including replacement of flood walls with more natural appearing bioengineered slopes and establishing visual linkage with Creek Park, would not be realized under this alternative.

2. ***Hazardous Building Materials (Impact 4.8-1)***. As described in Section 4.8, the building at 634-636 San Anselmo Avenue may contain asbestos and other hazardous building materials. Preservation of the building would reduce the potential for release of such materials during demolition; however, this was already a less-than-significant impact under the proposed Project.

3. ***Transportation and Circulation (Impacts 4.15-1, 4.15-2, and 4.15-4).*** There would be slight increases in construction truck trips compared to the proposed Project. In both cases, these construction impacts would be mitigated to less-than significant-levels with the implementation of the Traffic Management Plan required by Mitigation Measure 4.15-1.

Severity and Frequency of Flooding for the Raised Building Alternative (Impact 4.9-4)

Tables summarizing the changes in flood extent and inundation depth are presented in Appendix D, which shows the results of the hydraulic modeling conducted for the proposed Project and alternatives. This alternative would have the same hydraulic and hydrologic effects on flooding as the proposed Project, and it would have the same impact significance. Compared to the proposed Project, this alternative would neither increase nor decrease the extent or depth of flooding under any of the various flood events included in the modeling. That impact would remain significant and unavoidable, and it would be about the same with this alternative.

6.3.4 Alternative 4: Increased Capacity Basin

6.3.4.1 Description

The Increased Capacity Basin Alternative would make the same changes to San Anselmo Creek in downtown San Anselmo as the proposed Project would (i.e., removing the building at 634-636 San Anselmo Avenue and making other creek capacity and channel improvements), but it would construct a larger capacity FDS basin at the former Sunnyside Nursery site, shown on **Figure 6-4** (Stetson Engineers, 2018). This alternative was selected for analysis to investigate whether the provision of additional flood detention capacity could lessen the magnitude of downstream flooding associated with the proposed Project. Additional flooding is identified in Chapter 4 as the only significant and unavoidable impact of the Project. The total capacity of the Increased Capacity basin design would be 41 acre-feet, compared to 31.6 acre-feet for the Project. The bottom elevation of this basin would be 2.5 feet deeper than in the proposed Project. At the southeast corner of the basin, a deeper pocket would be excavated to a depth of 10 feet below the rest of the basin floor to create a sump. A pump would be installed to fully drain the deeper basin when needed. It would also have narrowed setbacks (25 feet instead of 50 feet) from the adjacent property lines on the east and west sides. The top elevation of the eastern embankment (and thus its height as viewed from outside) would be unchanged from that in the proposed Project. The diversion structure, side weir, gated and open openings, riser outlet pipeline, perimeter road, vehicle access, western embankment, floodwall, and perimeter fence would be the same as described for the proposed Project.

As planned, the pump would be a 60 horsepower vertical sump pump to be powered by electricity from the existing grid. It would actively drain the sump and the basin prior to large storm events, shut down during events to reduce peak downstream flows, and then turn on again after the peak discharge has passed. The discharge pipe would empty into Fairfax Creek downstream of the diversion berm at the same point as the primary, passive gated outlet. This basin design necessitates a somewhat more involved operational regime for the Nursery Basin. First, due to the increased depth, more groundwater could emerge in the basin and collect in the sump. Ponded water above the elevation of the top of the sump would passively drain, as in the proposed Project, but any water below that elevation would need to be pumped out as needed to avoid creating breeding habitat for mosquitoes. Alternatively, the pump could cycle on and off at appropriate intervals (e.g. once per week or whatever proved necessary) or when triggered by a float system that automatically turns the pump on and off when water elevations in the sump reach certain levels.

Prior to forecast weather events, the pump would drain any ponded water in the basin or its sump. The pump would be designed to completely empty the basin within 24 hours. As in the proposed Project, before such an event, part of the opening or openings in the diversion structure and the drain pipe gates inside the basin would close and cause water to pond behind the diversion berm in the Fairfax Creek channel. It would then spill over and fill the basin. If the combined storage capacity of the basin and the creek channel behind the diversion berm is exceeded, water would drain over the diversion berm and into downstream Fairfax Creek. Once the storm had passed, and the peak flows had diminished, the passive drain would be opened and the pump switched back on to quickly drain the basin.

6.3.4.2 Ability to Meet Project Objectives

This alternative would meet the Project objectives for flood risk reduction. The larger basin would provide a somewhat greater degree of reduction without increasing downstream risk. The environmental enhancements proposed under the Project (creek channel and stream bank improvements) would be fully realized at the downtown San Anselmo site. Like the Project, this alternative would also add public access and recreational enhancements by improving views of the creek in downtown San Anselmo. The other Project objectives (maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting the public health and safety) would all be met.

A.	**Flow Diversion and Overflow Structure**. Concrete diversion structure with gated opening(s) required to immediately reduce flow passing downstream by partially closing the opening(s) and allowing water to begin filling the basin. The exact dimensions and configuration of the gated opening(s) would be developed during final design to support sediment transport.
B.	**Spillway**. Same as Option 2. The 235-foot elevation spillway would be overtopped only if the gated opening is closed for detention operations and high Fairfax Creek flows continue or rise. Spillway passes estimated 1,000-year flood downstream to Fairfax Creek without basin water surface elevation rising above 236.5 feet – preventing the basin water surface elevation from overtopping the basin.
C.	**Gated Opening**. Same as Option 2. Automatic or manual mechanical gate closure initiates detention operations to immediately reduce flow passing downstream in Fairfax Creek when overbank flooding of vulnerable downstream areas is imminent.
D.	**Ungated Opening**. Same as Option 2. Ungated opening remains always open and suitable for fish passage, sediment transport, and wildlife movement.
E.	**East Levee**. Same as Option 2. 238-foot fill levee top elevation contains temporary basin storage under detention operations. Provides 1.5 feet residual freeboard under potential maximum basin water surface elevation.
F.	**Side-weir**. Same as Option 2. Fairfax Creek begins shallow overflow into the basin while the gated opening remains open when natural high water surface elevations are higher than the 228-foot elevation perimeter road weir segment. Weir and side slopes are rock-armored to prevent erosion by overflow. Under detention operations, the basin drain outlet is closed & the gated opening under the diversion structure is closed and the water surface elevation would rise and fill the basin. At cessation of natural high flows or emergency detention operations, both gates are opened and basin stored water passes back to Fairfax Creek over weir and through outlet pipe. Side slopes may be gradually ramped for maintenance vehicles to access basin floor, and to access Fairfax Creek bed if needed for sediment maintenance.
G.	**Basin Floor**. About 2.5 feet lower than Option 2. Bottom elevation varies from 223.6 feet at northwest corner to 221.3 at southwest corner.
H.	**Basin Drain**. Augmented by Pump Station. If basin receives overflow from Fairfax Creek, upper portion of temporary basin storage drains back to Fairfax Creek by gravity via open storm drain outlet pipe with inlet at elevation 221.3 feet in southeast corner of basin. Because Fairfax Creek bed elevation at basin drain outlet is higher than the drain inlet – approximately 222.4 – a pump is required to eliminate the remainder of temporary ponded water. Pump also required to drain remainder of ponded water following local rainfall runoff entering basin absent overflow from Fairfax Creek.
I.	**Operations and Maintenance Vehicle Access**. Same as Option 2. Access provided by existing or improved driveway bridge, diversion structure, and gated access from Deer Creek Ct cul-de-sac. For the short duration that the basin water surface elevation rises above the spillway, only the driveway bridge and Deer Creek Ct gate would provide vehicle access to basin perimeter. Access ramps to the basin floor may be provided from east, west levees, and side-weir.
J.	**Perimeter Road**. Same as Option 2. 15-foot-wide road for routine maintenance and operations vehicle access. Perimeter road top elevation of 238 feet on west side of basin provides freeboard above the 236.5-foot potential maximum basin water surface elevation.
K.	**West Levee**. Same as Option 2. 238-foot fill levee top elevation contains temporary peak volume storage under detention operations. Provides 1.5 feet residual freeboard for potential maximum basin water surface elevation.
L.	**West Gate**. Same as Option 2. Locked vehicle access gate through fence.
M.	**Deer Creek Court Stormwater Drains and Rip Rap Energy Dissipation Structure**. Same as Option 2. Maximum potential water surface elevations in basin and Fairfax Creek may rise above the existing Deer Creek Ct cul-de-sac storm drain inlet. New storm drain provided to basin floor and to Fairfax Creek downstream from the diversion structure for preventing inundation of cul-de-sac.
N.	**Floodwall/Road Barrier**. Same as Option 2. 238-ft top elevation floodwall provided bordering Sir Francis Drake Blvd for preventing basin overflow onto roadway by providing 1.5 feet residual freeboard for potential maximum basin water surface elevation.
O.	**Perimeter Fence**. Same as Option 2. Security fencing.
P.	**Setback – East**. Narrower than Option 2. Toe of fill levee minimum 25 feet from property line.
Q.	**Setback – West**. Narrower than Option 2. Same as Option 6. Top of basin cut slope minimum 25 feet from property line.
R.	**Rip-Rap Bank Protection**. Same as Option 2. Vegetated rip-rap and other biotechnical bank erosion protection and stabilization both banks Fairfax Creek for protecting habitat and facilities from hydraulic and sediment transport and deposition dynamics during operations.

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

Figure 6-4
Increased Capacity Basin Alternative - Nursery Basin Site Plan

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6.3.4.3 Environmental Impacts

Table 6-5 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the FDS basin in this Increased Capacity Basin Alternative. As stated above, the Downtown San Anselmo Element of the Increased Capacity Basin Alternative would be unchanged from the proposed Project; consequently, the impacts would be as characterized throughout Chapter 4. As shown in Table 6-5, most of the impacts attributable to the Nursery Basin Element of the proposed Project would be the same or similar under this alternative; notable exceptions include the following:

1. ***Air Quality and Greenhouse Gas Emissions; Energy Use (Impacts 4.3-1, 4.3-3, 4.3-4, 4.3 6; 4.4-1)***. In this alternative, the larger FDS basin would necessitate increased earthmoving and off-hauling (by truck) of the excavated material. This would increase construction dust and emissions of criteria pollutants and greenhouse gases in total, but would do so over a longer construction period, which would decrease the average daily emissions. The total emissions and average annual emissions would increase. During the operations phase, there would be slight increases in these emissions and in overall energy use due to the need to operate the sump pump and from occasional maintenance visits to assess the pump and its functioning.
2. ***Biological Resources (Impacts 4.5-1, 4.5-3, 4.5-7, 4.5-8, 4.5-9).*** In this alternative, there would be a slightly increased area of ground disturbance in Fairfax Creek and its riparian corridor to place the second outflow pipe, the pump system, and the bank protection. This would incrementally increase the potential impacts on amphibians and aquatic species and habitats, as well as the riparian area and jurisdictional waters of the U.S. (including any wetlands that are present).
3. ***Hydrology and Water Quality (Impact 4.9-2).*** This alternative's FDS basin would be more deeply excavated, which would increase the necessary amount of construction dewatering and associated best management practices.
4. ***Noise (Impacts 4.11-1, 4.11-4).*** This alternative's longer construction period would increase the duration of construction noise-related disturbances, but would not cause an overall increase in noise levels. Operation of the basin's pump would be a new source of occasional noise during the operational phase, but it is a small (60 hp) electric pump and not expected to be audible at the nearest sensitive receptors.
5. ***Transportation and Circulation (Impacts 4.15-1 through 4.15-4).*** There would be slight increases in construction truck trips compared to the proposed Project (because of greater off-hauling of material). The impacts of these additional construction truck trips would be mitigated to less than significant levels with the implementation of the Traffic Management Plan required by Mitigation Measure 4.15-1.

Severity and Frequency of Flooding for Alternative 4 (Impact 4.9-4)

Tables summarizing the changes in flood extent and inundation depth are presented in Appendix D, which shows the results of the hydraulic modeling conducted for each of the alternatives to the proposed Project. These changes to flooding are the only significant and unavoidable impact expected to result from the proposed Project.

Implementation of the Increased Capacity Basin Alternative would remove more area from the 10-year floodplain and would reduce the depth of inundation more than the proposed Project.

During the 25-year event, it would reduce depth of inundation over a larger area in Fairfax and in much of downtown San Anselmo. However, in the vicinity of the Winship Bridge, it would have similar effects as the proposed Project in increasing inundation extent and depth. During the 100-year event, similar to the proposed Project, this alternative would not substantially reduce the extent of inundation in Fairfax or San Anselmo. That impact, though incrementally reduced by this Larger Capacity Basin Alternative, would remain significant and unavoidable in those few locations near the Winship Bridge whose owners would not accept a flood barrier on their properties. This alternative would bring a larger benefit in the 10-year flood event by reducing the depth of inundation over a larger area than the proposed Project would. Finally, the degree of backwater flooding upstream of the diversion structure in Fairfax Creek would be similar to that in the proposed Project.

6.4 Comparison of Alternatives

6.4.1 Ability to Meet Project Objectives

For ease of reference, **Table 6-7** summarizes the discussion in Section 6.3 regarding the ability of the alternatives to meet project objectives.

6.4.2 Environmental Trade-Offs among Alternatives and Environmentally Superior Alternative

The text below summarizes a comparison of the significant impacts of the proposed Project and Alternatives 1 (No Project), 2 (Morningside/Passive Basin Alternative), 3 (Raised Building Alternative), and 4 (Increased Capacity Basin Alternative), and also discusses the environmentally superior alternative. The State CEQA *Guidelines* require the identification of an environmentally superior alternative. If it is determined that the “no project” alternative would be the environmentally superior alternative, then the EIR must also identify an environmentally superior alternative among the other project alternatives (Section 15126.6).

6.4.2.1 No Project Alternative

As described in Section 6.3.1, the No Project Alternative would avoid all of the environmental impacts of constructing and operating the proposed Project. However, because there would be no reduction in flood risk under the No Project Alternative, the intended benefits of the Project and all of the other alternatives would not be achieved. The severity and frequency of San Anselmo Creek flooding under current conditions would persist, resulting in property damage and economic hardship to residents and businesses. The flooding that is expected to continue under the No Project Alternative would result in numerous adverse environmental impacts to resources within and near the creek. In addition, stream channels and banks and their associated riverine and riparian habitats would not be enhanced by removal of concrete and other materials. In consideration of the impacts identified for the proposed Project and the three “action” alternatives, the No Project Alternative is not considered the environmentally superior alternative.

TABLE 6-7
SUMMARY OF ABILITY OF PROJECT AND ALTERNATIVES TO MEET PROJECT OBJECTIVES

Project Objective	Proposed Project	Alternative 1: No Project	Alternative 2: Morningside/ Passive Basin Alternative	Alternative 3: Raised Building Alternative	Alternative 4: Increased Capacity Basin Alternative
	Would the project or alternative meet the objective?				
1. Reduce the risks related to both frequency and severity of flooding.	Yes	No	Partial (some improvement but not as much as intended by project or its grant funding)	Yes	Yes
2. Provide multiple public benefits including environmental enhancements and recreational enhancements.	Yes	No	Partial (reduced environmental enhancements and no recreational benefits)	Partial (both environmental enhancements and recreational benefits would be minimal)	Yes
3. Provide a flood risk reduction project in balance with available and reasonably foreseeable funding.	Yes	No	Yes	Yes (at an increased cost)	Yes
4. Maintain the quality of adjoining neighborhoods.	Yes	Yes	Yes	Yes	Yes
5. Ensure basin design meets community needs.	Yes	No	Partial (reduced basin capacity would not provide intended flood risk reduction)	Yes	Yes
6. Comply with local, state, and federal environmental laws and regulations.	Yes	Yes	Yes	Yes	Yes
7. Protect the public's health and safety.	Yes	No	Yes	Yes	Yes

6.4.2.2 Environmental Trade-offs among Action Alternatives

The environmental impacts of the action alternatives vary; as a result, there are trade-offs in the environmental impacts of each, summarized below.

Flood Risk

Reduction in flood risk (extent and inundation depth) in the Fairfax-San Anselmo area is the fundamental purpose and key environmental benefit, in terms of avoided impacts, of the proposed Project. Most of the alternatives provide similar flood risk reduction except for the Morningside/Passive Basin Alternative, due to the reduced capacity provided by the FDS basin in that alternative and because of the different hydrologic effects of shifting the creek capacity improvements into Sleepy Hollow Creek. Also, some of the benefits in reduced flood risk would occur in a portion of the Morningside neighborhood instead of in downtown San Anselmo.

As discussed in Section 4.9, Hydrology and Water Quality (Impact 4.9-4), the only significant and unavoidable impact of the proposed Project is that it could increase flood risk in two locations and for different reasons:

1. The first location is along a short section of San Anselmo Creek near the Winship Bridge. Flows in San Anselmo Creek in the 25-year event that are currently constrained by the foundations of the building at 634-636 San Anselmo Avenue would instead be passed downstream and would be constrained by the Winship Bridge. In the Morningside/Passive Basin Alternative, this effect would be reduced because the building at 634-636 San Anselmo Avenue would remain in place. Instead, the removal of the two bridge foundations in Sleepy Hollow Creek in the Morningside/Passive Basin Alternative would pass increased flows from Sleepy Hollow Creek into San Anselmo Creek, where capacity would remain limited and increase flood inundation depths in portions of downtown San Anselmo, both upstream and downstream of the project area. In the Increased Capacity Basin Alternative, this effect would be incrementally reduced because of the larger capacity of the upstream FDS basin at the Nursery Basin site.

2. The second location is along Fairfax Creek upstream from the diversion structure. Because the diversion structure would detain water in the creek channel, the sediments carried by Fairfax Creek would settle out and deposit in the channel upstream of the diversion structure. That reduces storage capacity and changes the timing of the operation of the basin system. If substantial deposition were to occur prior to subsequent large storms and flood events and before it could be removed from the channel by the Flood Control District, there could be an increased risk of backwater flooding (i.e., additional pooling of water beyond that intended by the design) that could extend upstream into the Deer Creek Court area to the west of the Nursery Basin site.

As discussed in Section 4.9, if Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas were implemented on all of the adversely affected areas, the adverse impacts would be fully mitigated in both locations. However, because the Flood Control District can neither compel private landowners to accept a flood barrier on their properties nor fully control the schedule for implementing the Winship Bridge Replacement Project, this impact must be considered significant and unavoidable.

Alternatively, this impact could be avoided in the San Anselmo area if removal of the Winship Bridge from San Anselmo Creek (described in Chapter 5, *Growth-Inducing and Cumulative Impacts*) were to be completed prior to removal of 634-636 San Anselmo Avenue. This is expected to happen in time to avoid this potential effect, but that is not certain. That external project would not affect the potential for backwater flooding along Fairfax Creek upstream of the FDS basin site, and so Mitigation Measure 4.9-4 is the only option to reduce this impact to a less-than-significant level.

FDS Basin Elements

Among the FDS basin elements considered, the severity and magnitude of many construction- and operational-phase impacts at and in the vicinity of the Nursery Basin site would generally be less with the passive basin than with either the proposed Project or the Increased Capacity Basin Alternative because construction of the diversion structure would not occur, resulting in less extensive conversion and disturbance of aquatic and riparian habitat and associated special-status species within Fairfax Creek. The passive basin would also remove fewer trees, which would also reduce the changes to the visibility of the site from Sir Francis Drake Boulevard (an Aesthetic and Visual Resources impact). While daily truck trips and associated air pollution emissions would be greater than under either the proposed Project or the Increased Capacity Alternative on a *daily* basis, there would be fewer truck trips *overall* and the duration of construction (and thus construction-related traffic, air quality and noise impacts) would be two months shorter. The passive basin would also reduce operational impacts associated with the need to remove deposited sediment from behind the diversion structure; this annual removal of deposited material would be a repeated impact to the stream channel, water quality, and aquatic and amphibian wildlife species. The different basin designs are otherwise quite similar in both the proposed Project and the action alternatives with regard to increases in scour/erosion potential and other hydraulic impacts.

Creek Capacity Elements

Among the creek capacity elements considered, the severity and magnitude of impacts to the natural (as opposed to human) environment would be less with the Morningside/Passive Basin Alternative than with either the proposed Project or the Increased Capacity Basin Alternative because the extent of disturbance to stream habitat would be less. However, implementing creek capacity improvements on Sleepy Hollow Creek instead of on San Anselmo Creek at the downtown location would essentially transfer impacts to a location surrounded by residences, which are more sensitive to construction-phase disturbance (e.g., noise and vibration, transportation, land use) than commercial uses. Under the Raised Building Alternative, almost all of the impacts attributable to the Downtown San Anselmo Element of the proposed Project also would occur; consequently, this alternative offers little environmental advantage. Construction-phase truck trips would be incrementally greater under this alternative, and some environmental benefits of the Project (converting flood walls to bioengineered slopes) would not be realized. This alternative would also have somewhat reduced impacts from changes in community function and character and visual impacts (both of which would be less than significant in the proposed Project) from retaining the bridge building.

6.4.2.3 Environmentally Superior Alternative

One of the main goals of identifying an environmentally superior alternative under CEQA is to reduce or eliminate significant and unavoidable impacts from the Project being considered. By that definition, because the Morningside/Passive Basin Alternative would avoid the potential for Project-related backwater flooding upstream of the FDS basin site and is the only alternative that would do that, it the environmentally superior alternative.

However, the Morningside/Passive Basin Alternative would increase flood risk in portions of downtown San Anselmo that would not be adversely affected by the proposed Project, and it would not wholly avoid the significant and unavoidable impact of increased flood risk near the Winship Bridge (i.e., between Barber Avenue and the Sir Francis Drake Bridge). If, however, either implementation of Mitigation Measure 4.9-4 or the Winship Bridge Replacement Project could be assured to occur prior to removal of the bridge building at 634-636 San Anselmo Avenue, then an alternative combining the passive basin component of the Morningside/Passive Basin Alternative with the Downtown San Anselmo Element of the proposed Project would be considered environmentally superior based on the environmental trade-offs described in the preceding sections. This combined alternative would reduce construction impacts on biological, water quality, and most hydrologic impacts, including the sediment deposition and backwater flooding upstream of the diversion structure, compared to the proposed Project. It would also reduce flood risk compared to existing conditions, but the flood risk reductions would be less than the proposed Project. Therefore, it would not be as effective in reducing or avoiding adverse environmental impacts. Accordingly, this modified alternative would be the environmentally superior alternative, but it would have less overall benefit from flood reduction. Further, in those locations that would experience increased flood risk in the proposed Project (as compared to the existing conditions), there would be an additional incremental increase in those risks from this modified alternative. This combination was not one of the initial alternatives because the modeling of all of the combinations of different design elements was not completed when this alternatives analysis began.

Finally, if Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas were implemented on all of the adversely affected areas, the adverse impacts would be mitigated to a less-than-significant level, and this modified alternative would be the environmentally superior alternative. However, as discussed in Section 4.9.3.3, the Flood Control District cannot compel private landowners to accept a flood barrier on their properties. Also, as discussed in Chapter 5, *Growth-Inducing and Cumulative Impacts*, under the expected future conditions, the significant and unavoidable impact would be avoided by the replacement of the Winship Bridge, which would take its flow-constraining foundations out of San Anselmo Creek, allowing flows to pass downstream and avoiding the increased flood risk upstream of the bridge. This bridge removal is part of the Ross Valley Program; it is recommended by the Ross Town Council for construction in 2020.

6.5 Alternatives Considered but Eliminated from Further Analysis

This section discusses several possible alternatives to the proposed Project that the Flood Control District considered but rejected from further analysis because the alternative would fail to reduce the potential environmental impacts of the project or would increase impacts compared to the proposed Project, because they were not feasible to implement, and/or because they failed to meet most of the basic objectives of the Project. These potential alternatives and the reasons for their rejection are summarized in **Table 6-8** and described below.

6.5.1 No-Basin Alternative

6.5.1.1 Description

As its name implies, the No-Basin Alternative would have attempted to achieve a comparable level of flood risk reduction as the originally proposed Memorial Park Basin Alternative and as the proposed Project, but it would do so without any FDS basins. This alternative was based on the recognition that it can be difficult to obtain approval from local residents for construction of a multi-use flood storage and diversion basin. It instead focuses on removing flow constraints and improving channel capacity.

TABLE 6-8
ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER CONSIDERATION

Potential Alternative Identified	Description	Ability to Meet Project Objectives / Reasons for Rejection
No-Basin Alternative	• Would have removed more flow-constraints and added more creek capacity improvements	• Would not meet most Project Objectives: would not provide a sufficient reduction in flood risk • Reduced impacts associated with basin construction • Increased impacts associated with in-stream construction; similar operational impacts
Memorial Park Basin Alternative	• The originally funded project • Would have included a large, dual-use FDS basin in a reconfigured playing field at Memorial Park; during periods without extreme flooding, park would remain open for current uses	• Would meet most of the project objectives • Similar or potentially reduced construction impacts as proposed Project; similar operational effects • Not acceptable to the community; would not have complied with local ordinance Measure D
Sleepy Hollow Creek Watershed Alternative	• Construct FDS basin at Brookside Elementary School • Remove or replace Morningside Drive Bridge • Extensive Sleepy Hollow Creek channel improvements	• Would not meet project objectives • Would have similar or increased adverse environmental impacts from construction with less flood risk reduction
Fairfax Creek Alternative 1	• Construct FDS basin at former Sunnyside Nursery site • Remove building at 634-646 San Anselmo Avenue; modify or replace building at 540-546 San Anselmo Avenue • San Anselmo Creek improvements, including removing concrete weir and other flow constraints • Add a public access trail to the perimeter of the basin property to connect to a trail in the Loma Alta Open Space area to the north	• Would meet project objectives • Would result in increased downstream flood risk • High environmental impacts during construction phase • Public access trail not feasible for lack of connectivity options, parking, or other amenities
Lefty Gomez Basin Alternative (Fairfax Creek Alternative 2)	• Construct multi-use FDS basin at former Lefty Gomez Field site • Sleepy Hollow Creek channel improvements	• Would meet project objectives • Not acceptable to the community • Similar or increased construction impacts; similar operational impacts
Green Infrastructure and Flood-proofing Actions Alternative	• Low-impact development policies • Stormwater infiltration • Green infrastructure • Flood proofing • Home elevation	• Would not meet project objectives • Components already part of Ross Valley Flood Protection and Watershed Program • Would not provide a sufficient reduction in flood risk
Accelerated Implementation of Winship Bridge Replacement Project Alternative	• Accelerate Winship Bridge replacement to ensure that Winship Bridge replacement is complete prior to or concurrent with Project completion.	• Would meet project objectives • Infeasible (Flood Control District does not fully control implementation schedule of Winship Bridge Replacement Project)
Phased Implementation/ Temporary Flow-Constraining Alternative	• Install temporary flow-constraining systems in place of building foundations at 634-634 San Anselmo Avenue • Once Winship Bridge is removed, the flow-constraining system would be removed as well	• Would not meet project objectives in the short term; could in the long-term • Reasons for Rejection - Infeasible (Flood Control District does not control implementation of Winship Bridge Replacement Project) - Uncertainty of outcome not acceptable to Flood Control District

This potential alternative included the removal of the building bridge at 634-636 San Anselmo Avenue, and replacement or modification of building bridges at 540-546 San Anselmo Avenue and 638-702 San Anselmo Avenue. It also included structural modifications to a building that overhangs the creek (at 510-524 San Anselmo Avenue). and the replacement of the Sir Francis Drake Blvd. bridge in the Town of Ross (not far downstream of the San Anselmo border). It also included additional downstream creek flow improvement measures, such as flood walls/flood barriers, channel enlargements and biotechnical bank stabilization.

6.5.1.2 Reasons for Rejection

While detailed two-dimensional hydraulic modeling was not conducted for this alternative, a preliminary analysis of the hydraulic performance of this alternative indicated that it has the potential to reduce localized flooding in the areas where the improvements would be made. However, a simplified version of the hydraulic modeling completed for the other alternatives under consideration was sufficient to indicate that some temporary detention of peak flows is necessary to meet objectives of the Project and the DWR grant requirement of providing a comparable level of flood risk reduction to the original Memorial Park FDS basin (Geomorph Design, 2016). This alternative would not reduce flooding enough to meet that target. It would also have increased downstream flood risk.

6.5.2 Memorial Park Basin Alternative

6.5.2.1 Description

The original plan for a flood risk reduction project in and around the Town of San Anselmo included a large FDS basin at Memorial Park. That basin would have had capacity for up to 80 acre-feet of water from Sorich Creek, a small tributary to San Anselmo Creek a short distance upstream of that confluence. This project concept was the one that the California Department of Water Resources' grant was intended to fund. However, in November of 2015, voters in the Town of San Anselmo passed a voter-sponsored initiative (Measure D) to prohibit the Town government and the Flood Control District from building a basin at Memorial Park.

6.5.2.2 Reasons for Rejection

Following the passage of Measure D, the Memorial Park Basin Alternative was no longer feasible due to its rejection by the community and presumed (based on Measure D) failure to meet the project's objectives to ensure basin design meets community needs and to maintain the quality of adjoining neighborhoods. This alternative was removed from further analysis and consideration, but its level of flood risk reduction became the target for subsequent migration of the grant funds to a replacement project, which is now the proposed Project.

6.5.3 Sleepy Hollow Creek Watershed Alternative

6.5.3.1 Description

The Sleepy Hollow Creek Watershed Alternative included upstream detention at Brookside Elementary School (4 acre-feet), replacing the Morningside Drive Bridge, and implementing channel improvements and creek restoration components including those described in the Morningside/Passive Basin Alternative, plus much more extensive enhancements that would begin at the confluence with San Anselmo Creek and continue upstream towards Brookside Elementary School. This alternative also included several channel improvements along Sleepy Hollow Creek, including replacement or removal of the Morningside Drive Bridge, and slope stabilization, restoration and habitat enhancements along Sleepy Hollow Creek between the confluence point at San Anselmo Creek and the area upstream of Arroyo Avenue. Construction of a multi-purpose FDS basin at this location would require reconstructing sport field facilities below grade and enhancing recreational facilities at the school. The size and location of the site limited this FDS basin to approximately 4 acre-feet of storage , as compared to the 80 acre-feet that could have been provided by the original Memorial Park Project and comparable combined reductions in flood risk from the currently proposed Project.

6.5.3.2 Reasons for Rejection

As explained above, the multi-purpose detention basin at Brookside Elementary School site would have brought a small flow reduction benefit of 4 acre-feet. This was an insufficient amount of flood risk reduction to meet the objectives of this project, even in combination with the creek channel capacity improvements. In fact, making the flow capacity improvements to Sleepy Hollow Creek without also providing more upstream storage could have exacerbated flood risk problems downstream in downtown San Anselmo.

6.5.4 Fairfax Creek Alternative 1

6.5.4.1 Description

In many ways, this alternative is a larger version of the proposed Project. Fairfax Watershed Alternative 1 included an FDS basin at the former Sunnyside Nursery site, removing one building bridge and replacing another in downtown San Anselmo and implementing a set of creek restoration improvements (including removing deposited sediment, a concrete weir, and other structural impairments to creek flow), also in downtown San Anselmo. It also would have added a public access trail around a portion of the perimeter of the Nursery Basin property to connect to a trail in the Loma Alta Open Space area immediately adjacent to the northern edge of the property.

The buildings that would have been removed were 634-636 San Anselmo Avenue (the same as in the proposed Project) and 540-546 San Anselmo Avenue. The latter of these buildings could have been permanently removed, modified or rebuilt in order to remove creek channel capacity constraints. In addition, the portion of San Anselmo Creek between these two structures would have been improved to add capacity. Concrete foundations and a weir would have been removed. Slope stabilization, creek restoration and habitat enhancements along San Anselmo Creek could reduce localized flooding while providing top-of- bank recreational opportunities, and could improve public access along San Anselmo Creek through the downtown area.

The FDS basin at the former Sunnyside Nursery site was originally conceptualized as having approximately 65 acre-feet of storage capacity. This capacity was also the initial plan for the proposed Project, but due to site constraints and input from neighbors, the Flood Control District reduced the planned capacity for a basin at this location, as in the proposed Project.

6.5.4.2 Reasons for Rejection

The Fairfax Creek Alternative 1 is similar to the proposed Project in that it would have the same FDS basin site (and presumably the same capacity, as described above) and would address creek channel capacity improvements in the downtown portion of San Anselmo Creek. The main difference is that this alternative also would have removed several other flow constraining structures at substantial additional cost, necessitated acquisition of more parcels of land and buildings, and would have created more substantial changes in the visual character and land use in downtown San Anselmo than the proposed Project. Overall, there would have been increased levels of construction relative to the proposed Project, involving greater construction impacts due to more in-stream work with a greater potential for adverse impacts on biological resources.

Without adding more upstream storage in the form of FDS basins, the added flow capacity from the full implementation of this alternative would have increased the delivery of peak stream flows to the downstream communities in the Ross Valley, including Kentfield, Ross, and Corte Madera. The proposed downtown San Anselmo improvements would have increased the water surface elevation downstream more than could be compensated for by the revised former Sunnyside Nursery site FDS basin alone. This would have increased the overall flood risk of the larger Ross Valley at an increased cost and an increased level of construction-related environmental impacts, making it infeasible to implement.

Finally, the public access trail element of this alternative was determined to be infeasible at this location because there is no safe parking area along Sir Francis Drake Boulevard and because there is no other trail or public access feature or amenity to connect to the Loma Alta trail. For all of these reasons, this alternative was removed from further consideration, and a scaled-down version of it became the proposed Project.

6.5.5 Lefty Gomez Basin Alternative

6.5.5.1 Description

The Lefty Gomez Basin Alternative was originally called Fairfax Watershed Alternative 2. It included a large, multi-use FDS basin (up to 90 acre-feet) at Lefty Gomez Field, which is a large ballfield adjacent to White Hill Middle School, in the Fairfax subwatershed. It would also include minor creek improvements to improve channel capacity on Sleepy Hollow Creek, near the Morningside Bridge. It would not include work in downtown San Anselmo or bridge removals. In a study of possible FDS basin sites (CH2M 2015), this site ranked highest for flood risk reduction because it could store a large amount of storm water (very close to that of the Memorial Park FDS

Basin in the initial project concept). It also would have afforded opportunities to incorporate recreational enhancements to Lefty Gomez Field, which would have been reconstructed in the footprint of that FDS basin. It would not have required purchase of any private property for the basin location (as the Flood Control District did for the former Sunnyside Nursery property), because the field is a public/quasi-publicly-owned facility. However, acquisition of temporary or permanent easements would have been necessary for approximately 10 parcels along Sleepy Hollow Creek, where the creek improvements would have been made. This alternative would have required close coordination with the school district and public outreach with the parents of students, residents near the school, and the community.

6.5.5.2 Reasons for Rejection

The public in the Towns of San Anselmo and Fairfax expressed similar concern about the FDS basin at the Lefty Gomez Field as they did about the Memorial Park basin location. Due to community resistance to incorporate flood diversion and storage into an existing park facility, this option was not as acceptable or feasible to construct. Therefore, it would not have achieved the objective of meeting community needs. Subsequently, the Flood Control District was able to acquire the property that until recently had been the site of the Sunnyside Nursery. That property is only one-quarter mile upstream of Lefty Gomez Field, and the proposed FDS basin at that location would be able to hold a comparable volume of water to the basin that could have been constructed at the Lefty Gomez Field location. Given those considerations, the Lefty Gomez Field Alternative was removed from further consideration.

6.5.6 Green Infrastructure and Flood-proofing Actions Alternative

6.5.6.1 Description

In several instances, including at the scoping meetings for this Project and for the Ross Valley Program, recommendations have been made to the Flood Control District to consider implementing or encouraging sets of spatially distributed actions that do not depend on large structural actions to be implements in discrete locations (such as an FDS basin is). These smaller and widespread actions would collectively increase stormwater infiltration and thereby decrease the volume in the creeks, thereby decreasing the likelihood of overtopping those creek channels Some of the measures to increase stormwater infiltration would be policies that the Flood Control District and local Towns could use to encourage private landowners to implement on their land. Others would be smaller efforts undertaken by the Flood Control District or other communities in Marin County. Suggestions for these have included:

1. Low-impact development policies such as setbacks
2. Rain gardens, rain barrels and cisterns
3. Other infrastructure projects like green streets
4. A catch basin in Creek Park
5. Raising single-family homes
6. Flood-proofing commercial buildings

For the purposes of this EIR, these different concepts were grouped into a single alternative for discussion in this chapter.

6.5.6.2 Reasons for Rejection

These potential solutions can have some effectiveness in reducing flood risk when taken in aggregate in many locations within a watershed. However, even in the aggregate, they would not achieve the most basic project objectives of intended levels of flood risk reduction. Further, most of them would be implemented by individual property owners or other entities and not directly by the Flood Control District. Therefore, these solutions are best viewed not an alternative to the proposed Project but as efforts that could be made in addition to it. In fact, these different solutions are element types that are included in the Ross Valley Flood Protection and Watershed Program being undertaken now by the Flood Control District. These elements will complement the outcomes of the proposed Project.

6.5.7 Accelerated Implementation of Winship Bridge Replacement Project Alternative

6.5.7.1 Description

As discussed in Section 4.9, Hydrology and Water Quality, the Project would result in new inundation during the 25-year event upstream of Winship Avenue, due in part to the channel constriction caused by the Winship Bridge. This impact could be avoided if the Winship Bridge Replacement Project were to be completed prior to removal of 634-636 San Anselmo Avenue. The Winship Bridge Replacement Project is fully funded and likely to occur concurrent with construction of the proposed Project (i.e., it is expected to be completed between 2019 and 2022). This alternative would seek to accelerate implementation of the Winship Bridge Replacement Project to ensure that the Winship Bridge replacement project is complete prior to or concurrent with completion of the proposed Project.

6.5.7.2 Reason for Rejection

As discussed in Section 4.9, Hydrology and Water Quality and in Chapter 5, *Growth-Inducement and Cumulative Impacts*, the Winship Bridge replacement project is funded jointly by the California Department of Transportation, the Town of Ross (which is also the CEQA lead agency), and by the Flood Control District. If completion of the Winship Bridge replacement prior to completion of the proposed Project could be assured, this alternative would avoid the potentially significant impact associated with increased inundation levels and would meet all Project objectives. However, because the Flood Control District cannot fully control implementation of the Winship Bridge replacement project, consistent with CEQA,[4] this alternative is considered infeasible. Also, this alternative would not reduce the potential for backwater flooding upstream of the diversion structure in Fairfax Creek in the proposed Project.

[4] State CEQA *Guidelines* Section 15126.6(f)(1).

6.5.8 Phased Implementation/Temporary Flow-Constraining Alternative

6.5.8.1 Description

Under this alternative, the proposed Project would be constructed as described throughout this EIR, with the Nursery Basin being built and operated as described and with the same impacts. The Downtown San Anselmo Element would be the same as well, except that following the removal of the building foundation and implementation of all of the other creek channel improvements, a temporary system of flow-constraining components would be installed to retain water in the same way that the building foundation does in the existing condition. Those components could include an inflatable weir, flow baffles, or some other temporary and manageable system of flow constraints. The intent would be to not pass flows downstream and into the area near the Winship Bridge and instead maintain the current flooding regime in downtown San Anselmo until such time and the Winship Bridge can be removed. Once the Winship Bridge is removed, the flow-constraining system would be as well, and the result would be full completion of the proposed Project. Therefore, this alternative is a phased implementation of the proposed Project.

This alternative would avoid increasing downstream flooding near the Winship Bridge, and it would still reduce the extent and depth of flooding in downtown San Anselmo because of the upstream FDS basin at the Nursery Basin site. However, it would reduce the benefit and the effectiveness of the Project during the period between completion of the San Anselmo Flood Risk Reduction Project and the removal of the Winship Bridge.

6.5.8.2 Reason for Rejection

This alternative would not meet project objectives in the short term. During that time, the temporary flow-constraining system would undo much of the potential benefit of the Project. During the longer term, it would fully implement the proposed Project and meet the same objectives it would. However, the Flood Control District does not control the Winship Bridge Replacement Project. If the Winship Bridge removal were to not be completed for some reason, this system would become permanent and result in a substantial amount of ongoing flooding in the areas that were targeted for flood reduction by the funding source. This uncertainty of outcome makes this alternative infeasible and unacceptable to the Flood Control District. Also, this alternative would not reduce the potential for backwater flooding upstream of the diversion structure in Fairfax Creek in the proposed Project.

6.6 References

CH2M, Ross Valley Flow Reduction Study Report, November 2015.

Geomorph Design, Memorandum from Matt Smeltzer to Flood Control District regarding Modifying Bridge-Building 2 – Summary Feasibility Evaluation, February 28, 2018.

Geomorph Design, Technical Memorandum: “Proxy” Plans for Preventing Potential Downstream Effects of the Proposed Downtown San Anselmo Creek Restoration Project, December 2, 2016.

Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017.

Stetson Engineers Inc. (Stetson Engineers 2018a), Report on Hydraulic Analysis of the Morningside Alternative, May 2, 2018.

Stetson Engineers Inc. (Stetson Engineers 2018b), San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

CHAPTER 7
Report Preparation

This EIR was prepared by an environmental team led by ESA. The analyses were coordinated by the Marin County Community Development Agency staff.

7.1 Persons Responsible for Report Preparation and Contributors to the EIR

7.1.1 Marin County Community Development Agency

- Rachel Reid, Environmental Planning – Planning Manager

7.1.2 Marin County Department of Public Works

- Liz Lewis, Planning Manager
- Russ Eberwein, Senior Engineer
- Tony Williams, Flood Control Division Manager
- Liz Lotz, Resource Specialist GIS

7.1.3 Marin County Parks and Open Space

- Kristina Tierney, Open Space Planner

7.1.4 Environmental Science Associates

- Jim O'Toole, Project Director
- Dave Halsing, Project Manager
- Karen Lancelle, Deputy Project Manager, Hydrology and Water Quality
- Dave Davis, Aesthetics and Visual Resources
- Matthew Fagundes, Air Quality, Greenhouse Gas Emissions, Energy Resources
- Brian Schuster, Air Quality, Greenhouse Gas Emissions, Energy Resources
- Liza Ryan, Biological Resources
- Jill Sunahara, Biological Resources
- Heidi Koenig, RPA, Cultural Resources

- Michael Burns, Geology, Hazards and Hazardous Materials
- Ari Frink, Hydrology and Water Quality, Project Associate
- Luke Evans, Land Use, Recreation
- Stan Armstrong, Noise
- Alena Maudru, Population and Housing, Public Services and Utilities, Project Associate
- Jack Hutchison, PE, TE, Transportation and Circulation
- Meryka Dirks, Cumulative Impacts
- Jill Hamilton, Alternatives
- Wes McCullough, GIS
- Lisa Bautista, Desktop Publishing
- Anthony Padilla, Production
- Logan Sakai, Desktop Publishing, Production

7.1.5 Stetson Engineers

- James Reilly, Lead Engineer
- Xiaoqing Zeng, Project Engineer

7.1.6 Geomorph Design

- Matt Smeltzer

7.1.7 Consultant to the Marin County Community Development Agency

- Dan Sicular

7.1.8 Walls Land Water +Design

- Scott Walls

APPENDIX A
Notice of Preparation and Scoping Report

NOTICE OF PREPARATION AND
NOTICE OF PUBLIC SCOPING MEETING
FOR THE
SAN ANSELMO FLOOD RISK REDUCTION PROJECT
ENVIRONMENTAL IMPACT REPORT

The Marin County Flood Control and Water Conservation District (Flood Control District) will be preparing an Environmental Impact Report (EIR) for the San Anselmo Flood Risk Reduction Project (Project). The Project involves implementing various flood risk reduction measures in Fairfax and San Anselmo to achieve a 25 year level of flood protection, located in central eastern Marin County.

The Project proposes several flood reduction elements (elements) designed to reduce flood risk in the watershed. Proposed elements include:

- Increasing creek and floodplain capacity to convey floodwaters.
- Removing or modifying buildings to convey floodwaters
- Enlarging some channels through the removal or modification of existing obstructions to flow.
- Reducing peak discharge and attenuating flows by increasing floodplain detention storage

This Project is part of the overall Ross Valley Watershed and Flood Risk Reduction Program that includes approximately 180 potential elements to increase the capacity of Corte Madera Creek and its tributaries as well as up to five or more detention basins located throughout the watershed. When implemented in concert, these elements provide flood risk reduction on a watershed-wide scale.

Project construction is estimated to occur over portions of two years in 2019 and 2020. In addition to certification of this EIR, regulatory permits from State and Federal agencies are required to construct these projects. Additional details about the Project are provided online at http://www.marinwatersheds.org/rossvalleywatershed-org/.

The Flood Control District is the lead agency, pursuant to the State Guidelines for the California Environmental Quality Act (State CEQA Guidelines Section 15050) for the preparation of an EIR. This EIR is being prepared by the Flood Control District in accordance with CEQA, the State of California CEQA Guidelines, and County Environmental Impact Review Guidelines. This EIR is being prepared as a project-level EIR, pursuant to the State Guidelines for the California Environmental Quality Act (State CEQA Guidelines Section 15161). This EIR will evaluate the following topical issues, but will focus on some issues more than others:

1) Aesthetics and Visual Resources	6) Geology, Soils, and Seismicity	11) Population and Housing
2) Air Quality and Greenhouse Gas Emissions	7) Hazards and Hazardous Materials	12) Public Services and Utilities
3) Biological Resources	8) Hydrology and Water Quality/Climate Change	13) Parks and Recreation
4) Cultural Resources	9) Land Use and Planning	14) Transportation, Circulation and Parking
5) Energy, Mineral, Forest and Agricultural Resources	10) Noise	

To ensure that the EIR for this San Anselmo Flood Risk Reduction Project is thorough and adequate, and meets the needs of all agencies reviewing it, we are soliciting comments on specific issues to be included in the environmental review. Public comments on the scope of issues to be evaluated in the EIR are encouraged. Details of the proposed Project elements are available on the Program website: http://www.marinwatersheds.org/rossvalleywatershed-org/.

To maximize public involvement a public scoping session meeting is planned for **Thursday, April 20, 2017 from 7:00 p.m. to 9:00 p.m. at the San Anselmo Town Hall, 525 San Anselmo Avenue, San Anselmo, CA 94960.** A presentation on the Project will begin at 7:10pm. Informational stations about the Project will be available for review and input before the meeting at 6:30 p.m. and after the meeting until 9:00 p.m. Public agencies, community groups and interested members of the public are invited to attend this meeting and present oral or written comment on the proposed Project. Hard copies of the scoping session materials will not be distributed in advance of the meeting; however can be found on the Ross Valley Watershed Program website, http://www.marinwatersheds.org/rossvalleywatershed-org/, and will be available in hard copy at the scoping session. You may also subscribe to the Program website and receive notices about future meetings and new information posted to the site.

If you wish to comment during the Notice of Preparation (NOP) comment period, or if you cannot attend the scoping meeting, we will accept written comments about the scope of the environmental report until the close of the NOP comment period at **4:00 p.m. on May 8, 2017**. Commenters are advised to mail written comments (postmarked on or before May 4) to the attention of Rachel Reid, Environmental Planning Manager at 3501 Civic Center Drive, Suite 308, San Rafael, CA 94903. Comments can also be submitted via email to

EnvPlanning@marincounty.org before the end of the comment period deadline. Please direct questions about the Project description to Liz Lewis, Planning Manager in the Department of Public Works at (415) 473-7226 or lizlewis@marincounty.org.

Rachel Reid,
Environmental Planning Manager

The San Anselmo Town Hall is accessible to persons with disabilities. If you require American Sign Language interpreters, assistive listening devices, or if you require this document in an alternate format (example: Braille, Large Print, Audiotape, CD-ROM), or if you require other accommodations to participate in this meeting, you may request them by calling (415) 473-2255 (voice/TTY) or 711 for the California Relay Service or e-mailing disabilityaccess@marincounty.org at least **four working days** in advance of the event.

Responses to NOP and Disposition of NOP Responses

This appendix contains written responses to letters received by the Marin County Flood Control & Water Conservation District (Flood Control District) in response to the NOP, submitted by interested individuals and organizations related to the San Anselmo Flood Risk Reduction Project Environmental Impact Report (EIR). Also included are responses to comments received during the scoping meeting held April 20, 2017, at San Anselmo Town Hall. The scoping period closed on May 8, 2017. Seven written comments were received and four speakers provided comments during the scoping meeting. **Table A-1** includes a summary of the comments received by Flood Control District for the EIR in response to the NOP. Responses to the comments are provided in the table.

The comment letters received on the NOP follow Table A-1.

TABLE A-1
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 20, 2017	Sally Goldman	• The aesthetic value of a restored creek in the downtown San Anselmo area would be a benefit to the community and the EIR should discuss that	• Section 4.2, Aesthetics and Visual Resources
April 20, 2017	Brian Hennessy	• Effects of detention basin use on local groundwater hydrology, ground settlement, and liquefaction	• Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources • Section 4.9, Hydrology and Water Quality
April 20, 2017	Lise Stampfu Jorme	• Cumulative effects of upstream flood reductions on downstream communities and ecosystems should be described and evaluated	• Chapter 5, Growth-Inducing and Cumulative Effects
		• Evaluate the long-term impact of sea level rise on project effectiveness	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Richard Lee	• Witnessed creek levels at various location in downtown San Anselmo, Ross, and College of Marin during winter 2016/2017 flood events	• Chapter 3, Project Description
		• Recalls activities during the flood event on the evening of 1/10/17 including the flood siren sounding, peak creek levels, flooding in downtown areas, and road closures on Sir Francis Drake Boulevard	• Section 4.9, Hydrology and Water Quality
		• Concludes that the capacity of the creek in the College of Marin/Ross areas is similar to that of downtown San Anselmo, and that most of the improvements under consideration will not prevent flooding	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Carol Page	• CEQA process should include improved provision of information to the public	• Chapter 1, Introduction (CEQA process) • Chapter 3, Project Description
		• The project could increase flood risks to downstream areas	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Anne Petersen	• Include description and analysis of the sequencing of different implemented flood protection actions on downstream communities	• Chapter 3, Project Description • Section 4.9, Hydrology and Water Quality
		• Include noise analysis of any pumps or other infrastructure designed to help manage flooding	• Section 4.11, Noise
April 26, 2017	Suzuki Cady + 76 other area residents	• Detention basins are unpopular to the residents, who voted down a flood basin project in San Anselmo in 2015 and have spoken out against their use and location at several flood advisory board meetings	• Chapter 3, Project Description
		• Detention basins are hazardous due to stormwater surging in and out at high velocity, and stormwater debris containing hazardous materials	• Section 4.9, Hydrology and Water Quality

Table A-1 (continued)
Summary of Public Comments Received in Response to the NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 26, 2017 (cont.)	Suzuki Cady + 76 other area residents (cont.)	• Examples of deaths due to flash floods and drowning in detention basins	• Section 4.9, Hydrology and Water Quality
		• Detention basins can fail and flood nearby residents	• Section 4.9, Hydrology and Water Quality
		• Detention basins are susceptible to clogged drains from trash, debris, and stormwater detritus	• Section 4.9, Hydrology and Water Quality
		• Detention basins require dams and spillways, which may fail over time	• Section 4.9, Hydrology and Water Quality
		• Detention basins are expensive to build and maintain, who will pay for their future maintenance?	• Chapter 3, Project Description
		• Earthquake damage to the detention basin is likely	• Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources
		• Want to know who will be liable for a levee or spillway breach impacting those who live downstream	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment; Liability related to possible project failure is not subject to analysis under CEQA.
		• Detention basins don't work for Ross Valley due to being unpopular, hazardous, expensive, and should therefore be removed from the flood control plan	• Chapter 3, Project Description
		• Examples of what can be done instead of a detention basin	• Chapter 6, Alternatives
April 28, 2017	Sharaya Souza	• CEQA was amended in 2014 with Assembly Bill 52 (AB 52) to create a separate category of cultural resources, "tribal cultural resources", and public agencies shall, when feasible, avoid damaging effects to any tribal cultural resources • AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015 • The Native American Heritage Commission (NAHC) recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area as early as possible • This comment letter summarizes AB 52 and the additional requirements it has added to CEQA including, but not limited to, a fourteen-day period to provide Notice of Completion of an Application/Decision to undertake a project, mandatory topics of consultation if requested by a tribe, confidentially of information submitted by a tribe during the environmental review process, and recommended mitigation measures.	• Section 4.6, Cultural Resources

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 28, 2017 (cont.)1	Sharaya Souza (cont.)	• Senate Bill 18 (SB 18) applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. • Some of SB 18's provisions include tribal consultation, no statutory time limit of SB 18 tribal consultation, confidentially, and conclusion of SB 18 tribal consultation. • Neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18 • Several actions for adequately assessing the existence and significance of tribal cultural resources and planning for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources are recommended by the NAHC	
April 30, 2017	Kathleen Gundry and Bill Maly	• Project design/components seem to be focused on (1) retention basins to keep a percentage of the water from flowing through the creek during storm events, and (2) flood walls and channel changes to speed up creek flow	• Chapter 3, Project Description • Chapter 6, Alternatives
		• Suggest that the county considers broadening the scope of the project or including a program of distributed Best Management Practices in residential and commercial designs	• Chapter 3, Project Description • Chapter 6, Alternatives
		• Concerned about project objectives being to alleviate flooding, and suggest they should include water quality and habitat objectives	• Chapter 3, Project Description
		• Ensure that the San Anselmo flooding project does not worsen the situation for neighbors downstream	• Section 4.9, Hydrology and Water Quality
		• Planning for improvement of stormwater management in the watershed seems imperative for long term impacts from sea-level rise on Marin communities	• Section 4.9, Hydrology and Water Quality
		• Take a more expansive, environmentally responsible approach than solutions associated with the Army Corps of Engineers	• Chapter 3, Project Description
May 8, 2017	Jean Jung	• Opposes the suggested removal of 634-636 San Anselmo Avenue	• Chapter 6, Alternatives
		• Suggests various ideas to help water flow through the area including dredging the creek and removing the weir	• Chapter 6, Alternatives

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Jean Jung (cont.)	• Voices concern about the impacts of demolishing buildings on San Anselmo Avenue on loss of business and revenue, and does not think it is the most economical solution[1]	• This comment addresses the merits of the project and not the scope or content of the EIR, which is required under CEQA to address potential physical impacts of the proposed project.
May 8, 2017	Garril Page	• Beneficial and adverse effects on all stakeholders should be thorough as review of environmental effects[2]	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA.
		• The EIR should include the potential of this project, even in concept stage, as a deterrent to good community relations which then translate into quantifiable impacts on Aesthetics and Visual resources.	• Section 4.2 Aesthetics and Visual Resources
		• Adversarial attitudes over a structure that is perceived to be responsible for flooding can cause great harm even without a project: less business, empty storefronts, and unpleasant associations do not add to San Anselmo's "ambiance". Where future vacancies and loss of current amenities result from Project, these diminish the community as well as individuals.	• This comment addresses the merits of the proposed project and not the scope of the EIR. • The EIR focuses on physical environmental effects rather than social and economic effects
		• Changes in community relations associated with the project could affect Land Use, Population and Housing	• Section 4.10, Land Use Planning • Section 4.12, Population and Housing
		• Nursery Basin positive and negative topographic changes should be documented	• Chapter 3, Project Description
		• Aesthetic and visual effects analyses of floodwalls and structural changes should include all direct and indirect effects, including effects from root cutting	• Section 4.2, Aesthetics and Visual Resources
		• To the degree relationships and social behaviors in downtown San Anselmo, the Nursery Basin community, and the Winship Bridge neighborhood become divisive, fragmented by the Project and influences of the flawed Project process, these are identifiable as cultural losses. There have been Project and Program presentations which cause confusion and dissension instead of enabling real progress toward a shared goal. Factual errors about the Project/Program are acknowledged in public meetings, yet left uncorrected. Meeting protocols have stifled public participation, creating frustration.	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA. • Chapter 1, Introduction (CEQA process)

[1] Consistent with CEQA, economic or social effects of a project are not to be treated as significant effects on the environment (CEQA Guidelines Section 15131).
[2] Consistent with CEQA, economic or social effects of a project are not to be treated as significant effects on the environment (CEQA Guidelines Section 15131).

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Garril Page (cont.)	• A process driven more by reliance on consultants, grant acquisition and subsequent deadlines, has resulted in wasted funding that precludes solutions that might enhance communities through better-supported local projects. This is a cultural loss.	• Chapter 1, Introduction (CEQA process)
		• When residents are forced to pay fees, yet feel unrepresented by the process, community culture suffers. Flood control as a process loses both credibility, support, and instead engenders ill-will. This is a cultural loss.	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA.
		• Biological resources effects analyses of floodwalls and structural changes should include all direct and indirect effects, including effects from root cutting.	• Section 4.5, Biological Resources
		• More information about changes to creek hydraulics and sediment transport is needed to adequately address impacts to biological resources	• Section 4.5, Biological Resources • Section 4.9, Hydrology and Water Quality
		• Sources of sediment, sediment particle sizes, and sediment analysis methods should be included in the document	• Section 4.9, Hydrology and Water Quality
		• Describe the conditions under which sediment will be deposited in the downtown reaches of San Anselmo Creek, and conditions under which sediment will be flushed into lower San Anselmo, Corte Madera, and Ross Creeks, including quantification of the transit and deposition patterns for defined, various sized sediments	• Section 4.9, Hydrology and Water Quality
		• Describe how sedimentation patterns will affect flows in downtown reaches of San Anselmo Creek	• Section 4.9, Hydrology and Water Quality
		• Describe whether the project will include testing for residual toxins at the Nursery Basin site, what testing methods may be used, and whether written testing reports will be available to homeowners and the surrounding community	• Section 4.8, Hazards and Hazardous Materials
		• Describe whether the project at the Nursery Basin will include groundwater monitoring wells and describe the monitoring process	• Section 4.9, Hydrology and Water Quality
		• Describe whether the project will include testing or monitoring to protect air, soil, and water during and after construction, whether written reports to the surrounding community will be provided for a specified period of time, and what the period of reporting will be	• Mitigation measures developed for the project are identified in Chapters 4 and 5 of this EIR; the final mitigation monitoring and reporting program will be adopted as part of project approval. (CEQA Guidelines Sections 15091 and 15097)
		• Describe efforts to coordinate with Ross Valley Sanitary District to protect from floodwater pollution associated with sewer overflow conditions, spills, and pipeline breaks or blockages during project construction and operation	• Section 4.13, Public Services and Utilities

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Garril Page (cont.)	• Evaluation of hazards and utility service interruption should account for inconvenience, liability, and emergency response, as well as identifying entity responsible for organizing and executing plans	• Section 4.13, Public Services and Utilities
		• Describe steps that will be undertaken to help educate and prepare residents for the disruptive impacts to their daily lives by this Project	• Section 4.13, Public Services and Utilities
		• Describe emergency dewatering plans for the Nursery Basin	• Chapter 3, Project Description
		• Describe number of spillways at Nursery Basin	• Chapter 3, Project Description
		• Describe plans to dewater the Nursery Basin after each flood event, and estimate time required to empty Basin	• Chapter 3, Project Description
		• Describe whether rodent extermination is planned at Nursery Basin	• Chapter 3, Project Description
		• Identify who is responsible for Nursery Basin embankment integrity.	• Chapter 3, Project Description
		• Describe the size of the vegetative buffer surrounding the Nursery Basin.	• Chapter 3, Project Description
		• Describe how the stormwater collection system would be maintained free of leaves and debris, and which agency would be responsible for maintenance.	• Chapter 3, Project Description
		• Are there detention basins comparable to the Nursery Basin? Where are the comparable basins?	• This comment is on the merits of the proposed project and not the scope of the EIR.
		• Included by reference are comments from Garril Page on the Program EIR dated February 24, 2017	• Included by reference are responses to comments from Garril Page on the Program EIR, dated February 24, 2017.

-----Original Message-----
From: Brian Hennessy [mailto:hennessydds@comcast.net]
Sent: Thursday, April 20, 2017 8:55 PM
To: EnvPlanning
Cc: Brian Hennessy
Subject: Sunnyside Detention basin attention Rachel Reid

Rachel, I live at 16 Deer Creek Court ; the adjacent property on the western and creek side of the planned Sunnyside basin. I would hope and expect the EIR to address some hydrology questions I have. Common sense would tell me that when water is retained in the creek (first part of basin) and Sunnyside my water table will rise. When released it will fall. This will create at the very least increase settling of my house, which we've lived in for twenty five years. The increase in saturated soil under my house will also increase the risk of liquefaction. Look forward to your response, Brian

From: Richard Lee [mailto:rlbuilder@comcast.net]
Sent: Thursday, April 20, 2017 10:29 PM
To: EnvPlanning
Subject: Flood project comment

Hi Rachel,

I attended the 4/20/17 flood project meeting at San Anselmo Town Hall and made a comment at the end of the meeting regarding capacity of the creeks from downtown San Anselmo through Kentfield at the College of Marin. I'd like to follow up with a more thorough explanation of what I saw and the conclusions I draw from this winter's flood events.

For the flood events of 12/15/16, 1/10/17, and 2/7/17 I witnessed creek levels at various locations in downtown San Anselmo, Ross, and College of Marin. I also carefully followed rainfall rates and online creek level postings. I wish to call attention to conditions for the flood event on the evening of 1/10/17:

- San Anselmo flood siren sounded at approximately 7:00 pm
- Peak creek level at downtown San Anselmo was >13 feet according to the online gauge information
- Tide level at 7:30 pm was approximately +2.0 ft and rising with a high tide of +5.0 ft expected at 11:00 pm
- Flooding was beginning in downtown San Anselmo, Ross, and in the College of Marin parking lot just upstream of College Avenue.
- The entire Ross Creek canal from the concrete section through College of Marin till where it opens up to the wider, more natural portion was FULL or within an inch or two of full.
- Sir Francis Drake Blvd. through Ross was closed, I assume because of flooding there.

The overall flood project concerns much more than the snapshot I describe above, but I have to conclude that capacity of the creek in the College of Marin/Ross areas is already very similar to that of downtown San Anselmo. If that is a reasonable conclusion, then most if not all of the improvements under consideration for downtown San Anselmo will not prevent flooding. I would argue that detention basins should be of higher priority than any improvements in downtown San Anselmo until the capacity of the entire creek can be improved.

I would appreciate it if you would circulate my comments to appropriate parties. Thank you for your consideration.

Regards,
Richard

Richard Lee Fine Carpentry
101 Hilldale Drive

San Anselmo, CA 94960
415-497-1253 ph.
#874967

From: Suzuki C [mailto:suzukicady@gmail.com]
Sent: Wednesday, April 26, 2017 12:24 PM
To: EnvPlanning
Subject: Attn: Rachel Reed, comments on SAN ANSELMO FLOOD RISK REDUCTION PROJECT

Hello Rachel,

Please submit the following comments on the SAN ANSELMO FLOOD RISK REDUCTION PROJECT for its EIR:

The following letter is co-signed by 77 area residents.

Detention basins are unpopular.

Residents in San Anselmo voted down a flood basin project slated for Memorial Park in 2015.

Many residents have spoken out against their use (or their locations) at countless Flood Zone 9 Ross Valley flood advisory board meetings. Perhaps that is why the flood advisory board has chosen not to record their meetings — a bad faith policy.

Detention basins are hazardous.

Storm water surges in and out of these structures at high velocity. Storm water debris contains hazardous materials.

Following a flash flood in Hawaii, a girl drowned in a 4-ft high flood basin which had a drain blocked by debris, while trying to save a friend who had fallen in.

Las Vegas had a flash flood last year where three people drowned in municipal flood control facilities (July 1-3). One body was found in a detention basin the day after the storm, and two others were swept away and drowned in flood channels that divert water into detention basins there. One was a woman trapped by debris in the rushing waters of the channel. Rescuers tried unsuccessfully to save her. Las Vegas has spent $1.7 billion on its flood control, by the way.

Detention basins can fail.

A detention basin failed in Mesa, Arizona, due to improper maintenance, and flooded the 200 homes nearby. Since those homes weren't previously in a flood zone, the 200 residents affected did not have flood insurance. (Lots of stories like this over the past few years.)

Detention basins are susceptible to clogged drains from trash, debris and storm water detritus. They require a lot of timely maintenance.

Detention basins require dams and spillways. Levees and spillways tend to fail over time (observe the Oroville Dam and Spillway this year).

Detention basins are expensive.

Building them is extremely expensive. Maintaining them is, too — a cost with no end.

Impossible to know how well the flood basins would be maintained over time — or who will pay for all their future maintenance needs, upgrades, renovations, and retrofits.

Earthquake damage to the structures is likely at some point.

Who would be liable for any levee or spillway breaches impacting those who live downstream of them?

Detention basins don't work for the Ross Valley.

Because flood detention basins are unpopular, hazardous, expensive, and complicated, they are not the right path forward for the Ross Valley. They should be removed from its flood control program.

What can be done instead?

Matt Smeltzer, P.E. Engineer/Geomorphologist, has a submitted a powerful approach to address flooding in San Anselmo: Creek daylighting and restoration.

Downtown San Anselmo creek restoration is an extremely effective, sustainable, environmentally-friendly, less-expensive solution. Watch his presentation to the San Anselmo Town Council (link below).

Let's proceed down that path.

Thank you,
Suzuki Cady, Fairfax; Dine DeMarlie, Fairfax; Doug Addis, Fairfax; Kelly Alpert, Fairfax; Richard Alpert, Fairfax; Ling Shien Bell, Fairfax; Mark Bell, Fairfax; Claudia Belshaw, Fairfax; David Belshaw, Fairfax; Patty Bredt, Fairfax; Wendy Botwin, Fairfax; Tracy Brien, Fairfax (business); Ellen Caldwell, San Anselmo; Susanne Chaney, Fairfax; Nancy Clothier, Fairfax; Jim Collier, Fairfax; Dottie Escue, Fairfax; Ellen Floyd, Fairfax; Evangeline Fugazzotto, Fairfax; Cormac Gannon, Fairfax; Marc Hammerman, Fairfax; Nancy Hammerman, Fairfax; Sandy Handsher, Fairfax; Pamela Hayes, Fairfax; Jim Hill, Fairfax; Karl Hoagland, Fairfax; Janet Knudsen, Fairfax; Russell Knudsen, Fairfax; Gail Koffman, Fairfax; Janusz Kolodziejczyk, Fairfax; Henry Kyburg, Fairfax; Jennifer Laursen, Fairfax; Stefan Laursen, Fairfax; Ralph Lewin, Fairfax; Lindsay London Stocker, Fairfax; Christine Margetic, Fairfax; Merrell Maschino, Fairfax; Petra McClinton, Fairfax; Katya McCullogh, San Anselmo; Rick Meissner, Fairfax; Glenn Miwa, Fairfax, San Anselmo (business); Laura Miwa, Fairfax, San Anselmo (business); Nancy Morita, Fairfax; Megan Murdock, Fairfax; Robert Murdock, Fairfax; Joseph Odom, Fairfax; Nancy Okada, San Anselmo; Garril Page, San Anselmo; Diana Perdue, Fairfax; Jamie Redford, Fairfax; Kyle Redford, Fairfax; Tina Salter, Fairfax; Otis Scarecroe, Fairfax; Akiko Schertell, Fairfax; Cathy Shea, Fairfax; George Shea, Fairfax; Cristina Simmons, Fairfax; John Simmons, Fairfax; Sabrina Simmons, Fairfax; Douglas Smith, Fairfax; Mark Solomons, Fairfax; Michael Stocker, Forest Knolls; George Taylor, Fairfax; Ben Tedder, Fairfax; Camila Tedder, Fairfax; Claire Thuesen, Fairfax; Thue Thuesen, Fairfax; Claudia Tomaso, Fairfax; Lew Tremaine, Fairfax; Martha Ture, Fairfax; Michael Van Metre, Fairfax; Bryan

Vidinsky, San Anselmo; Tom Vogelheim, Fairfax; Scott Walker, Fairfax; Birgit Wick, Fairfax; Mark Woodrow, Fairfax; Gordon Wright, Fairfax

Links to Sources:

http://bit.ly/2oxcMeB (Research Assessing the Safety Hazards Associated with Detention Basins)
twitter.com/SaveLeftyGomez (links to multiple articles)
www.saveleftygomez.com/news (links to multiple articles)
Matt Smeltzer's Creek Restoration presentation to San Anselmo Town Council, 10/25/16 (Agenda Item 10)
http://bayareane.ws/2qfq2AP (Greener Solutions article by Warren Karlenzig)
http://www.saveleftygomez.com/detention-basin-failures.html (links to multiple articles)
http://www.saveleftygomez.com/ (Save White Hill School/Lefty Gomez Field)
http://www.facebook.com/saveleftygomez/ (links to multiple articles)

STATE OF CALIFORNIA Edmund G. Brown Jr., Governor
NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone (916) 373-3710
Fax (916) 373-5471
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

April 28, 2017

Rachel Reid
Marin County

Sent by Email: EnvPlanning@marincounty.org

RE: SCH#2017042041, San Anselmo Flood Risk Reduction Project, Marin County

Dear Ms. Reid:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.**

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or

tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

   a. A brief description of the project.
   b. The lead agency contact information.
   c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).
   d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).
   a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
   a. Alternatives to the project.
   b. Recommended mitigation measures.
   c. Significant effects. (Pub. Resources Code § 21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
   a. Type of environmental review necessary.
   b. Significance of the tribal cultural resources.
   c. Significance of the project's impacts on tribal cultural resources.
   d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
   a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
   b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
   a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
   b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
    a. Avoidance and preservation of the resources in place, including, but not limited to:
        i. Planning and construction to avoid the resources and protect the cultural and natural context.
        ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
    b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
        i. Protecting the cultural character and integrity of the resource.
        ii. Protecting the traditional use of the resource.
        iii. Protecting the confidentiality of the resource.
    c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
    d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
    e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
    f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
    b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
    - **a.** The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
    - **b.** Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
    - **a.** If part or all of the APE has been previously surveyed for cultural resources.
    - **b.** If any known cultural resources have been already been recorded on or adjacent to the APE.
    - **c.** If the probability is low, moderate, or high that cultural resources are located in the APE.
    - **d.** If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
    - **a.** The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
    - **b.** The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
    - **a.** A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
   a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
   b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
   c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions, please contact me at my email address: sharaya.souza@nahc.ca.gov.

Sincerely,

Sharaya Souza
Staff Services Analyst
cc: State Clearinghouse

From: Kathleen Gundry [mailto:kgundry@verizon.net]
Sent: Sunday, April 30, 2017 9:08 PM
To: EnvPlanning
Cc: wmaly@verizon.net
Subject: San Anselmo Flood Risk Reduction Project EIR Scoping Comments

To: Rachel Reid, Environmental Planner, Marin County Community Development Agency

From: Kathleen Gundry and Bill Maly, 70 Barber Ave, San Anselmo, CA 949660

Re: San Anselmo flood risk reduction EIR/Programmatic EIR for the Ross Valley watershed

We are San Anselmo residents who own a home on San Anselmo Creek. Though our house is too high to be at risk of flooding, we want our community to be protected from frequent floods so that downtown merchants no longer lose revenue days and other neighbors do not have to live in fear of flood waters in their homes every time it rains.

We attended the EIR scoping meeting on April 20, 2017, at the San Anselmo Town Hall to learn about the project and the EIR process. These comments address the proposed San Anselmo Flood Risk Reduction project within the context of the broader Ross Valley project. We hope these comments can be used to shape the composition of the project or the evaluated alternatives with the intent of reducing environmental impacts on water quality and stream health, while meeting the objectives of flood risk reduction in San Anselmo and in the broader Ross Valley.

Project Design. Current Project components seem to be mostly focused on two types of relatively large-scale engineering solutions to reduce flood risk: (1) retention basins to keep a percentage of the water from flowing through the creek during storm events, and (2) flood walls and channel changes to speed up creek flow. We suggest that the county consider broadening the scope of the project or including in the evaluated alternatives a program of distributed Best Management Practices in residential and commercial design—such as rain gardens, rain barrels and cisterns, and other infrastructure projects like green streets.

Project objectives. The flooding problem is closely linked to stream health. If the main objective is to alleviate flooding, this leads to a project design aimed at speeding up creek flow, which is not conducive to a healthy stream environment. We suggest that the project objectives include water quality and habitat objectives. This would ensure that the EIR would include measurement of stream pollution, microorganism content, and species diversity, and address those impacts and measures to mitigate them. We also want to make sure the long-overdue solution to San Anselmo's flooding problem does not worsen the situation for our downstream neighbors and thereby create the need for other large-scale engineering projects downstream to deal with increased water flows.

A project design that seeks to reduce runoff by reducing impervious surfaces and capturing water in a variety of ways may also be able to reduce the speed of creek flow—by reducing runoff from neighborhoods into the creek—thus improving stream health and reducing the potential downstream impacts of flooding and pollution runoff during a storm event. Though planning for improvement of storm water management in the watershed may seem like a long-term goal that will not provide immediate relief from flooding, it seems imperative in light of the inevitable sea-level rise and its impact on Marin communities. In addition, a healthy stream environment could be an asset to the aesthetics of the community, facilitating development of creek-focused development to replace the current structures that essentially cover the creek with concrete buildings.

While solutions associated with the Army Corps of Engineers are probably a necessary part of the plan to reduce flooding, we would like to see the plan take a more expansive, environmentally responsible approach. Here are a few links that you may find useful in considering an enhanced storm water management program:

Center for Watershed Protection (www.cwp.org).

City of Philadelphia's plans for green storm water management: http://www.phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan

City of Los Angeles storm water management planning programs:

- http://www.lastormwater.org/
- Low Impact Development guides and ordinances: http://www.lastormwater.org/green-la/
- Detailed watershed management plans that incorporate low impact development: http://www.lastormwater.org/green-la/enhanced-watershed-management-program/

We look forward to the next steps in the EIR process and hope that the project that takes shape will benefit the immediate San Anselmo community and the greater Ross Valley and San Francisco Bay.

Kathleen Gundry and Bill Maly

70 Barber Ave.

San Anselmo, CA 94960

-----Original Message-----
From: Jean Jung [mailto:jeanmjung@earthlink.net]
Sent: Monday, May 08, 2017 10:26 PM
To: EnvPlanning
Subject: flood mitigation issues.

I have owned property in fairfax since 1972. I also now am a part owner of a building at 574 San Anselmo Ave. San Anselmo, CA.I have owned and operated Gold Dreams Jewelry in San Anselmo since 1989. I have witnessed and have been impacted by the flood of 1982, 1987 and 2005.

I strongly oppose the suggested removal of 634-636 San Anselmo Ave. Removing the buildings in no way would guarantee the area wouldn't flood but it would destroy the downtown business community.

If the creek was dredged and the weir removed that would help water flow. I would think that creating a catch basin in the park on the opposite side of the creek from 634-636 would help water flow. Making the creek wider from the park side would also make water flow easier. If flood gates were created along the creek depositing water in to a detainment area built under the park and then releasing the water as the flow decreased is an idea that seems to have merit. This would be in addition to a possible basin in Fairfax.

It was stated that removing the building was the most economical solution which makes no sense to me. Purchasing buildings and then paying to have them demolished destroying the businesses along San Anselmo while the work was being done and then the aftermath of people no longer coming down to the avenue since they would no longer think about shopping there would create a serious drain on the economy of San Anselmo. Much of the loss of business and revenue can not be measured in an economic forecast. Additionally the lives of the business owners and members of the community would be seriously impacted in a negative way.

There are many ideas as to ways to solve the flooding issue in Fairfax, San Anselmo and the other towns in the Ross valley. It seems like a broader view of the possibilities would help find a solution that would save the buildings and the business community.

Sincerely,

Jean M. Jung
415 453-3050

Comment on Project EIR

May 8. 2017

My comment is primarily on Alternative 2A, Removal of Building Bridge 2 (# 634-636 San Anselmo Ave), creek improvements/flood barriers, and Nursery Detention Basin, which may include creek alterations and removal of the Winship Bridge.

Undeniably, ambiance, and San Anselmo's small town character are a major part of San Anselmo's appeal. To the extent this perception is lessened, the entire community and surrounding area are adversely affected.

1. Aesthetics and Visual Resources

a.) Flooding in downtown San Anselmo is historic, a condition that has been recognized for decades. This Project is new. Comparing the effects of flooding versus the effects of the proposed Project is appropriate, and the comparison of beneficial and adverse effects on all stakeholders should be as thorough as the review of other Environmental Effects. Lines of sandbags can be viewed as deleterious or as a sign of community spirit and resilience.

b.) At the May 3, 2017, merchants' meeting, several commenters identified negative impacts already experienced by residents and merchants in downtown areas due to their inclusion in, or proximity to, this project. The EIR should include the potential of this project, even in concept stage, as a deterrent to good community relations which then translate into quantifiable impacts on Aesthetics and Visual resources.

c.) Adversarial attitudes over a structure that is perceived to be responsible for flooding can cause great harm even without a project: less business, empty storefronts, and unpleasant associations do not add to San Anselmo's "ambiance". Where future vacancies and loss of current amenities result from Project, these diminish the community as well as individuals.

d.) Those affected by the Nursery Basin, including those homeowners who felt compelled to defensive legal action, can be included under (b.) above and consideration of the Nursery Basin neighbors' community relations applies equally to (c.) above which affects Land Use, Population and Housing also.

e.) The Nursery Basin site should clearly identify both positive and negative elevations of the basin's design in terms of pre-project ground levels. This is an obvious Aesthetic and Visual Resource effect needing documentation and inclusion.

d.) All floodwalls and structural changes should document both above grade and below grade changes as these affect Aesthetic and Visual Resources both immediately and well into the future. For example, trees that suffer root cuts, may take years to to die.

2. Cultural Resources

a.) To the degree relationships and social behaviors in downtown San Anselmo, the Nursery Basin community, and the Winship Bridge neighborhood become divisive, fragmented by the Project and influences of the flawed Project process, these are identifiable as cultural losses. There have been Project and Program presentations which cause confusion and dissension instead of enabling real progress toward a shared goal. Factual errors about the Project/Program are acknowledged in public meetings, yet left uncorrected. Meeting protocols have stifled public participation, creating frustration.

b.) A process driven more by reliance on consultants, grant acquisition and subsequent deadlines, has resulted in wasted funding that precludes solutions that might enhance communities through better-supported local projects. This is a cultural loss.

c.) When residents are forced to pay fees, yet feel unrepresented by the process, community culture suffers. Flood control as a process loses both credibility, support, and instead engenders ill-will. This is a cultural loss.

3. Biological Resources, Water Quality

a.) All floodwalls and structural changes should document both above grade and below grade changes because these affect Biological Resources both immediately and well into the future. Vegetation that suffers root damage may take years to to die. Impacts on creek resources, riparian and benthic losses may take several years to become apparent.

b.) Hydraulic changes caused by altered sediment deposition and transit patterns heavily impact creek modification projects. Comments on the critical topic of Biological Resources in and along San Anselmo Creek are impeded because the Project is not designed, hydraulic models are incomplete, discharge and channel capacities are unknown.

c.) What are the sources of sediment deposition being studied?

d.) Under what conditions will additional sediment deposit in the downtown reaches of San Anselmo Creek, how will this affect flows, what maintenance will be required, and who will be charged with the performance of this maintenance?

e.) Under what conditions will sediment be flushed downstream into lower San Anselmo, Corte Madera and Ross Creeks? The response should include quantification of the transit and deposition patterns for defined, various sized sediment?

f.) What sediment particle sizes are being studied and what analysis methods considered appropriate to the studies being performed?

g.) Prior uses of the Nursery Basin may result in toxic residues at the site. Will the project include testing to assure there are no residual toxins? What methods of testing? What assurances will be made to neighboring homeowners? Will these include written reports to the surrounding community?

4. Natural Resources, Soils, Hazards, Water Quality

a.) Past uses of the Nursery Basin may result in a toxic subterranean plume moving toward neighboring homes. Will the project include monitoring wells? What will be the monitoring process: depth, type and frequency of testing, and will it include providing reports to homeowners?

b.) Will the project include testing to assure safe air, soil, water during and after construction? What assurances will be made to neighboring homeowners? Will these include written reports to the surrounding community for a specified period? If so, define the period of time?

5. Utilities and Service Systems

a.) Floodwaters are known to spread pollution. What efforts will be made to assure the Project coordinates with RVSD to assure protection from sewer overflow conditions, spills, breaks and blockages both during and post-construction?

b.) Hazards and interruption to electric and gas services should take full account of all aspects of inconvenience and liability, including plans for emergency response. Who is responsible for organizing and execution of these plans?

c.) What steps will be undertaken to help educate and prepare residents for the disruptive impacts to their daily lives by this Project?

6. Land Use and Planning, Parks & Recreation, Hazards

a.) Recent flood events have been during serial storms. What plans exist for dewatering the Nursery Basin on an emergency basis? Detail the design plans for freeboard allowance and emergency spillway use.

b.) How many spillways will the Nursery Basin have?

c.) Detention basins that impound water between events pose a hazard, especially if the Nursery Basin is used as a park or recreational area. What design and plans exist for completely dewatering the basin after each event? How much time is needed to empty the basin?

d.) What means of rodent extermination is planned for the Nursery Basin?

Who is responsible for maintaining embankment integrity?

e.) The nursery basin is located in a wooded area. What size vegetative buffer is planned?

f.) How will the stormwater collection system be maintained free of leaves and debris? Who is responsible for this task?

g.) Basin sites shown in community meeting presentations are multiple-acre, flat, sunny, grassy areas with gradually-sloped, low embankment walls and located in a floodplain. The Nursery Basin site appears unlike any sites in those presentation slides and photographs. Are there detention basins comparable to the Nursery Basin? Where are the comparable basins?

Since there is overlap between the Program and Project EIRs and in order to minimize repetition, I include by reference relevant portions of my Comment on the PEIR, dated Feb 24, 2017, attached below.

Thank you for the opportunity Comment on the Project EIR.

//s//

Garril Page
San Anselmo.

1

(PLEASE PRINT LEGIBLY) Date: 4/20/17

Project EIR: SA Flood Risk Reduction

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: Sandy Guldman

Email:

Representing: Friends of CM Creek

Please submit this card to staff; and
LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.

2

(PLEASE PRINT LEGIBLY) Date: 4/20/2017

Project EIR:

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: ANNE PETERSEN

Email: annepetersen129@gmail.com

Representing: Kentfield

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

3

(PLEASE PRINT LEGIBLY) Date: APRIL 20, 2017

Project EIR: San Anselmo

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: ~~John Bartolomi~~ withdrew

Email: john.bartolomi@outlook.com

Representing: John Bartolomi - Homeowner

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

4

(PLEASE PRINT LEGIBLY) Date: April 19 2016

Project EIR:

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: Garrit Page

Email: gbrlty @ comcast.net

Representing:

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

(PLEASE PRINT LEGIBLY) Date:________ (5)

Project EIR:________

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: LISE STAMPFLI JORANE

Email: LSTAMPFLI@EARTHLINK.net

Representing: Flood Mitigation League of Ross Valley

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

APPENDIX B

Air Quality Calculations

Table of Contents

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B-1 Summary Tables

Tables for EIR

Updated: 4/16/2018

Alt 4	Nursery Site Detention Basin - Option 6
Alt 2	Nursery Site Detention Basin - Option 7

Green = use in EIR

Impact Summary

Alternative	Impact compared to project 4.3-1	4.3-2	4.3-3	4.3-4	4.3-5	4.3-6
Alternative 2 (Option 7)	Greater Than	Same As	Less Than	Less Than	Same As	Less Than
Alternative 4 (Option 6)	Less Than	Same As	Less Than	Greater Than	Same As	Greater Than

	Activity WorkDays	Off-Road hrs	Total Truck T	Haul Truck Tr	Construction, Unmit Daily NOx	Total DPM	Total Cancer HI (Res)		PM2.5 (Res)	Operational Emissions, Unmit Daily NOx	Total GHGs
Project	147	5,588	4,141	2,663	32.1	138.49	34.6	6.6	0.47	0.332	553.5
Alternative 2 (Option 7)	113	4,438	4,712	3,459	49.5	132.22	21.9	5.9	0.45	0.332	549.1
Alternative 4 (Option 6)	165	6,508	5,350	3,628	31.3	156.19	42.0	8.8	0.48	0.332	674.6
Percent change compared to project											
Alternative 2 (Option 7)	-23%	-21%	14%	30%	54%	-5%	-37%	-11%	-4%	0%	-1%
Alternative 4 (Option 6)	12%	16%	29%	36%	-2%	13%	21%	34%	3%	0%	22%

Criteria Pollutant Tables

CONSTRUCTION

Source	Unmitigated Average Daily Emissions (lbs/day) ROG	NO_x	Exhaust PM10	Exhaust PM2.5	Mitigated Average Daily Emissions (lbs/day) ROG	NO_x	Exhaust PM10	Exhaust PM2.5	
Nursery Site Detention Basin									
Off-Road Equipment	1.0	11.3	0.5	0.5	0.3	6.3	<0.1	<0.1	
On-Road Trucks	0.7	14.4	0.2	0.2	0.7	14.4	0.2	0.2	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.0*	*25.8*	*0.8*	*0.7*	*1.3*	*20.9*	*0.4*	*0.3*	
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road Equipment	0.6	5.7	0.3	0.3	0.2	4.1	<0.1	<0.1	
On-Road Trucks	0.4	6.3	<0.1	<0.1	0.4	6.3	<0.1	<0.1	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*1.2*	*12.2*	*0.4*	*0.4*	*0.8*	*10.7*	*0.2*	*0.2*	
Nursery Site Detention Basin - Option 6									
Off-Road Equipment	1.1	11.4	0.5	0.5	0.3	6.7	<0.1	<0.1	
On-Road Trucks	0.9	17.3	0.3	0.3	0.9	17.3	0.3	0.3	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.2*	*28.9*	*0.8*	*0.7*	*1.5*	*24.1*	*0.4*	*0.4*	
Nursery Site Detention Basin - Option 7									
Off-Road Equipment	0.9	9.8	0.4	0.4	0.3	5.5	<0.1	<0.1	
On-Road Trucks	1.1	21.7	0.3	0.3	1.1	21.7	0.3	0.3	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.3*	*31.8*	*0.8*	*0.7*	*1.6*	*27.5*	*0.5*	*0.4*	
Total Average Daily Emissions									***NOT THE SUM - see below***
Project	**2.7**	**32.1**	**1.0**	**0.9**	**1.7**	**26.3**	**0.5**	**0.4**	
Alt 4 - Option 6	**2.5**	**31.3**	**0.9**	**0.8**	**1.7**	**26.4**	**0.5**	**0.4**	
Alt 2 - Option 7	**3.8**	**49.5**	**1.4**	**1.2**	**2.7**	**42.9**	**0.8**	**0.7**	
BAAQMD Construction Threshold	**54**	**54**	**82**	**54**	**54**	**54**	**82**	**54**	
Exceeds Threshold?									
Project	No	No	No	No	No	No	No	No	
Alt 4 - Option 6	No	No	No	No	No	No	No	No	
Alt 2 - Option 7	No	No	No	No	No	No	No	No	
Alternative 2 (Option 7)	41.5%	54.2%	37.5%	38.6%	53.9%	62.8%	62.6%	66.8%	
Alternative 4 (Option 6)	-5.0%	-2.3%	-5.6%	-5.1%	-2.8%	0.2%	-0.3%	1.2%	

Impact 4.3-1 Summary	Compared to project
Alternative 2 (Option 7)	Greater Than
Alternative 4 (Option 6)	Less Than

Actual Data: Average lbs/day	ROG	NOX	PM10 Exh	PM2.5 Ex	ROG	NOX	PM10 Exh	PM2.5 Ex	*WorkDays*
Nursery Site Detention Basin									
Off-Road	1.0449	11.2818	0.4848	0.4519	0.3181	6.3098	0.0675	0.0675	*147*
Haul Trucks	0.4480	11.8272	0.1907	0.1824	0.4480	11.8272	0.1907	0.1824	*147*
Onsite trucks	0.2721	2.5322	0.0279	0.0267	0.2721	2.5322	0.0279	0.0267	*147*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*147*
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road	0.5859	5.6848	0.2802	0.2623	0.2212	4.1387	0.0654	0.0654	*75*
Haul Trucks	0.1901	5.0190	0.0809	0.0774	0.1901	5.0190	0.0809	0.0774	*75*
Onsite trucks	0.1621	1.3220	0.0154	0.0147	0.1621	1.3220	0.0154	0.0147	*75*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*75*
Nursery Site Detention Basin - Option 6									
Off-Road	1.0847	11.4431	0.4996	0.4672	0.3411	6.6557	0.0793	0.0793	*165*
Haul Trucks	0.5409	14.2794	0.2302	0.2203	0.5409	14.2794	0.2302	0.2203	*165*
Onsite trucks	0.3143	3.0061	0.0328	0.0313	0.3143	3.0061	0.0328	0.0313	*165*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*165*
Nursery Site Detention Basin - Option 7									
Off-Road	0.9345	9.8455	0.4298	0.4030	0.2933	5.5438	0.0732	0.0732	*113*
Haul Trucks	0.6806	17.9668	0.2897	0.2771	0.6806	17.9668	0.2897	0.2771	*113*
Onsite trucks	0.3839	3.7767	0.0408	0.0389	0.3839	3.7767	0.0408	0.0389	*113*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*113*
Total Average Daily Emissions									

Project	2.6584	32.0865	0.9967	0.8844	1.7455	26.3257	0.4698	0.3995	*147*
Alt 1 - Option 6	2.5242	31.3369	0.9407	0.8394	1.6959	26.3689	0.4686	0.4043	*165*
Alt 2 - Option 7	3.7627	49.4782	1.3705	1.2260	2.6865	42.8560	0.7640	0.6663	*113*
	unmitigated	*unmitigated*	*unmitigated*	*unmitigated*	*mitigated*	*mitigated*	*mitigated*	*mitigated*	

OPERATION

Source	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)			
	ROG	NO_X	PM10	PM2.5	ROG	NO_X	PM10	PM2.5
Nursery Site Detention Basin								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Bridge Building #2 Demolition and Riparian Restoration								
Off-Road Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Worker Trips	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Nursery Site Detention Basin - Option 6								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Nursery Site Detention Basin - Option 7								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Total Average Daily Emissions								
Project	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Alt 1 - Option 6	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Alt 2 - Option 7	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
BAAQMD Construction Threshold	**54**	**54**	**82**	**54**	**54**	**54**	**82**	**54**
Exceeds Threshold?								
Project	No	No	No	No	No	No	No	No
Alt 4 - Option 6	No	No	No	No	No	No	No	No
Alt 2 - Option 7	No	No	No	No	No	No	No	No

Impact 4.3-3	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Less Than

	Lbs/day				Tons/Year				
Actual Data: Average lbs/day	**ROG**	**NOX**	**PM10 T**	**PM2.5 T**	**ROG**	**NOX**	**PM10 T**	**PM2.5 T**	
Nursery Site Detention Basin									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0081	0.0606	0.0012	0.0011	
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	no emissions
On-Road Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Worker Trips	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Nursery Site Detention Basin - Option 6									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	same as project
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Nursery Site Detention Basin - Option 7									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	same as project
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Total Average Daily Emissions									
Project	0.0178	0.3323	0.0066	0.0060	0.0081	0.0606	0.0012	0.0011	
Alt 4 - Option 6	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Alt 2 - Option 7	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
	unmitigated	*unmitigated*	*unmitigated*	*unmitigated*					

HRA Tables

CONSTRUCTION

CANCER RISK — **Unmitigated**

Element	Cancer Risk			Chronic Hazard Index		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site Detention Basin						
Maximum Cancer Risk	34.6	0.0	3.4	0.1	0.0	<0.1
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**
Exceeds Threshold?	Yes	No	No	No	No	No
Bridge Building #2 Demolition and Riparian Restoration						

Actual Values

Cancer Risk			Chronic Hazard Index		
Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
34.60	0.00	3.44	0.108	0.000	0.083

Maximum Cancer Risk	18.0	2.1	0.3	0.2	<0.1	<0.1		18.03	2.06	0.30	0.186	0.011	0.014
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Nursery Site Detention Basin - Option 6													
Maximum Cancer Risk	42.0	0.0	4.0	0.1	0.0	<0.1		42.00	0.00	3.99	0.110	0.000	0.085
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Nursery Site Detention Basin - Option 7													
Maximum Cancer Risk	21.9	0.0	2.5	0.1	0.0	<0.1		21.86	0.00	2.50	0.102	0.000	0.079
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Alternative 2 (Option 7)	-36.8%	#DIV/0!	-27.3%	-4.9%	#DIV/0!	-4.9%							
Alternative 4 (Option 6)	21.4%	#DIV/0!	15.8%	2.7%	#DIV/0!	2.7%							

Impact 4.3-4	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Greater Than

Mitigated

Element	Cancer Risk			Chronic Hazard Index									
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor							
Nursery Site Detention Basin													
Maximum Cancer Risk	6.6	0.0	0.7	<0.1	0.0	<0.1	4.04	6.56	0.00	0.65	0.020	0.000	0.016
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Bridge Building #2 Demolition and Riparian Restoration													
Maximum Cancer Risk	5.6	0.6	<0.1	<0.1	<0.1	<0.1	4.56	5.61	0.64	0.09	0.058	0.003	0.004
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Nursery Site Detention Basin - Option 6													
Maximum Cancer Risk	8.8	0.0	0.8	<0.1	0.0	<0.1	5.29	8.76	0.00	0.83	0.023	0.000	0.018
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Nursery Site Detention Basin - Option 7													
Maximum Cancer Risk	5.9	0.0	0.7	<0.1	0.0	<0.1	4.02	5.86	0.00	0.67	0.027	0.000	0.021
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							

PM2.5 CONCENTRATIONS

Element	Unmitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)			Mitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site Detention Basin						
Average Annual PM2.5 Exhaust Concentr	0.47	0.00	0.36	0.10	0.00	0.08
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Bridge Building #2 Demolition and Riparian Restoration						
Average Annual PM2.5 Exhaust Concentr	0.82	0.05	0.06	0.28	0.02	0.02
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	No	No	No	No
Nursery Site Detention Basin - Option 6						
Average Annual PM2.5 Exhaust Concentr	0.48	0.00	0.37	0.11	0.00	0.09
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Nursery Site Detention Basin - Option 7						
Average Annual PM2.5 Exhaust Concentr	0.45	0.00	0.35	0.13	0.00	0.10
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Alternative 2 (Option 7)	-3.6%	#DIV/0!	-3.6%	#DIV/0!	33.0%	#REF!
Alternative 4 (Option 6)	3.4%	#DIV/0!	3.4%	#DIV/0!	13.3%	#REF!

Actual Values

Unmitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)			Mitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)		
Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
0.47	0.00	0.36	0.10	0.00	0.08
0.82	0.05	0.06	0.28	0.02	0.02
0.48	0.00	0.37	0.11	0.00	0.09
0.45	0.00	0.35	0.13	0.00	0.10

Impact 4.3-4	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Greater Than

GHG Tables

Source	Total Annual Emissions (metric tons)		
	Construction	Operation	Cons+Ops
Nursery Site Detention Basin			
Off-Road Equipment	120.4	16.0	136.4
On-Road Trucks	281.6	12.9	294.5
Worker Trips	31.6	0.4	32.0
Subtotal	*433.6*	*29.3*	*462.9*
Bridge Building #2 Demolition and Riparian Restoration			
Off-Road Equipment	38.1	0.0	38.1
On-Road Trucks	65.8	0.0	65.8
Worker Trips	16.1	0.0	16.1
Subtotal	*120.0*	*0.0*	*120.0*
Nursery Site Detention Basin - Option 6			
Off-Road Equipment	141.1	16.0	157.1
On-Road Trucks	378.1	12.9	391.0
Worker Trips	35.5	0.4	35.9
Subtotal	*554.6*	*42.8*	*597.5*
Nursery Site Detention Basin - Option 7			

Off-Road Equipment	81.2	16.0	97.2
On-Road Trucks	323.7	12.9	336.5
Worker Trips	24.3	0.4	24.7
Subtotal	*429.1*	*29.3*	*458.4*
Total Annual Emissions			
Project	553.5	29.3	582.8
Alt 4 - Option 6	674.6	42.8	717.4
Alt 2 - Option 7	549.1	29.3	578.4
Total Emissions Amortized over 30 Years			
Project	18.5	29.3	47.8
Alt 4 - Option 6	22.5	42.8	65.3
Alt 2 - Option 7	18.3	29.3	47.6
BAAQMD Threshold	**1,100**	**1,100**	**1,100**
Exceeds Threshold?			
Project	No	No	No
Alt 4 - Option 6	No	No	No
Alt 2 - Option 7	No	No	No
Alternative 2 (Option 7)	-0.8%		
Alternative 4 (Option 6)	21.9%		

Impact 4.3-6			
Summary	**Compared to project**		
Alternative 2 (Option 7)	Less Than	Less Than	Less Than
Alternative 4 (Option 6)	Greater Than	Greater Than	Greater Than

Actual Data: Annual MTCO2e	**Construction CO2e**	**Operation CO2**	**Cons+Ops CO2e**	
Nursery Site Detention Basin				
Off-Road	120.40	15.99	136.39	
Haul Trucks	235.64	12.89	248.53	
Onsite trucks	45.92		45.92	
Worker	31.61	0.43	32.04	
Pump	0.00	0.00	0.00	
Subtotal	433.57	29.31	462.88	
Bridge Building #2 Demolition and Riparian Restoration				
Off-Road	38.08	0.00	38.08	no emissions
On-Road Trucks	51.02	0.00	51.02	
Onsite trucks	14.74		14.74	
Worker	16.13	0.00	16.13	
Pump	0.00	0.00	0.00	
Subtotal	119.96	0.00	119.96	
Nursery Site Detention Basin - Option 6				
Off-Road	141.09	15.99	157.08	
On-Road Trucks	319.34	12.89	332.23	
Onsite trucks	58.72		58.72	
Worker	35.48	0.43	35.91	
Pump	0.00	13.53	13.53	
Subtotal	554.63	42.84	597.47	
Nursery Site Detention Basin - Option 7				
Off-Road	81.18	15.99	97.17	
On-Road Trucks	275.17	12.89	288.06	
Onsite trucks	48.48		48.48	
Worker	24.30	0.43	24.73	
Pump	0.00	0.00	0.00	
Subtotal	429.13	29.31	458.44	
Total Average Annual Emissions				
Project	553.53	29.31	582.84	
Alt 4 - Option 6	674.59	42.84	717.43	
Alt 2 - Option 7	549.09	29.31	578.40	Assumes all during 1 year
Total Emissions Amortized over 30 Years				
Project	18.45	29.31	47.76	
Alt 4 - Option 6	22.49	42.84	65.33	
Alt 2 - Option 7	18.30	29.31	47.61	

unmitigated

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B-2 Operational Emissions

Operational Emissions

Updated: 4/16/2018

Operational truck trips for material removal for 2A and 6
Operational excavator and backhoe operations for 2A and 6
Operational pump for alt 6

Emissions Summary

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)				
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e	
Nursery Site Detention Basin													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.01	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.02	0.33	0.01	0.01	0.01	0.06	0.00	0.00	15.67	0.00	0.57	16.24	
Bridge Building #2 Demolition and Riparian Restoration													
Off-Road Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NOT USED - CalEEMod instead
On-Road Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nursery Site Detention Basin - Option 6													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.00	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.53	
Total	0.02	0.33	0.01	0.01	0.00	0.06	0.00	0.00	15.67	0.00	0.57	29.77	
Nursery Site Detention Basin - Option 7													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.00	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.02	0.33	0.01	0.01	0.00	0.06	0.00	0.00	15.67	0.00	0.57	16.24	

Truck Trips

Truck Operations

Daily Sediment (CY)	290	
Daily Truck Loads	33	
Truck Capacity (CY)	8.8	
Annual Sediment (CY)	1,600	
Annual Truck Loads	182	
Annual one-way trips	364	
Annual VMT	7,283	20-mile one-way trip to Redwood Landfill
Days of trucking	6	
Annual Idling hours	46	15 min idling per roundtrip
Onsite VMT		

PD Page 30:

Sediment may be removed at least annually from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel. One routine, annual sediment removal would occur in the dry season to reduce effects on water quality and aquatic species. The amount of sediment removed in that routine maintenance action would vary depending on storm events and sediment moving into the creek each year. During especially wet years, a second sediment removal action may be necessary. This second removal could occur between large winter storms to restore detention capacity. The depth of sediment removal would be feathered in the up and downstream edges of the area to match the existing channel gradient. The removal would be done using a bulldozer in the creek and an excavator working from the maintenance access road, top of the diversion structure, or top of the side-weir, as needed to reach the deposited material. Up to 1,600 cubic yards of sediment may be removed from Fairfax Creek per sediment removal event. Removed sediment would be hauled to Redwood Landfill. Approximately 290 cubic yards, requiring 33 truckloads, would be generated each day during sediment removal; about one week would be required to remove 1,600 cubic yards of sediment.

Calculated EFs - Onsite Trucks tab

	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
Running Emissions (g/mi)	0.219409436	5.791844	0.09337962	0.08934006	1652.954936	0.254775	77.42681
Idling Emissions (g/hr)	2.498328858	40.6292	0.06610876	0.06324892	6271.596817	0.116041	

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)			
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	0.01	0.27	0.00	0.00	0.002	0.049	0.001	0.001	12.32	0.00	0.56	12.89
Bridge Building #2 Demolition and Riparian R	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00
Nursery Site Detention Basin - Option 6	*0.01*	*0.27*	*0.00*	*0.00*	*0.002*	*0.049*	*0.001*	*0.001*	*12.32*	*0.00*	*0.56*	*12.89*
Nursery Site Detention Basin - Option 7	*0.01*	*0.27*	*0.00*	*0.00*	*0.002*	*0.049*	*0.001*	*0.001*	*12.32*	*0.00*	*0.56*	*12.89*

Off-Road Equipment - NOT USED

Excavator Operations

hrs/day	10
days	6
total hours	60

Emission Factors

				Emission Factors (g/hp-hr) - Unmitigated						Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim					
Equipment Type	CalEEMod Equip HP	HP Source	LF	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4
336 Excavator	Excavators 266	http://www.r	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152

*= EF * HP * LF * lbs/g * equip hrs*

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)			
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	0.006	0.065	0.002	0.002	0.001	0.012	0.000	0.000	2.92	0.0009	0.0001	2.92
Bridge Building #2 Demolition and Riparian R	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.0000	0.0000	0.00
Nursery Site Detention Basin - Option 6	*0.006*	*0.065*	*0.002*	*0.002*	*0.001*	*0.012*	*0.000*	*0.000*	*2.92*	*0.0009*	*0.0001*	*2.92*
Nursery Site Detention Basin - Option 7	*0.006*	*0.065*	*0.002*	*0.002*	*0.001*	*0.012*	*0.000*	*0.000*	*2.92*	*0.0009*	*0.0001*	*2.92*
CalEEMod Comparison	0.006	0.065	0.002	0.002	0.001	0.012	0.000	0.000	0.000			
Here vs. CalEEMod	0%	0%	-1%	-2%	0%	0%	-1%	-2%	#DIV/0!			

Worker Trips

Workers/day	10	conservative assumption
One-way trips/day	20	
one-way trip distance	10.8	CalEEMod default
days	6	
Total annual VMT	1296	

Calculated EFs (g/mi)

Vehicle Type	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
Weighted Average	0.192195934	0.143548	0.04690031	0.01972737	327.6578282	0.420809	3.733709

see *WorkerCommute* tab

*= 20 one-way trips/day * 10.8 miles per one-way trip * 6 days * grams per mile / 365 days per year (convert to MT for GHGs*

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Annual Emissions (MTCO2e)				
Site	ROG	NOX	PM10	PM2_5	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e	
Nursery Site Detention Basin	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	
Bridge Building #2 Demolition and Riparian R	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.0000	0.0000	0.00	*no excavation / sediment removal*
Nursery Site Detention Basin - Option 6	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	
Nursery Site Detention Basin - Option 7	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	

Excavator Operations

Water Pump

This is ONLY for Nursery Site Option 6

Pump Operations

pump type	Flygt Vertical Pump: Model LL 3400	
pump HP	60	
pump kW	40	http://www.xylemwatersolutions.com/scs/denmark/da/produkter/avloppsvattenpumpar/pumpermedstortflow/Documents/vertical%20column%20pumps%20web.pdf
Efficiency	70%	
kWh per hour	57.14	
daily hours per event	24	
Annual events	50	Email from Dave Halsing on 4/4/18 says 2; but NOAA indicates 4 main storm periods for the 2016-2017 rainy season: https://www.cnrfc.noaa.gov/storm_summaries/janfeb2017storms.php. Assume 5 to be safe
annual hours	1200	
PG&E Emission Factor (lbs CO2e/MWh)	435	https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/fighting-climate-change/fighting-climate-change.page

Total Emissions (MTCO2e) **13.53**

Alts Section page 6-16:

The pump (approximately 10 horsepower; to be powered by electricity from the existing grid) would be installed to actively drain the sump and the basin prior to large storm events, shut down during events to reduce peak downstream flows, and then turn again after the peak discharge has passed. The discharge rate of the pumping system would need to be 1,170 gallons per minute in order to meet the design requirements; this is a rate that can be accommodated with a standard vertical turbine pump. The discharge pipe would empty into Fairfax Creek downstream of the diversion berm at the same point as the primary, passive gated outlet.

Flygt LL & NL 3000 capacities and sizes

Model	max. Capacity (at 60 Hz)	Head range	Motor 50Hz kW / rpm	Motor 60Hz hp / rpm	Discharge tube Ø mm /inch	Diffuser material	Propeller Material
NL 3102	70 l/s	1,5-7,5m	3,1 kW / 1440	5 hp / 1720	500 / 20"	Cast iron	Cast iron or SS
NL 3127	90 l/s	1,5-8,5m	7,5 kW / 1455	10 hp / 1735	600 / 24"	Cast iron	Cast iron or SS
LL 3152	240 l/s	1,5-6,5 m	8,8 kW / 955	14 hp / 1155	600 / 24"	Cast iron	Cast iron or SS
LL 3201	360 l/s	2-9,5 m	22 kW / 970	30 hp / 855	800 / 32"	Cast iron	Cast iron or SS
LL 3300	540 l/s	3-15 m	37 kW / 725	60 hp / 870	800 / 32"	Cast iron	Cast iron or SS
NL 3300	520 l/s	3-23 m	27 kW / 725	60 hp / 875	800 / 32"	Cast iron	Cast iron or SS
NL 3300	520 l/s	3-23 m	44 kW / 975	75 hp / 1170	800 / 32"	Cast iron	Cast iron or SS
LL 3356	560 l/s	5-21 m	55 kW / 730	135 hp / 880	800 / 32"	Cast iron	Cast iron or SS
LL 3356	760 l/s	8-38 m	160 kW / 985	310 hp / 1185	800 / 32"	Cast iron	Cast iron or SS
LL 3400	600 l/s	3,5-8 m	40 kW / 490	60 hp / 505	900 / 36"	Cast iron	Cast iron or SS
LL 3400	700 l/s	4-11 m	70 kW / 585	110 hp / 590	900 / 36"	Cast iron	Cast iron or SS
LL 3400	840 l/s	5-16 m	140 kW / 730	150 hp / 705	900 / 36"	Cast iron	Cast iron or SS
LL 3400	1050 l/s	8-26 m		355 hp / 880	900 / 36"	Cast iron	Cast iron or SS
LL 3400	1200 l/s	10-30 m	375 kW / 985		900 / 36"	Cast iron	Cast iron or SS
LL 3602	1300 l/s	2-7 m	70 kW / 415		1200 / 48"	Cast iron	Cast iron or SS
LL 3602	1550 l/s	3-11 m	135 kW / 485	185 hp / 500	1200 / 48"	Cast iron	Cast iron or SS
LL 3602	1850 l/s	5-15 m	125 kW / 585	310 hp / 590	1200 / 48"	Cast iron	Cast iron or SS
LL 3602	2200 l/s	6-22 m	430 kW / 740	565 hp / 710	1200 / 48"	Cast iron	Cast iron or SS

B-3 Construction Schedule

Construction Schedule

Updated: 4/3/2018

NO OVERLAP BETWEEN PROJECTS; assume BB2 starts when nursery ends

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin — changes from original modeling

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	3	1/16/2019	1/20/2019	3
5	Remove Trees	3	1/21/2019	1/23/2019	3
6	Remove septic tanks	1	1/24/2019	1/24/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/25/2019	1/27/2019	1
8	Remove OH Electrical & Poles	2	1/28/2019	1/29/2019	2
9	Remove Fencing	1	1/30/2019	1/30/2019	1
10	Abandon Water Well	1	1/31/2019	1/31/2019	1
11	Top Soil Stripping/Stockpile	2	2/1/2019	2/4/2019	2
12	Excavation (Cut)	18	2/5/2019	2/28/2019	18
13	Over-excavation beneath berm	3	3/1/2019	3/5/2019	3
14	Over-excavation at spillway	3	3/6/2019	3/10/2019	3
15	Backfill Over-Excavated Areas	7	3/11/2019	3/19/2019	7
16	Off-Haul Trucks				0
17	Catch Basins, Manholes, Drainage Pi	15	3/20/2019	4/9/2019	15
18	Precast Box Culvert (6'x4' & 10'x5'),	8	4/10/2019	4/21/2019	8
19	Construct Overflow Weir/Floodwall	20	4/22/2019	5/19/2019	20
20	Pour Concrete Overflow Weir/Flood	3	5/20/2019	5/22/2019	3
21	Embankment (Berm)	6	5/23/2019	5/30/2019	6
22	Riprap	10	5/31/2019	6/13/2019	10
23	Riprap Trucks				0
24	Seepage cutoff wall 3' x 7'	13	1/2/1900	1/18/1900	13
25	Finish Grade Slopes/Seasonal Chann	2	1/19/1900	1/22/1900	2
26	Place Topsoil	1	1/23/1900	1/23/1900	1
27	Plantings	5	1/24/1900	1/30/1900	5
28	Hydroseeding	1	1/31/1900	1/31/1900	1
29	Fence	5	2/1/1900	2/7/1900	5
30	Demobilization	2	2/8/1900	2/9/1900	2
	Total	**147**	**1/1/2019**	**7/24/2019**	**147**
				Total Days	**204**
				Years	**0.56**

Bridge Building #2 Demolition and Riparian Restoration — changes from original modeling

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control/Stream Diversion	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	2	1/8/2019	1/9/2019	2
3	Demo Concrete Structures	15	1/10/2019	1/30/2019	15
4	Clearing & Grubbing, Tree Removal	2	1/31/2019	2/3/2019	2
5	Top Soil Stripping/Stockpile	1	2/4/2019	2/4/2019	1
6	1/2 Ton Riprap. Slope Transition Structure	10	2/5/2019	2/18/2019	10
7	Terrace Flood Plain	2	2/19/2019	2/20/2019	2
8	Flood Walls	9	2/21/2019	3/5/2019	9
9	Storm Drain	1	3/6/2019	3/6/2019	1
10	Bioengineered Slope	14	3/7/2019	3/26/2019	14
11	Place Topsoil	1	3/27/2019	3/27/2019	1
12	Plantings	10	3/28/2019	4/10/2019	10
13	Guardrail	1	4/11/2019	4/11/2019	1
14	Demobilization	2	4/12/2019	4/15/2019	2
	Total	**75**	**1/1/2019**	**4/15/2019**	**75**
				Total Days	**104**
				Years	**0.28**

Alternative 4

Nursery Site Detention Basin - Option 6

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	3	1/16/2019	1/20/2019	3
5	Remove Trees	3	1/21/2019	1/23/2019	3
6	Remove septic tanks	1	1/24/2019	1/24/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/25/2019	1/27/2019	1
8	Remove OH Electrical & Poles	2	1/28/2019	1/29/2019	2
9	Remove Fencing	1	1/30/2019	1/30/2019	1
10	Abandon Water Well	1	1/31/2019	1/31/2019	1
11	Top Soil Stripping/Stockpile	2	2/1/2019	2/4/2019	2
12	Excavation (Cut)	23	2/5/2019	3/7/2019	23
13	Over-excavation beneath berm	3	3/8/2019	3/12/2019	3
14	Over-excvation at spillway	3	3/13/2019	3/17/2019	3
15	Backfill Over-Excavated Areas	7	3/18/2019	3/26/2019	7
16	Off-Haul Trucks				
17	Catch Basins, Manholes, Drainage Pi	15	3/27/2019	4/16/2019	15
18	Precast Box Culvert (6'x4' & 10'x5'),	8	4/17/2019	4/28/2019	8
19	Storm Water Lift Station	15	4/29/2019	5/19/2019	15
20	Construct Overflow Weir/Floodwall	20	5/20/2019	6/16/2019	20
21	Pour Concrete Overflow Weir/Flood	3	6/17/2019	6/19/2019	3
22	Embankment (Berm)	4	6/20/2019	6/25/2019	4
23	Riprap	10	6/26/2019	7/9/2019	10
24	Riprap Trucks				0
25	Seepage cutoff wall 3' x 7'	13	1/2/1900	1/18/1900	13
26	Finish Grade Slopes/Seasonal Chann	2	1/19/1900	1/22/1900	2
27	Place Topsoil	1	1/23/1900	1/23/1900	1
28	Plantings	5	1/24/1900	1/30/1900	5
29	Hydroseeding	1	1/31/1900	1/31/1900	1
30	Fence	5	2/1/1900	2/7/1900	5
31	Demobilization	2	2/8/1900	2/9/1900	2
	Total	**165**	**1/1/2019**	**8/19/2019**	**165**
				Total Days	**230**
				Years	**0.63**

Alternative 2

Nursery Site Detention Basin - Option 7

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	2	1/16/2019	1/17/2019	2
5	Remove Trees	3	1/18/2019	1/22/2019	3
6	Remove septic tanks	1	1/23/2019	1/23/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/24/2019	1/24/2019	1
8	Remove OH Electrical & Poles	2	1/25/2019	1/28/2019	2
9	Remove Fencing	1	1/29/2019	1/29/2019	1
10	Abandon Water Well	1	1/30/2019	1/30/2019	1
11	Top Soil Stripping/Stockpile	1	1/31/2019	1/31/2019	1
12	Excavation (Cut)	19	2/1/2019	2/27/2019	19
13	Over-excavation beneath berm	3	2/28/2019	3/4/2019	3
14	Backfill Over-Excavated Areas	4	3/5/2019	3/10/2019	4
15	Off-Haul Trucks				
16	Catch Basins, Manholes, Drainage Pi	15	3/11/2019	3/31/2019	15
17	Construct Overflow Weir/Floodwall	20	4/1/2019	4/28/2019	20

18	Pour Concrete Overflow Weir/Flood	3	4/29/2019	5/1/2019	3
19	Embankment (Berm)	1	5/2/2019	5/2/2019	1
20	Riprap	9	5/3/2019	5/15/2019	9
21	Riprap Trucks				0
22	Finish Grade Slopes/Seasonal Chann	2	5/16/2019	5/19/2019	2
23	Place Topsoil	1	5/20/2019	5/20/2019	1
24	Plantings	5	5/21/2019	5/27/2019	5
25	Hydroseeding	1	5/28/2019	5/28/2019	1
26	Fence	5	5/29/2019	6/4/2019	5
27	Demobilization	2	6/5/2019	6/6/2019	2
	Total	**113**	**1/1/2019**	**6/6/2019**	**113**
				Total Days	**156**
				Years	**0.43**

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B-4 Off-Road Construction Emissions

Off-road Construction Equipment Emissions

Updated: 4/12/2018

Summary Emissions

	Unmitigated Average Daily Emissions (lbs/day criteria, MTCO2/yr GHGs)								Mitigated Average Daily Emissions (lbs/day, MTCO2/yr GHGs) - Tier 4 Interim								Mitigated Average Daily Emissions (lbs/day, MTCO2/yr GHGs)) - Tier 4 Interim							
	ROG	NOX	Exhaust PM10	Exhaust PM2.5	CO2	CH4	N2O	CO2e	ROG	NOX	Exhaust PM10	:haust PM2	CO2	CH4	N2O	CO2e	ROG	NOX	Exhaust PM10	Exhaust PM2.5	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	1.045	11.282	0.485	0.452	118.617	0.035	0.003	120.395	0.318	6.310	0.068	0.068	118.617	0.035	0.003	120.395	0.318	6.310	0.068	0.068	118.617	0.035	0.003	120.395
Bridge Building #2 Demolition and Rip	0.586	5.685	0.280	0.262	37.521	0.011	0.001	38.076	0.221	4.139	0.065	0.065	37.521	0.011	0.001	38.076	0.221	4.139	0.065	0.065	37.521	0.011	0.001	38.076
Nursery Site Detention Basin - Option	1.085	11.443	0.500	0.467	139.026	0.040	0.004	141.089	0.341	6.656	0.079	0.079	139.026	0.040	0.004	141.089	0.341	6.656	0.079	0.079	139.026	0.040	0.004	141.089
Nursery Site Detention Basin - Option	0.934	9.845	0.430	0.403	80.000	0.023	0.002	81.177	0.293	5.544	0.073	0.073	80.000	0.023	0.002	81.177	0.293	5.544	0.073	0.073	80.000	0.023	0.002	81.177

No renewable diesel included

	For HRA - Total Annual PM (lbs)							
Pollutant	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Jnmitigate	Nursery7 Mitigated
PM10 - DPM	71.2657	9.9231	21.0130	4.9078	82.4391	13.0792	48.5678	8.2709
PM2.5	66.4262	9.9231	19.6760	4.9078	77.0959	13.0792	45.5334	8.2709
		9.0198		4.5751		11.9034		7.5130

<old mitigated with gens and plate compactors tier 4

Emission Factors

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
					Emission Factors (g/hp-hr) - Unmitigated						Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim						Mitigated EFs percent reduction					
Equipment Type	CalEEMod Equipment	HP	HP Source	LF	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4
450 Backhoe	Tractors/Loaders/Backhoes	137	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	-78%	-23%	-94%	-94%	0%	0%
966 Wheel Loader	Tractors/Loaders/Backhoes	170	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	-78%	-23%	-94%	-94%	0%	0%
336 Excavator	Excavators	266	http://www.ritch	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152	-51%	-28%	-86%	-85%	0%	0%
Air Compressor	Air Compressor	63	http://www.sulla	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	568.299	0.048	-78%	-26%	-57%	-57%	0%	0%
963 Track Loader	Tractors/Loaders/Backhoes	150	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	-78%	-23%	-94%	-94%	0%	0%
Skidsteer Loader	Skid Steer Loader	65	CalEEMod defaul	0.37	0.199	2.65586	0.122	0.112	482.3844	0.153	0.12	2.74	0.112	0.112	482.3844	0.153	-40%	3%	-8%	0%	0%	0%
CP433 Compactor	Other Construction Equipment	105	http://www.ritch	0.42	0.55	5.04831	0.379	0.349	482.2177	0.153	0.11	2.14	0.008	0.008	482.2177	0.153	-80%	-58%	-98%	-98%	0%	0%
Plate Compactor	Plate Compactors	8	CalEEMod defaul	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	568.299	0.059	0%	0%	0%	0%	0%	0%
5kW Generator	Generator Sets	10	5k~7HP	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	568.299	0.059	0%	0%	0%	0%	0%	0%
D6 Dozer	Crawler Tractors	245	http://www.cat.c	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153	0.08	1.29	0.008	0.008	483.4489	0.153	-79%	-74%	-96%	-95%	0%	0%
140M Grader	Graders	213	http://www.cat.c	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154	0.08	1.29	0.008	0.008	486.3288	0.154	-78%	-73%	-95%	-94%	0%	0%
CP64 Compactor	Other Construction Equipment	156	http://www.cat.c	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	-85%	-52%	-97%	-96%	0%	0%
Hydroseeder	Other Construction Equipment	125	http://www.finn	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	-85%	-52%	-97%	-96%	0%	0%

CalEEMod Emission Factors

Equipment Type	Year	Low HP	High HP	TOG	ROG	CO	NOX	SO2	PM10	PM2.5	CO2	CH4
Air Compressors	2019	6	15	1.951	0.748	3.562	4.647	0.008	0.241	0.241	568.299	0.067
Air Compressors	2019	16	25	4.106	0.787	2.501	4.596	0.007	0.222	0.222	568.299	0.071
Air Compressors	2019	26	50	9.076	1.129	5.283	4.546	0.007	0.287	0.287	568.299	0.101
Air Compressors	2019	51	120	9.123	0.538	3.718	3.706	0.006	0.26	0.26	568.299	0.048
Air Compressors	2019	121	175	12.833	0.401	3.204	2.874	0.006	0.15	0.15	568.299	0.036
Air Compressors	2019	176	250	14.416	0.304	1.132	2.469	0.006	0.078	0.078	568.299	0.027
Air Compressors	2019	251	500	24.559	0.293	1.086	2.193	0.005	0.075	0.075	568.299	0.026
Air Compressors	2019	501	750	38.104	0.294	1.086	2.247	0.005	0.076	0.076	568.299	0.026
Air Compressors	2019	751	1000	56.984	0.324	1.182	4.073	0.005	0.102	0.102	568.299	0.029
Crawler Tractors	2019	26	50	2.648469	2.225	7.58896	5.85476	0.005	0.64	0.589	525.9767	0.166
Crawler Tractors	2019	51	120	0.901167	0.757	4.08842	6.39347	0.005	0.535	0.492	486.9909	0.154
Crawler Tractors	2019	121	175	0.615173	0.517	3.37886	5.38191	0.005	0.3	0.276	481.6222	0.152
Crawler Tractors	2019	176	250	0.45175	0.38	1.60445	4.9721	0.005	0.187	0.172	483.4489	0.153
Crawler Tractors	2019	251	500	0.37933	0.319	2.21938	3.93412	0.005	0.153	0.141	485.8645	0.154
Crawler Tractors	2019	501	750	0.316919	0.266	1.35585	3.34253	0.005	0.123	0.113	483.3879	0.153
Crawler Tractors	2019	751	1000	0.547243	0.46	2.02037	7.21215	0.005	0.211	0.194	486.2545	0.154
Excavators	2019	16	25	0.75855	0.637	4.59698	4.19867	0.005	0.25	0.23	536.9132	0.17
Excavators	2019	26	50	0.75855	0.637	4.59698	4.19867	0.005	0.25	0.23	536.9132	0.17
Excavators	2019	51	120	0.386598	0.325	3.52421	3.36874	0.005	0.211	0.194	478.2452	0.151
Excavators	2019	121	175	0.293021	0.246	3.08163	2.53264	0.005	0.122	0.112	482.6838	0.153
Excavators	2019	176	250	0.220917	0.186	1.12671	2.24187	0.005	0.068	0.063	482.2503	0.153
Excavators	2019	251	500	0.192898	0.162	1.1135	1.77986	0.005	0.058	0.053	481.2361	0.152
Excavators	2019	501	750	0.209677	0.176	1.17289	1.98661	0.005	0.067	0.062	479.2876	0.152
Generator Sets	2019	6	15	1.758	0.662	3.562	4.617	0.008	0.224	0.224	568.299	0.059
Generator Sets	2019	16	25	3.356	0.731	2.501	4.596	0.007	0.214	0.214	568.299	0.066
Generator Sets	2019	26	50	6.208	0.779	4.076	4.215	0.007	0.222	0.222	568.299	0.07
Generator Sets	2019	51	120	8.233	0.405	3.396	3.446	0.006	0.206	0.206	568.299	0.036
Generator Sets	2019	121	175	10.727	0.29	2.929	2.669	0.006	0.118	0.118	568.299	0.026
Generator Sets	2019	176	250	11.695	0.211	1.036	2.285	0.006	0.064	0.064	568.299	0.019
Generator Sets	2019	251	500	17.492	0.199	1.015	2.056	0.005	0.062	0.062	568.299	0.018
Generator Sets	2019	501	750	28.675	0.202	1.015	2.104	0.005	0.062	0.062	568.299	0.018
Generator Sets	2019	1001	9999	71.228	0.261	1.103	3.829	0.005	0.087	0.087	568.299	0.023
Graders	2019	26	50	3.11378	2.616	8.27912	5.94463	0.005	0.737	0.678	503.7509	0.159
Graders	2019	51	120	1.228249	1.032	4.6424	8.1592	0.005	0.665	0.612	479.9011	0.152
Graders	2019	121	175	0.724541	0.609	3.65586	6.01354	0.005	0.337	0.31	489.0419	0.155
Graders	2019	176	250	0.428358	0.36	1.35927	4.86575	0.005	0.156	0.144	486.3288	0.154
Graders	2019	251	500	0.384059	0.323	1.52849	3.21794	0.005	0.124	0.114	482.5879	0.153
Graders	2019	501	750	13.635	0.335	1.255	2.276	0.005	0.08	0.08	568.299	0.03
Other Construction Equipment	2019	6	15	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	16	25	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	26	50	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	51	120	0.655004	0.55	3.7535	5.04831	0.005	0.379	0.349	482.2177	0.153
Other Construction Equipment	2019	121	175	0.490382	0.412	3.25619	4.4331	0.005	0.233	0.215	480.4518	0.152
Other Construction Equipment	2019	251	500	0.277883	0.233	1.66739	2.85547	0.005	0.103	0.094	485.4127	0.154
Plate Compactors	2019	6	15	0.79	0.661	3.469	4.142	0.008	0.161	0.161	568.299	0.059
Skid Steer Loaders	2019	16	25	0.531282	0.446	3.73957	3.75009	0.005	0.154	0.141	539.2667	0.171
Skid Steer Loaders	2019	26	50	0.531282	0.446	3.73957	3.75009	0.005	0.154	0.141	539.2667	0.171
Skid Steer Loaders	2019	51	120	0.2373	0.199	3.27736	2.65586	0.005	0.122	0.112	482.3844	0.153
Tractors/Loaders/Backhoes	2019	16	25	1.095082	0.92	5.20327	4.60928	0.005	0.33	0.304	527.6843	0.167
Tractors/Loaders/Backhoes	2019	26	50	1.095082	0.92	5.20327	4.60928	0.005	0.33	0.304	527.6843	0.167
Tractors/Loaders/Backhoes	2019	51	120	0.437701	0.368	3.63777	3.69257	0.005	0.247	0.227	485.8548	0.154
Tractors/Loaders/Backhoes	2019	121	175	0.321856	0.27	3.12158	2.78412	0.005	0.14	0.129	477.9151	0.151
Tractors/Loaders/Backhoes	2019	176	250	0.291458	0.245	1.22027	3.14683	0.005	0.102	0.094	481.4206	0.152
Tractors/Loaders/Backhoes	2019	251	500	0.245176	0.206	1.38918	2.34458	0.005	0.082	0.075	479.0826	0.152
Tractors/Loaders/Backhoes	2019	501	750	0.311873	0.262	1.6025	3.12046	0.005	0.117	0.107	478.9216	0.152

Tier	Low HP	High HP	CO,g/bhp-hr	NOx,g/bhp-hr	PM10,g/bhp-hr	PM2.5,g/bhp-h	ROG,g/bhp-hr
Tier 1	25	49	4.1	5.26	0.48	0.48	1.74
Tier 1	50	74	6.9	6.54	0.552	0.552	1.19
Tier 1	75	119	6.9	6.54	0.552	0.552	1.19
Tier 1	120	174	6.9	6.54	0.274	0.274	0.82
Tier 1	175	299	6.9	5.93	0.108	0.108	0.38
Tier 1	300	599	6.9	5.93	0.108	0.108	0.38
Tier 1	600	750	6.9	5.93	0.108	0.108	0.38
Tier 1	751	2000	6.9	5.93	0.108	0.108	0.38
Tier 2	25	49	4.1	4.63	0.28	0.28	0.29
Tier 2	50	74	3.7	4.75	0.192	0.192	0.23
Tier 2	75	119	3.7	4.75	0.192	0.192	0.23
Tier 2	120	174	3.7	4.17	0.128	0.128	0.19
Tier 2	175	299	2.6	4.15	0.088	0.088	0.12
Tier 2	300	599	2.6	3.79	0.088	0.088	0.12
Tier 2	600	750	2.6	3.79	0.088	0.088	0.12
Tier 2	751	2000	2.6	3.79	0.088	0.088	0.12
Tier 3	25	49	4.1	4.63	0.28	0.28	0.29
Tier 3	50	74	3.7	2.74	0.192	0.192	0.12
Tier 3	75	119	3.7	2.74	0.192	0.192	0.12
Tier 3	120	174	3.7	2.32	0.112	0.112	0.12
Tier 3	175	299	2.6	2.32	0.088	0.088	0.12
Tier 3	300	599	2.6	2.32	0.088	0.088	0.12
Tier 3	600	750	2.6	2.32	0.088	0.088	0.12
Tier 3	751	2000	2.6	2.32	0.088	0.088	0.12
Tier 4 Interim	25	49	4.1	4.55	0.128	0.128	0.12
Tier 4 Interim	50	74	3.7	2.74	0.112	0.112	0.12
Tier 4 Interim	75	119	3.7	2.14	0.008	0.008	0.11
Tier 4 Interim	120	174	3.7	2.15	0.008	0.008	0.06
Tier 4 Interim	175	299	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	300	599	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	600	750	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	751	2000	2.6	2.24	0.048	0.048	0.12
Tier 4 Final	25	49	4.1	2.75	0.008	0.008	0.12
Tier 4 Final	50	74	3.7	2.74	0.008	0.008	0.12
Tier 4 Final	75	119	3.7	0.26	0.008	0.008	0.06
Tier 4 Final	120	174	3.7	0.26	0.008	0.008	0.06
Tier 4 Final	175	299	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	300	599	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	600	750	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	751	2000	2.6	2.24	0.016	0.016	0.06

Source: Offroad_Efs

Emissions by Site / Alternative

							Emission Factors (g/hp-hr) - Unmitigated					
Equipment Recap	Hrs/day	Days	Equip Hrs	Equipment Type	HP	LF	ROG	NOX	PM10	PM2.5	CO2	CH4
Bridge Building #2 Demolition and Riparian Restoration			**5,581**		**1,588**							
Pickup Trucks Superintendent, Forema	10	225	2250									
450 Backhoe: Items 1, 14	8	7	56	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
Flatbed Truck: Items 1-5, 8, 9, 12-14	8	48	384									
966 Wheel Loader: Item 2	8	2	16	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
336 Excavator: Items 2, 3, 4, 6, 7 & 9	8	51	404	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152
End Dump/Highside: Items 2-4, 6, 10	8	122	976									
Watertruck: Items 2, 3, 4, 5, 6, 8, 10	8	47	376									
Air Compressor: Items 2, 3, 8, 13	8	27	216	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048
963 Track Loader: Items 3, 4, 6 & 9	8	28	224	963 Track Loader	150	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
Skidsteer Loader: Items 5, 7, 10, 11, 1:	8	28	224	Skidsteer Loader	65	0.37	0.199	2.65586	0.122	0.112	482.3844	0.153
CP433 Compactor: Items 7, 10	8	16	128	CP433 Compactor	105	0.42	0.55	5.04831	0.379	0.349	482.2177	0.153
Plate Compactor: Items 7, 10	8	16	128	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059
5kW Generator: Items 8, 10, 13	8	24	192	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059
Ready Mix Truck	8	1	7									
Nursery Site Detention Basin			**10,820**		**4,000**							
Pickup Trucks Superintendent, Forema	10	441	4410									
450 Backhoe: Items 1, 10, 27, 29, 30	10	18	180	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
Flatbed Truck: Items 1-15, 19-22, 24, 2	10	120	1200									
966 Wheel Loader: Item 2-7, 11-18, 21	10	100	1000	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
336 Excavator: Items 2-7, 12-14, 17, 1ɛ	10	84	840	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152
D6 Dozer: Items 11- 15, 21, 25	10	41	410	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153
140M Grader: Items 15, 21, 25, 26	10	16	160	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154
End Dump/Highside: Items 2-7	10	14	140									
Watertruck: Items 11-18, 21, 25, 26, 2	10	66	660									
Air Compressor: Items 1, 2, 8, 9, 17-20	10	50	500	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048
CP64 Compactor: Items 15, 21	10	13	130	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Plate Compactor: Items 17, 18	10	23	230	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059
5kW Generator: Items 8, 9, 17-20, 29	10	54	540	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059
Hydroseeder: item 28	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Ready Mix Truck: Item 20, 24	10	16	160									
Boom Truck: Item 8, 19, 20	10	25	250									
Nursery Site Detention Basin - Option 6			**12,490**		**4,920**							
Pickup Trucks Superintendent, Forema	10	495	4950									
450 Backhoe: Items 1, 10, 28, 30, 31	10	18	180	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
Flatbed Truck: Items 1-15, 20-25, 28, 3	10	123	1230									
966 Wheel Loader: Item 2-7, 11-19, 22	10	118	1180	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
336 Excavator: Items 2-7, 12-14, 17-1ç	10	104	1040	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152
D6 Dozer: Items 11-15, 22, 26	10	44	440	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153
140M Grader: Items 15, 22, 26, 27	10	14	140	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154
End Dump/Highside: Items 2-7	10	14	140									
Watertruck: Items 11-19, 22, 26, 27, 2	10	84	840									
Air Compressor: Items 2, 3, 8, 9, 17-21	10	75	750	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048
CP64 Compactor: Items 15, 22	10	11	110	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Plate Compactor: Items 17-19	10	38	380	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059
5kW Generator: Items 8, 9, 17-21, 30	10	69	690	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059
Hydroseeder: item 29	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Ready Mix Truck: Item 21, 25	10	16	160									
Boom Truck: Item 8, 20, 21	10	25	250									
Nursery Site Detention Basin - Option 7			**8,030**		**2,850**							
Pickup Trucks Superintendent, Forema	10	339	3390									
450 Backhoe: Items 1, 9, 10, 23, 25, 26	10	19	190	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
Flatbed Truck: Items 1-14, 17-20, 23, 2	10	94	940									
966 Wheel Loader: Item 2-7, 11, 12, 1(	10	50	500	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151
336 Excavator: Items 2-7, 12, 13, 16, 2	10	59	590	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152
D6 Dozer: Items 11-14, 17, 18	10	30	300	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153
140M Grader: Items 14, 19, 21,22	10	8	80	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154
End Dump/Highside: Items 2-7	10	13	130									
Watertruck: Items 11-14, 16, 19, 21, 2	10	47	470									
Air Compressor: Items 2, 3, 8, 9, 16-18	10	52	520	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048
CP64 Compactor: Items 14, 19	10	5	50	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Plate Compactor: Items 16	10	15	150	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059
5kW Generator: Items 8, 9, 16-18, 25	10	46	460	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059
Hydroseeder: item 25	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152
Boom Truck: Item 8, 17, 18	10	25	250									

*= EF * HP * LF * lbs/g * equip hrs*

	Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim						Emissions (lbs) - Unmitigated						Emissions (lbs) - Mitigated					
Equipment Recap	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4
Bridge Building #2 Demolition and Riparian Restoration																		
450 Backhoe: Items 1, 14	0.06	2.15	0.008	0.008	477.9151	0.151	1.689696467	17.42339899	0.876139	0.807299	2990.857	0.944978	0.375488	13.45499	0.050065	0.050065	2990.857	0.944978
966 Wheel Loader: Item 2	0.06	2.15	0.008	0.008	477.9151	0.151	0.599058184	6.17722175	0.310623	0.286217	1060.366	0.335029	0.133124	4.770278	0.01775	0.01775	1060.366	0.335029
336 Excavator: Items 2, 3, 4, 6, 7 & 9	0.08	1.29	0.008	0.008	481.2361	0.152	14.58465722	160.238568	5.221667	4.771524	43325.08	13.68437	7.2023	116.1371	0.72023	0.72023	43325.08	13.68437
Air Compressor: Items 2, 3, 8, 13	0.12	2.74	0.112	0.112	568.299	0.048	7.747336637	53.36734122	3.744066	3.744066	8183.65	0.691212	1.72803	39.4567	1.612828	1.612828	8183.65	0.691212
963 Track Loader: Items 3, 4, 6 & 9	0.06	2.15	0.008	0.008	477.9151	0.151	7.400130514	76.30685691	3.837105	3.535618	13098.64	4.138592	1.644473	58.92697	0.219263	0.219263	13098.64	4.138592
Skidsteer Loader: Items 5, 7, 10, 11, 1:	0.12	2.74	0.112	0.112	482.3844	0.153	2.363473783	31.54299236	1.448964	1.330196	5729.16	1.817143	1.42521	32.5423	1.330196	1.330196	5729.16	1.817143
CP433 Compactor: Items 7, 10	0.11	2.14	0.008	0.008	482.2177	0.153	6.84456516	62.82452135	4.716528	4.343188	6001.037	1.904034	1.368913	26.63158	0.099557	0.099557	6001.037	1.904034
Plate Compactor: Items 7, 10	0.661	4.142	0.161	0.161	568.299	0.059	0.641659289	4.020806011	0.156289	0.156289	551.6707	0.057274	0.641659	4.020806	0.156289	0.156289	551.6707	0.057274
5kW Generator: Items 8, 10, 13	0.662	4.617	0.224	0.224	568.299	0.059	2.073602709	14.46196935	0.701642	0.701642	1780.1	0.184807	2.073603	14.46197	0.701642	0.701642	1780.1	0.184807
Nursery Site Detention Basin																		
450 Backhoe: Items 1, 10, 27, 29, 30	0.06	2.15	0.008	0.008	477.9151	0.151	5.431167216	56.00378248	2.816161	2.594891	9613.47	3.037431	1.206926	43.24818	0.160923	0.160923	9613.47	3.037431
966 Wheel Loader: Item 2-7, 11-18, 21	0.06	2.15	0.008	0.008	477.9151	0.151	37.44113653	386.0763594	19.41392	17.88854	66272.91	20.9393	8.320253	298.1424	1.109367	1.109367	66272.91	20.9393
336 Excavator: Items 2-7, 12-14, 17, 1ɛ	0.08	1.29	0.008	0.008	481.2361	0.152	30.32453482	333.1692997	10.85693	9.92099	90081.86	28.45265	14.97508	241.4731	1.497508	1.497508	90081.86	28.45265
D6 Dozer: Items 11- 15, 21, 25	0.08	1.29	0.008	0.008	483.4489	0.153	36.18566906	473.4704346	17.80716	16.37878	46036.64	14.56949	7.618036	122.8408	0.761804	0.761804	46036.64	14.56949
140M Grader: Items 15, 21, 25, 26	0.08	1.29	0.008	0.008	486.3288	0.154	11.0897194	149.8883393	4.805545	4.435888	14981.25	4.743936	2.464382	39.73816	0.246438	0.246438	14981.25	4.743936
Air Compressor: Items 1, 2, 8, 9, 17-20	0.12	2.74	0.112	0.112	568.299	0.048	17.93364962	123.5355121	8.66682	8.66682	18943.63	1.600028	4.000071	91.33494	3.733399	3.733399	18943.63	1.600028
CP64 Compactor: Items 15, 21	0.06	2.15	0.008	0.008	480.4518	0.152	7.736580892	83.24523484	4.375299	4.037293	9021.976	2.854273	1.126687	40.37293	0.150225	0.150225	9021.976	2.854273
Plate Compactor: Items 17, 18	0.661	4.142	0.161	0.161	568.299	0.059	1.152981534	7.2248858	0.280832	0.280832	991.2833	0.102914	1.152982	7.224886	0.280832	0.280832	991.2833	0.102914
5kW Generator: Items 8, 9, 17-20, 29	0.662	4.617	0.224	0.224	568.299	0.059	5.832007619	40.67428879	1.973368	1.973368	5006.532	0.519771	5.832008	40.67429	1.973368	1.973368	5006.532	0.519771
Hydroseeder: item 28	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929
Nursery Site Detention Basin - Option 6																		
450 Backhoe: Items 1, 10, 28, 30, 31	0.06	2.15	0.008	0.008	477.9151	0.151	5.431167216	56.00378248	2.816161	2.594891	9613.47	3.037431	1.206926	43.24818	0.160923	0.160923	9613.47	3.037431
966 Wheel Loader: Item 2-7, 11-19, 22	0.06	2.15	0.008	0.008	477.9151	0.151	44.1805411	455.5701041	22.90843	21.10848	78202.03	24.70838	9.817898	351.808	1.309053	1.309053	78202.03	24.70838
336 Excavator: Items 2-7, 12-14, 17-1ç	0.08	1.29	0.008	0.008	481.2361	0.152	37.54466216	412.4953234	13.44192	12.28313	111529.9	35.22709	18.54057	298.9668	1.854057	1.854057	111529.9	35.22709
D6 Dozer: Items 11-15, 22, 26	0.08	1.29	0.008	0.008	483.4489	0.153	38.83340094	508.1146127	19.11012	17.57722	49405.17	15.63555	8.175453	131.8292	0.817545	0.817545	49405.17	15.63555
140M Grader: Items 15, 22, 26, 27	0.08	1.29	0.008	0.008	486.3288	0.154	9.703504471	131.1522969	4.204852	3.881402	13108.59	4.150944	2.156334	34.77089	0.215633	0.215633	13108.59	4.150944
Air Compressor: Items 2, 3, 8, 9, 17-21	0.12	2.74	0.112	0.112	568.299	0.048	26.90047444	185.3032681	13.00023	13.00023	28415.45	2.400042	6.000106	137.0024	5.600099	5.600099	28415.45	2.400042
CP64 Compactor: Items 15, 22	0.06	2.15	0.008	0.008	480.4518	0.152	6.546337678	70.43827563	3.702176	3.416171	7633.98	2.415154	0.95335	34.16171	0.127113	0.127113	7633.98	2.415154
Plate Compactor: Items 17-19	0.661	4.142	0.161	0.161	568.299	0.059	1.904926013	11.93676784	0.463983	0.463983	1637.772	0.170031	1.904926	11.93677	0.463983	0.463983	1637.772	0.170031
5kW Generator: Items 8, 9, 17-21, 30	0.662	4.617	0.224	0.224	568.299	0.059	7.452009736	51.97270234	2.521526	2.521526	6397.235	0.664152	7.45201	51.9727	2.521526	2.521526	6397.235	0.664152
Hydroseeder: item 29	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929
Nursery Site Detention Basin - Option 7																		
450 Backhoe: Items 1, 9, 10, 23, 25, 26	0.06	2.15	0.008	0.008	477.9151	0.151	5.732898728	59.11510373	2.972614	2.739052	10147.55	3.206177	1.273977	45.65086	0.169864	0.169864	10147.55	3.206177
966 Wheel Loader: Item 2-7, 11, 12, 1(	0.06	2.15	0.008	0.008	477.9151	0.151	18.72056826	193.0381797	9.706961	8.944272	33136.45	10.46965	4.160126	149.0712	0.554684	0.554684	33136.45	10.46965
336 Excavator: Items 2-7, 12, 13, 16, 2	0.08	1.29	0.008	0.008	481.2361	0.152	21.29937565	234.01177	7.625702	6.968314	63271.78	19.9846	10.51821	169.6061	1.051821	1.051821	63271.78	19.9846
D6 Dozer: Items 11-14, 17, 18	0.08	1.29	0.008	0.008	483.4489	0.153	26.47731882	346.4417814	13.02963	11.98447	33685.34	10.6606	5.574172	89.88353	0.557417	0.557417	33685.34	10.6606
140M Grader: Items 14, 19, 21,22	0.08	1.29	0.008	0.008	486.3288	0.154	5.544859698	74.94416965	2.402773	2.217944	7490.625	2.371968	1.232191	19.86908	0.123219	0.123219	7490.625	2.371968
Air Compressor: Items 2, 3, 8, 9, 16-18	0.12	2.74	0.112	0.112	568.299	0.048	18.65099561	128.4769326	9.013492	9.013492	19701.38	1.664029	4.160073	94.98834	3.882735	3.882735	19701.38	1.664029
CP64 Compactor: Items 14, 19	0.06	2.15	0.008	0.008	480.4518	0.152	2.975608035	32.01739801	1.682807	1.552805	3469.991	1.097797	0.433341	15.52805	0.057779	0.057779	3469.991	1.097797
Plate Compactor: Items 16	0.661	4.142	0.161	0.161	568.299	0.059	0.751944479	4.711882044	0.183151	0.183151	646.4891	0.067118	0.751944	4.711882	0.183151	0.183151	646.4891	0.067118
5kW Generator: Items 8, 9, 16-18, 25	0.662	4.617	0.224	0.224	568.299	0.059	4.96800649	34.64846823	1.681017	1.681017	4264.823	0.442768	4.968006	34.64847	1.681017	1.681017	4264.823	0.442768
Hydroseeder: item 25	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

B-5 Worker Commutes

Worker Commute Emissions

Updated: 4/4/2018

Calculated using EMFAC2017 EFs for LDA, LDT1, LDT2 (CalEEMod "LD_Mix")

Assumptions

Workers/day	30	PD says 20-30 workers/day
One-way trips/day	60	
Trip length (one-way)	10.8	CalEEMod default
Vehicle Types:		
LDA	50%	CalEEMod Appendix 2: 50% light-duty auto (or passenger car), 25% light-duty truck type 1 (LDT1), and 25% light-duty truck type 2 (LDT2)
LDT1	25%	
LDT2	25%	

EMFAC2017 Emission Factors

Total Emissions by Aggregated Speed Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_mc	sub_area	vehicle_cla	fuel	pollutant	emission
2019	Annual	Marin (SF)	LDA	Gas	NOx	0.494985
2019	Annual	Marin (SF)	LDA	Gas	PM10	0.220537
2019	Annual	Marin (SF)	LDA	Gas	PM2_5	0.0924
2019	Annual	Marin (SF)	LDA	Gas	ROG	0.65551
2019	Annual	Marin (SF)	LDT1	Gas	NOx	0.109347
2019	Annual	Marin (SF)	LDT1	Gas	PM10	0.025784
2019	Annual	Marin (SF)	LDT1	Gas	PM2_5	0.011013
2019	Annual	Marin (SF)	LDT1	Gas	ROG	0.16832
2019	Annual	Marin (SF)	LDT2	Gas	NOx	0.309677
2019	Annual	Marin (SF)	LDT2	Gas	PM10	0.088606
2019	Annual	Marin (SF)	LDT2	Gas	PM2_5	0.036974
2019	Annual	Marin (SF)	LDT2	Gas	ROG	0.343634
2019	Annual	Marin (SF)	LDA	Gas	CH4	1.679103
2019	Annual	Marin (SF)	LDA	Gas	CO2	1390.704
2019	Annual	Marin (SF)	LDA	Gas	N2O	14.79877
2019	Annual	Marin (SF)	LDT1	Gas	CH4	0.299203
2019	Annual	Marin (SF)	LDT1	Gas	CO2	186.4021
2019	Annual	Marin (SF)	LDT1	Gas	N2O	2.494028
2019	Annual	Marin (SF)	LDT2	Gas	CH4	0.798757
2019	Annual	Marin (SF)	LDT2	Gas	CO2	718.0189
2019	Annual	Marin (SF)	LDT2	Gas	N2O	7.730588

Default_Marin_2019_Annual_Worker_emission

Aggregated VMT

calendar_y	sub_area	vehicle_cla	fuel	vmt
2019	Marin (SF)	LDA	Gas	4279849
2019	Marin (SF)	LDT1	Gas	492237.3
2019	Marin (SF)	LDT2	Gas	1725363

Calculated EFs (g/mi)

Vehicle Type	Fuel	VMT	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
LDA	Gas	4,279,849	0.138946	0.10492	0.0467464	0.019586	294.7828	0.3559138	3.136845
LDT1	Gas	492,237	0.310211	0.201525	0.0475201	0.020298	343.536	0.5514257	4.596451
LDT2	Gas	1,725,363	0.18068	0.162826	0.0465884	0.01944	377.5298	0.4199815	4.064694
Weighted Average			0.192196	0.143548	0.0469003	0.019727	327.6578	0.4208087	3.733709

Worker Trip Emissions

*= 60 one-way trips/day * 10.8 miles per one-way trip * grams per mile * lbs per gram*

	Average Daily Emissions (lbs/day)				Annual Emissions (MTCO2e)			
Site	**ROG**	**NOX**	**PM10**	**PM2_5**	**CO2**	**CH4**	**N2O**	**CO2e**
Nursery Site Detention Basin	0.2746	0.2051	0.0670	0.0282	31.21	0.04	0.36	31.61
Bridge Building #2 Demolition and Riparia	0.2746	0.2051	0.0670	0.0282	15.92	0.02	0.18	16.13
Nursery Site Detention Basin - Option 6	0.2746	0.2051	0.0670	0.0282	35.03	0.04	0.40	35.48
Nursery Site Detention Basin - Option 7	0.2746	0.2051	0.0670	0.0282	23.99	0.03	0.27	24.30

B-6 Construction Haul Truck Emissions

HD Trucks

Updated: 4/4/2018

Includes semi-highside, semi-end dumps, bottom dumps, water trucks, ready mix, and boom trucks. Flatbed (MDV) and pickup trucks (LDHT) not included.

Calculated using EMFAC2017 EFs for HHDT

Assumptions

Trip lengths (one-way) 20 From R6 spreadsheet: *Bottom dump trucks haul an average of 14.5 CY to Redwood Landfill in Petaluma. Flagging required at SFDB. Quantity = (Excavation - Embankment) + 20%*

Note: ~21 miles from Nursery to Redwoord ~18 miles from BB2 to Redwood, and 20 mile CalEEMod default. So use 20 for all trucks.

Summary of Emissions

				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)			
	Total One-Way Trips	Total VMT	Average Daily Miles	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Ba	6,808	136,160	926	0.4480	11.8272	0.1907	0.1824	225.07	0.03	10.54	235.64
Bridge Building #2 Demoli	1,474	29,480	393	0.1901	5.0190	0.0809	0.0774	48.73	0.01	2.28	51.02
Nursery Site Detention Ba	9,226	184,520	1,118	0.5409	14.2794	0.2302	0.2203	305.00	0.05	14.29	319.34
Nursery Site Detention Ba	7,950	159,000	1,407	0.6806	17.9668	0.2897	0.2771	262.82	0.04	12.31	275.17

For HRA - Total Annual PM (lbs)

Pollutant	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Jnmitigate	Nursery6 Mitigated	Nursery7 Unmitigatec	Nursery7 Mitigated
PM10 - DPM	28.0309	*28.0309*	11.8952	*11.8952*	33.8426	*33.8426*	42.5817	*42.5817*
PM2.5	26.8182	*26.8182*	11.3806	*11.3806*	32.3786	*32.3786*	40.7396	*40.7396*

Emission Factors

Calculated EFs (g/mi) - Onsite Trucks tab

ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
0.219409436	5.791843668	0.093379625	0.089340063	1652.955	0.254775	77.426806

HD Truck Trips

Green = CalEEMod Entry CalEEMod NOT USED

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Control	5	2	20	4
2	Demo Wood Framed Building	1	4	8	8
3	Demo Misc Structures	5	4	40	8
4	Clearing & Grubbing	3	2	12	4
5	Remove Trees	3	2	12	4
6	Remove septic tanks	1	2	4	4
7	Remove Fire Hydrant & Water	1	2	4	4
8	Remove OH Electrical & Poles	2	7	28	14
9	Remove Fencing	1	2	4	4
10	Abandon Water Well	1	2	4	4
11	Top Soil Stripping/Stockpile	2	12	48	24
12	Excavation (Cut)	18	12	432	24
13	Over-excavation beneath bern	3	12	72	24
14	Over-excavation at spillway	3	12	72	24
15	Backfill Over-Excavated Areas	7	12	168	24
16	Off-Haul Trucks	13.61	142	3,866	284
17	Catch Basins, Manholes, Drain	15	12	360	24
18	Precast Box Culvert (6'x4' & 1C	8	12	192	24
19	Construct Overflow Weir/Floo	20	7	280	14
20	Pour Concrete Overflow Weir/	3	12	72	24
21	Embankment (Berm)	6	12	144	24
22	Riprap	10	32	640	64
23	Riprap Trucks	0	0	0	0
24	Seepage cutoff wall 3' x 7'	13	7	182	14
25	Finish Grade Slopes/Seasonal (	2	12	48	24
26	Place Topsoil	1	12	24	24
27	Plantings	5	2	20	4
28	Hydroseeding	1	12	24	24
29	Fence	5	2	20	4
30	Demobilization	2	2	8	4
	Total			**6,808**	
				0 HHDT rtps/day	
				0 Min	
				284 Max	

Bridge Building #2 Demolition and Riparian Restoration

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Cc	5	1	10	2
2	Demo Wood Framed Bu	2	8	32	16
3	Demo Concrete Structu	15	10	300	20
4	Clearing & Grubbing, Tr	2	8	32	16
5	Top Soil Stripping/Stock	1	6	12	12
6	1/2 Ton Riprap. Slope Ti	10	34	680	68
7	Terrace Flood Plain	2	6	24	12
8	Flood Walls	9	2	36	4
9	Storm Drain	1	6	12	12
10	Bioengineered Slope	14	11	308	22
11	Place Topsoil	1	1	2	2
12	Plantings	10	1	20	2
13	Guardrail	1	1	2	2
14	Demobilization	2	1	4	2
	Total			**1,474**	
				0 HHDT rtps/day	
				2 Min	
				68 Max	

Nursery Site Detention Basin - Option 6

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Control	5	2	22	4.339394
2	Demo Wood Framed Building	1	4	8	8.339394
3	Demo Misc Structures	5	4	42	8.339394
4	Clearing & Grubbing	3	4	25	8.339394
5	Remove Trees	3	4	25	8.339394
6	Remove septic tanks	1	2	4	4.339394
7	Remove Fire Hydrant & Water	1	2	4	4.339394
8	Remove OH Electrical & Poles	2	7	29	14.33939
9	Remove Fencing	1	2	4	4.339394
10	Abandon Water Well	1	2	4	4.339394
11	Top Soil Stripping/Stockpile	2	12	49	24.33939
12	Excavation (Cut)	23	12	560	24.33939
13	Over-excavation beneath bern	3	12	73	24.33939
14	Over-excvation at spillway	3	12	73	24.33939
15	Backfill Over-Excavated Areas	7	12	170	24.33939
16	Off-Haul Trucks	20.32	142	5,772	284
17	Catch Basins, Manholes, Drain	15	12	365	24.33939
18	Precast Box Culvert (6'x4' & 1C	8	12	195	24.33939
19	Storm Water Lift Station	15	12	365	24.33939
20	Construct Overflow Weir/Floo	20	7	287	14.33939
21	Pour Concrete Overflow Weir/	3	12	73	24.33939
22	Embankment (Berm)	4	12	97	24.33939
23	Riprap	10	32	643	64.33939
24	Riprap Trucks	0	0	0	0
25	Seepage cutoff wall 3' x 7'	13	7	186	14.33939
26	Finish Grade Slopes/Seasonal (	2	12	49	24.33939
27	Place Topsoil	1	12	24	24.33939
28	Plantings	5	2	22	4.339394
29	Hydroseeding	1	12	24	24.33939
30	Fence	5	2	22	4.339394
31	Demobilization	2	2	9	4.339394
	Total			**9,226**	
	Source: XXX			0 HHDT rtps/day	
				0 Min	
				284 Max	

Nursery Site Detention Basin - Option 7

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Cc	5	3	30	6
2	Demo Wood Framed Bu	1	5	10	10
3	Demo Misc Structures	5	5	50	10
4	Clearing & Grubbing	2	5	20	10
5	Remove Trees	3	5	30	10
6	Remove septic tanks	1	3	6	6
7	Remove Fire Hydrant &	1	3	6	6
8	Remove OH Electrical &	2	8	32	16
9	Remove Fencing	1	3	6	6
10	Abandon Water Well	1	3	6	6
11	Top Soil Stripping/Stock	1	13	26	26
12	Excavation (Cut)	19	13	494	26
13	Over-excavation beneat	3	13	78	26
14	Backfill Over-Excavated	4	13	104	26
15	Off-Haul Trucks	19.42	142	5,516	284
16	Catch Basins, Manholes	15	13	390	26
17	Construct Overflow We	20	8	320	16
18	Pour Concrete Overflow	3	8	48	16
19	Embankment (Berm)	1	13	26	26
20	Riprap	9	32	576	64
21	Riprap Trucks	0	0	0	0
22	Finish Grade Slopes/Sea	2	13	52	26
23	Place Topsoil	1	13	26	26
24	Plantings	5	3	30	6
25	Hydroseeding	1	13	26	26
26	Fence	5	3	30	6
27	Demobilization	2	3	12	6
	Total			**7,950**	
	Source: XXX			0 HHDT rtps/day	
				0 Min	
				284 Max	

For CalEEMod Entry

	Nursery Site	BB2	Nursery Site - Option 6	Nursery Site - Option 7	
Worker Trips					
Total Trips (one-way)	8,820	4,500	9,900	6,780	
Daily Trips (one-way)	60	60	60	60	*PD: 20-30 crew per day*
Pickups					
Total Trips (one-way)	735	375	825	565	

Daily Trips (one-way)	5	5	5	5
Haul Truck Trips (includes water trucks)				
Total Trips (one-way)	6,808	1,474	9,226	7,950
Daily Trips (one-way)	46	20	56	70

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B-7 Construction Onsite Truck Emissions

Onsite Trucks and Idling + Pickup Truck loads

Updated: 4/12/2018

Includes all HD trucks (semi-highside, semi-end dumps, bottom dumps, water trucks, ready mix, boom trucks, misc trucks), MD trucks (flatbed), and pickup trucks

Assumptions

avg. speed traveling onsite (mph)	5	assumption
Time spend moving onsite	20%	assumption
Time spend idling (water trucks)	15%	assumption
Onsite Haul truck idling time per round tı	15	standard assumption
	2	hrs driving onsite
	0.281	

GHG Scaling Factors (for Tables tab)		
LDT2	CH4:CO2	0.0011124
LDT2	N2O:CO2	0.0107666
HHDT	CH4:CO2	0.0001541
HHDT	N2O:CO2	0.0468415

2

Truck Types:	EMFAC Type	
Semi-Highside Dumps	HHDT	
Semi-End Dumps	HHDT	
Bottom Dumps	HHDT	
Water Trucks	HHDT	
Ready Mix Trucks	HHDT	
Boom Trucks	HHDT	
Miscellaneous	HHDT	e.g. porta potty service truck
Flatbed Trucks	MDV	e.g. Ford Superduty F550 utility bed truck (6500-8000lbs), from Rick Hutts at CH2M
Pickup trucks	LDT2	

EMFAC Type	Description
LDT2	Light-Duty Trucks (3751-5750 lbs)
MDV	Medium-Duty Trucks (5751-8500 lbs)
LHDT1	Light-Heavy-Duty Trucks (8501-10000 lbs)

Summary of Emissions

	Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)			
	ROG	**NOX**	**PM10 Exh**	**PM2.5 Exh**	**CO2**	**CH4**	**N2O**	**CO2e**
Nursery Site Detention Basin								
Onsite Trucks	0.21	2.03	0.0269	0.0257	35.2583	0.0212	1.3882	36.6676
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	4.0513	0.0045	0.0436	4.0994
Idling	0.03	0.48	0.0008	0.0007	4.9232	0.0001	0.2306	5.1539
Total	**0.27**	**2.53**	**0.0279**	**0.0267**	**44.2327**	**0.0258**	**1.6624**	**45.9209**
Bridge Building #2 Demolition and Riparian Restoration								
Onsite Trucks	0.12	1.08	0.0147	0.0140	11.0646	0.0071	0.3839	11.4556
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	2.0670	0.0023	0.0223	2.0915
Idling	0.01	0.22	0.0004	0.0003	1.1408	0.0000	0.0534	1.1943
Total	**0.16**	**1.32**	**0.0154**	**0.0147**	**14.2723**	**0.0094**	**0.4596**	**14.7414**
Nursery Site Detention Basin - Option 6								
Onsite Trucks	0.25	2.40	0.0316	0.0302	45.2514	0.0269	1.8240	47.1023
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	4.5473	0.0051	0.0490	4.6014
Idling	0.04	0.58	0.0009	0.0009	6.7059	0.0001	0.3141	7.0201
Total	**0.31**	**3.01**	**0.0328**	**0.0313**	**56.5047**	**0.0321**	**2.1871**	**58.7239**
Nursery Site Detention Basin - Option 7								
Onsite Trucks	0.31	3.00	0.0392	0.0375	37.5365	0.0220	1.5558	39.1143
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	3.1142	0.0035	0.0335	3.1512
Idling	0.05	0.75	0.0012	0.0012	5.9376	0.0001	0.2781	6.2159
Total	**0.38**	**3.78**	**0.0408**	**0.0389**	**46.5884**	**0.0255**	**1.8675**	**48.4814**

	For HRA - Total Annual PM (lbs)							
Pollutant	**Nursery Unmitigated**	**Nursery Mitigated**	**BB2 Unmitigated**	**BB2 Mitigated**	**Nursery6 Unmitigated**	**Nursery6 Mitigated**	**Nursery7 Jnmitigate**	**Nursery7 Mitigated**
PM10 - DPM	4.0641	*4.0641*	2.2164	*2.2164*	4.7792	*4.7792*	5.9471	*5.9471*
PM2.5	3.8820	*3.8820*	2.1142	*2.1142*	4.5661	*4.5661*	5.6835	*5.6835*

EMFAC2017 Emission Factors - Running

Total Emissions by Speed Bin

GHGs = CO2e

Located here: \\sfo-file01\PROJECTS\SFO\211xxx\D211432.07 - San Anselmo Flood Management Project\03 Working Documents\ADEIR\AQ-GHG\EMFAC

Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_month	sub_area	vehicle_class	fuel	speed	process	pollutant	emission
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	NOx	0.0005838
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	PM10	2.99404E-05
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	PM2_5	2.75307E-05
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	ROG	0.000374098
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	NOx	0.000418823
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	PM10	1.78584E-05
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	PM2_5	1.64318E-05
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	ROG	0.000309439
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	NOx	1.31626E-05
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	PM10	7.05067E-09
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	PM2_5	6.48283E-09
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	ROG	4.45331E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	NOx	5.21127E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	PM10	4.64778E-07
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	PM2_5	4.44672E-07
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	ROG	8.42136E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	NOx	1.09871E-05
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	PM10	1.05508E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	PM2_5	1.00944E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	ROG	1.38642E-05
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	NOx	0.031148598
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	PM10	0.00039545
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	PM2_5	0.000378343
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	ROG	0.003037706
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	CH4	0.002245772
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	CO2	2.461724828
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	N2O	0.013199865
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	CH4	0.001690529
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	CO2	1.647719749
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	N2O	0.009049638
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	CH4	2.32629E-05
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	CO2	0.008429718
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	N2O	0.000137184
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	CH4	9.7789E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	CO2	0.025332393
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	N2O	0.001186606
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	CH4	1.60992E-05
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	CO2	0.062392098
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	N2O	0.002922536
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	CH4	0.00352734
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	CO2	6.47514176
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	N2O	0.30330503

Default_Marin_2019_Annual_Speed_v2_emissions
Default_Marin_2019_Annual_Speed_v2_ghg

VMT by speed bin miles/day

calendar_year	sub_area	vehicle_class	fuel	speed	vmt
2019	Marin (SF)	LDT2	Gas	5	2585.05952
2019	Marin (SF)	MDV	Gas	5	1432.986202
2019	Marin (SF)	HHDT	Gas	5	1.427760007
2019	Marin (SF)	LDT2	Dsl	5	29.55078501
2019	Marin (SF)	MDV	Dsl	5	58.6098394
2019	Marin (SF)	HHDT	Dsl	5	1513.044123

Default_Marin_2019_Annual_Speed_v2_vmt

Total Emissions by Aggregated Speed

GHGs = CO2e

Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_month	sub_area	vehicle_class	fuel	process	pollutant	emission
2019	Annual	Marin (SF)	LDT2	Gas	DIURN	ROG	0.01583614
2019	Annual	Marin (SF)	LDT2	Gas	HOTSOAK	ROG	0.0366876
2019	Annual	Marin (SF)	LDT2	Gas	RESTLOSS	ROG	0.01553303
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	NOx	0.21109379
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	PM10	0.00298832
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	PM2_5	0.00274791
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	ROG	0.03919917
2019	Annual	Marin (SF)	LDT2	Gas	RUNLOSS	ROG	0.12549189
2019	Annual	Marin (SF)	LDT2	Gas	STREX	NOx	0.09858348
2019	Annual	Marin (SF)	LDT2	Gas	STREX	PM10	0.00050805
2019	Annual	Marin (SF)	LDT2	Gas	STREX	PM2_5	0.00046722
2019	Annual	Marin (SF)	LDT2	Gas	STREX	ROG	0.1108858
2019	Annual	Marin (SF)	MDV	Gas	DIURN	ROG	0.01055051
2019	Annual	Marin (SF)	MDV	Gas	HOTSOAK	ROG	0.02361079
2019	Annual	Marin (SF)	MDV	Gas	RESTLOSS	ROG	0.01054609
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	NOx	0.15827574
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	PM10	0.00181356
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	PM2_5	0.00166947
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	ROG	0.03512694
2019	Annual	Marin (SF)	MDV	Gas	RUNLOSS	ROG	0.07708475
2019	Annual	Marin (SF)	MDV	Gas	STREX	NOx	0.06834171
2019	Annual	Marin (SF)	MDV	Gas	STREX	PM10	0.00034092
2019	Annual	Marin (SF)	MDV	Gas	STREX	PM2_5	0.00031404
2019	Annual	Marin (SF)	MDV	Gas	STREX	ROG	0.08243168
2019	Annual	Marin (SF)	HHDT	Gas	DIURN	ROG	5.1846E-08
2019	Annual	Marin (SF)	HHDT	Gas	HOTSOAK	ROG	1.8437E-06
2019	Annual	Marin (SF)	HHDT	Gas	RESTLOSS	ROG	2.5487E-08
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	NOx	0.00159879
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	PM10	2.3806E-07
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	PM2_5	2.1889E-07
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	ROG	0.00015092
2019	Annual	Marin (SF)	HHDT	Gas	RUNLOSS	ROG	8.725E-06
2019	Annual	Marin (SF)	HHDT	Gas	STREX	NOx	1.9722E-07
2019	Annual	Marin (SF)	HHDT	Gas	STREX	PM10	1.4896E-08
2019	Annual	Marin (SF)	HHDT	Gas	STREX	PM2_5	1.3696E-08
2019	Annual	Marin (SF)	HHDT	Gas	STREX	ROG	4.4025E-08
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	NOx	0.00102039
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	PM10	0.00010954
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	PM2_5	0.0001048
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	ROG	0.00031864
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	NOx	0.0027358
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	PM10	0.00024237
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	PM2_5	0.00023189
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	ROG	0.00056554
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	NOx	0.48691435
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	PM10	0.00803757
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	PM2_5	0.00768987
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	ROG	0.01888548
2019	Annual	Marin (SF)	HHDT	Dsl	STREX	NOx	0.01161369
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	CH4	0.23188701
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	CO2	698.212568
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	N2O	4.7936308
2019	Annual	Marin (SF)	LDT2	Gas	STREX	CH4	0.56687024
2019	Annual	Marin (SF)	LDT2	Gas	STREX	CO2	19.8063604
2019	Annual	Marin (SF)	LDT2	Gas	STREX	N2O	2.93695699

Aggregated VMT miles/day

calendar_year	sub_area	vehicle_class	fuel	vmt
2019	Marin (SF)	LDT2	Gas	1725363
2019	Marin (SF)	MDV	Gas	956427.24
2019	Marin (SF)	HHDT	Gas	319.05479
2019	Marin (SF)	LDT2	Dsl	19723.271
2019	Marin (SF)	MDV	Dsl	39118.344
2019	Marin (SF)	HHDT	Dsl	78085.182

Default_Marin_2019_Annual_v2_vmt

2019	Annual	Marin (SF)	MDV	Gas	RUNEX	CH4	0.18262312
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	CO2	467.284799
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	N2O	3.33890169
2019	Annual	Marin (SF)	MDV	Gas	STREX	CH4	0.39710943
2019	Annual	Marin (SF)	MDV	Gas	STREX	CO2	13.8055593
2019	Annual	Marin (SF)	MDV	Gas	STREX	N2O	1.8211462
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	CH4	0.00078838
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	CO2	0.79099762
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	N2O	0.01666297
2019	Annual	Marin (SF)	HHDT	Gas	STREX	CH4	2.1012E-07
2019	Annual	Marin (SF)	HHDT	Gas	STREX	CO2	0.00229609
2019	Annual	Marin (SF)	HHDT	Gas	STREX	N2O	2.8628E-06
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	CH4	0.00037001
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	CO2	6.96407073
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	N2O	0.32620717
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	CH4	0.0006567
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	CO2	18.1943815
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	N2O	0.85225121
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	CH4	0.02192954
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	CO2	142.276698
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	N2O	6.66444686

Default_Marin_2019_Annual_v2_emissions
Default_Marin_2019_Annual_v2_ghg

Calculated EFs (g/mi) GHGs = CO2e

Vehicle Type	Fuel	Speed	VMT		ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
LDT2	Gas		5	2585.05952	0.131283688	0.204875181	0.0105071	0.00966144	863.9026765	0.788117357	4.632279917
MDV	Dsl		5	58.6098394	0.214595696	0.17006181	0.0163309	0.01562442	965.7282131	0.249188998	45.23610991
HHDT	Dsl		5	1513.044123	1.821335883	18.67595324	0.2371024	0.22684548	3882.339841	2.114908362	181.8544279
LDT2	Gas	Aggregated		1725362.976	0.180680396	0.162826363	0.0018384	0.00169049	377.5298361	0.419981541	4.064694432
MDV	Dsl	Aggregated		39118.34374	0.013115287	0.063445409	0.0056208	0.00537764	421.941943	0.0152295	19.76437247
HHDT	Dsl	Aggregated		78085.18166	0.219409436	5.791843668	0.0933796	0.08934006	1652.954936	0.254775001	77.42680614

Change from original EFs

ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
17%	11%	-5%	-5%	-30%	1662%	60270%
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
100%	-8%	360%	360%	-14%	-12%	122097%
11%	22%	-10%	-10%	-7%	4679%	73011%
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#N/A
44%	9%	243%	243%	-5%	199%	135676%

Onsite Truck Travel

Hours per Day of Truck Operation	Nursery	BB2	Nursery 6	Nursery 7
Pickups	10	10	10	10
Flatbed	10	8	10	10
Water Trucks	10	8	10	10
Haul Trucks	10	8	10	10
Other HD Trucks	10	8	10	10

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS and email from Gazaway, Constance/SJC on 4/12/18

Total Number of Trucks operating onsite
Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin — **Total Number of Trucks operating onsite**

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Erosion Control	5	1		0	1	5	*7*
2	Demo Wood Framed Building	5	1		1	1	1	*8*
3	Demo Misc Structures	5	1		1	1	5	*8*
4	Clearing & Grubbing	5	1		0	1	3	*7*
5	Remove Trees	5	1		0	1	3	*7*
6	Remove septic tanks	5	1		0	1	1	*7*
7	Remove Fire Hydrant & Water Valves	5	1		0	1	1	*7*
8	Remove OH Electrical & Poles	5	1		0	2	2	*8*
9	Remove Fencing	5	1		0	1	1	*7*
10	Abandon Water Well	5	1		0	1	1	*7*
11	Top Soil Stripping/Stockpile	5	1	1	0	1	2	*8*
12	Excavation (Cut)	5	1	1	0	1	18	*8*
13	Over-excavation beneath berm	5	1	1	0	1	3	*8*
14	Over-excavation at spillway	5	1	1	0	1	3	*8*
15	Backfill Over-Excavated Areas	5	1	1	0	1	7	*8*
16	Off-Haul Trucks				29		13.61	*29*
17	Catch Basins, Manholes, Drainage Pi	5		1	0	1	15	*7*
18	Precast Box Culvert (6'x4' & 10'x5'), E	5		1	0	1	8	*7*
19	Construct Overflow Weir/Floodwall	5	1		0	2	20	*8*
20	Pour Concrete Overflow Weir/Floodv	5	1		0	3	3	*9*
21	Embankment (Berm)	5	1	1	0	1	6	*8*
22	Riprap	5	1		6	1	10	*13*
23	Riprap Trucks				0		0	*0*
24	Seepage cutoff wall 3' x 7'	5	1		0	2	13	*8*
25	Finish Grade Slopes/Seasonal Chann	5		1	0	1	2	*7*
26	Place Topsoil	5		1	0	1	1	*7*
27	Plantings	5	1		0	1	5	*7*
28	Hydroseeding	5		1	0	1	1	*7*
29	Fence	5	1		0	1	5	*7*
30	Demobilization	5	1		0	1	2	*7*
	Total	**140**	**23**	**11**	**37**	**33**	**160.612676**	***244***

Bridge Building #2 Demolition Total Number of Trucks operating onsite

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Er	5	1		0	1	5	*7*
2	Demo Wood Fr	5	1	1	2	1	2	*10*
3	Demo Concrete	5	1	1	2	1	15	*10*
4	Clearing & Grul	5	1	1	2	1	2	*10*
5	Top Soil Strippi	5	1	1	0	1	1	*8*
6	1/2 Ton Riprap.	5		1	7	1	10	*14*
7	Terrace Flood F	5		1	0	1	2	*7*
8	Flood Walls	5	1		0	2	9	*8*
9	Storm Drain	5	1	1	1	1	1	*9*
10	Bioengineered	5		1	0	1	14	*7*
11	Place Topsoil	5			0	1	1	*6*
12	Plantings	5	1		0	1	10	*7*
13	Guardrail	5	1		0	1	1	*7*
14	Demobilization	5	1		0	1	2	*7*
	Total	**70**	**10**	**8**	**14**	**15**		***117***

Nursery Site Detention Basin - Option 6 — **Total Number of Trucks operating onsite**

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Erosion Control	5	1		0	1	5	*7*
2	Demo Wood Framed Building	5	1		1	1	1	*8*
3	Demo Misc Structures	5	1		1	1	5	*8*
4	Clearing & Grubbing	5	1		1	1	3	*8*
5	Remove Trees	5	1		1	1	3	*8*
6	Remove septic tanks	5	1		0	1	1	*7*
7	Remove Fire Hydrant & Water Valves	5	1		0	1	1	*7*
8	Remove OH Electrical & Poles	5	1		0	2	2	*8*
9	Remove Fencing	5	1		0	1	1	*7*
10	Abandon Water Well	5	1		0	1	1	*7*
11	Top Soil Stripping/Stockpile	5	1	1	0	1	2	*8*
12	Excavation (Cut)	5	1	1	0	1	23	*8*
13	Over-excavation beneath berm	5	1	1	0	1	3	*8*
14	Over-excvation at spillway	5	1	1	0	1	3	*8*
15	Backfill Over-Excavated Areas	5	1	1	0	1	7	*8*
16	Off-Haul Trucks				29		20.32	*29*
17	Catch Basins, Manholes, Drainage Pi	5		1	0	1	15	*7*
18	Precast Box Culvert (6'x4' & 10'x5'), E	5		1	0	1	8	*7*
19	Storm Water Lift Station	5		1	0	1	15	*7*
20	Construct Overflow Weir/Floodwall	5	1		0	2	20	*8*
21	Pour Concrete Overflow Weir/Floodv	5	1		0	3	3	*9*
22	Embankment (Berm)	5	1	1	0	1	4	*8*
23	Riprap	5	1		6	1	10	*13*
24	Riprap Trucks				0		0	*0*
25	Seepage cutoff wall 3' x 7'	5	1		0	2	13	*8*
26	Finish Grade Slopes/Seasonal Chann	5		1	0	1	2	*7*
27	Place Topsoil	5		1	0	1	1	*7*
28	Plantings	5	1		0	1	5	*7*
29	Hydroseeding	5		1	0	1	1	*7*
30	Fence	5	1		0	1	5	*7*
31	Demobilization	5	1		0	1	2	*7*
	Total	**145**	**23**	**12**	**39**	**34**	**185.323944**	***253***

Nursery Site Detention Basin - Total Number of Trucks operating onsite

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Er	5	1		0	1	5	*7*
2	Demo Wood Fr	5	1		1	1	1	*8*
3	Demo Misc Stru	5	1		1	1	5	*8*
4	Clearing & Grul	5	1		1	1	2	*8*
5	Remove Trees	5	1		1	1	3	*8*
6	Remove septic	5	1		0	1	1	*7*
7	Remove Fire Hy	5	1		0	1	1	*7*
8	Remove OH Ele	5	1		0	2	2	*8*
9	Remove Fencin	5	1		0	1	1	*7*
10	Abandon Wate	5	1		0	1	1	*7*
11	Top Soil Strippi	5	1	1	0	1	1	*8*
12	Excavation (Cut	5	1	1	0	1	19	*8*
13	Over-excavatio	5	1	1	0	1	3	*8*
14	Backfill Over-Ex	5	1	1	0	1	4	*8*
15	Off-Haul Trucks				29		19.42	*29*
16	Catch Basins, M	5	1	1	0	1	15	*8*
17	Construct Over	5	1		0	2	20	*8*
18	Pour Concrete (	5	1		0	3	3	*9*
19	Embankment (E	5	1	1	0	1	1	*8*
20	Riprap	5			6	1	9	*12*
21	Riprap Trucks				0		0	*0*
22	Finish Grade Slo	5		1	0	1	2	*7*
23	Place Topsoil	5		1	0	1	1	*7*
24	Plantings	5	1		0	1	5	*7*
25	Hydroseeding	5		1	0	1	1	*7*
26	Fence	5	1		0	1	5	*7*
27	Demobilization	5	1		0	1	2	*7*
	Total	**125**	**21**	**9**	**39**	**29**	**132.42254**	***223***

Total Truck Days	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	735	375	825	565	
Flatbed	120	48	123	100	
Water Trucks	66	47	84	47	
Haul Trucks	461	109	661	628	0.28
Other Trucks	188	84	206	141	
Total	**1,570**	**663**	**1,899**	**1,481**	

Total Miles traveled onsite (5 mph)	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	7,350	3,750	8,250	5,650	*= total truck days * hrs/day * 5 mph * 25% moving time*
Flatbed	1,200	384	1,230	1,000	""
Water Trucks	660	376	840	470	""
Haul Trucks	4,608	872	6,614	6,283	""
Other Trucks	1,880	672	2,060	1,410	""

Total Trips	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	735	375	825	565	
Flatbed	360	144	369	300	
Water Trucks	660	235	840	470	
Haul Trucks	2,245	418	3,210	3,041	
Other Trucks	499	84	563	464	
Total	**4,499**	**1,256**	**5,807**	**4,840**	
Total HD	**3,404**	**737**	**4,613**	**3,975**	
	2,879	**618**	**3,937**	**3,654**	
	3,104	646	4,142	3,805	*includes few other trucks not in truck trip table*

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Emissions

	General Information				Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Speed	Total miles	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin															
Pickups	LDT2	GAS	5	7,350	0.001063659	0.0016599	8.5128E-05	7.82769E-05	0.014471545	0.022583616	0.00115821	0.001064992	6.349684672	0.0057927	0.034047257
Flatbed	MDV	DSL	5	1,200	0.000283861	0.000225	2.1602E-05	2.06676E-05	0.00386206	0.003060588	0.000293906	0.000281191	1.158873856	0.000299	0.054283332
Water Trucks	HHDT	DSL	5	660	0.001325068	0.0135872	0.0001725	0.000165036	0.018028134	0.18486024	0.002346912	0.002245385	2.562344295	0.0013958	0.120023922
Haul Trucks	HHDT	DSL	5	4,608	0.009250732	0.0948569	0.00120427	0.001152169	0.125860306	1.290569854	0.016384558	0.015675769	17.88856433	0.0097448	0.837926293
Other Trucks	HHDT	DSL	5	1,880	0.003774436	0.038703	0.00049136	0.000470102	0.051352867	0.526571594	0.006685142	0.006395946	7.2987989	0.003976	0.341886325
Total					**0.015697756**	**0.149032**	**0.00197485**	**0.001886251**	**0.213574912**	**2.027645893**	**0.026868727**	**0.025663283**	**35.25826605**	**0.0212084**	**1.38816713**
Bridge Building #2 Demolition and Riparian Restoration															
Pickups	LDT2	GAS	5	3,750	0.000542683	0.0008469	4.3433E-05	3.99372E-05	0.014471545	0.022583616	0.00115821	0.001064992	3.239635037	0.0029554	0.01737105
Flatbed	MDV	DSL	5	384	9.08357E-05	7.199E-05	6.9127E-06	6.61362E-06	0.002422284	0.001919601	0.000184338	0.000176363	0.370839634	9.569E-05	0.017370666
Water Trucks	HHDT	DSL	5	376	0.000754887	0.0077406	9.8272E-05	9.40204E-05	0.020130324	0.206416065	0.002620576	0.002507211	1.45975978	0.0007952	0.068377265
Haul Trucks	HHDT	DSL	5	872	0.001750696	0.0179516	0.00022791	0.000218047	0.046685219	0.478709597	0.006077505	0.005814595	3.385400341	0.0018442	0.158577061
Other Trucks	HHDT	DSL	5	672	0.00134916	0.0138343	0.00017563	0.000168036	0.0359776	0.368913818	0.004683582	0.004480972	2.608932373	0.0014212	0.122206176
Total					**0.004488261**	**0.0404454**	**0.00055216**	**0.000526655**	**0.119686972**	**1.078542697**	**0.014724211**	**0.014044133**	**11.06456716**	**0.0071118**	**0.383902218**
Nursery Site Detention Basin - Option 6															
Pickups	LDT2	GAS	5	8,250	0.001193902	0.0018631	9.5552E-05	8.78618E-05	0.014471545	0.022583616	0.00115821	0.001064992	7.127197081	0.006502	0.038216309
Flatbed	MDV	DSL	5	1,230	0.000290958	0.0002306	2.2142E-05	2.11843E-05	0.003526763	0.002794873	0.000268389	0.000256779	1.187845702	0.0003065	0.055640415
Water Trucks	HHDT	DSL	5	840	0.00168645	0.0172928	0.00021954	0.000210046	0.020441818	0.209610124	0.002661126	0.002546007	3.261165466	0.0017765	0.152757719
Haul Trucks	HHDT	DSL	5	6,614	0.013278673	0.1361593	0.00172862	0.001653845	0.160953612	1.650416132	0.020953022	0.020046604	25.67757698	0.0139879	1.202774941
Other Trucks	HHDT	DSL	5	2,060	0.004135818	0.0424086	0.0005384	0.000515112	0.050131126	0.514043875	0.006526095	0.006243779	7.997620072	0.0043567	0.374620122
Total					**0.020585801**	**0.1979545**	**0.00260426**	**0.002488048**	**0.249524864**	**2.399448621**	**0.031566843**	**0.03015816**	**45.2514053**	**0.0269296**	**1.824009507**
Nursery Site Detention Basin - Option 7															
Pickups	LDT2	GAS	5	5,650	0.000817642	0.001276	6.5439E-05	6.0172E-05	0.014471545	0.022583616	0.00115821	0.001064992	4.881050122	0.0044529	0.026172382
Flatbed	MDV	DSL	5	1,000	0.000236551	0.0001875	1.8002E-05	1.7223E-05	0.004186747	0.003317894	0.000318614	0.000304831	0.965728213	0.0002492	0.04523611
Water Trucks	HHDT	DSL	5	470	0.000943609	0.0096758	0.00012284	0.000117526	0.016701043	0.171252266	0.00217415	0.002080097	1.824699725	0.000994	0.085471581
Haul Trucks	HHDT	DSL	5	6,283	0.012613311	0.1293367	0.00164201	0.001570975	0.223244448	2.289145516	0.029062075	0.027804862	24.39093675	0.013287	1.142506847
Other Trucks	HHDT	DSL	5	1,410	0.002830827	0.0290273	0.00036852	0.000352577	0.050103129	0.513756799	0.006522451	0.006240292	5.474099175	0.002982	0.256414743
Total					**0.017441941**	**0.1695032**	**0.00221681**	**0.002118472**	**0.308706912**	**3.000056091**	**0.0392355**	**0.037495075**	**37.53651399**	**0.0219651**	**1.555801663**
					ROG	*NOX*	*PM10*	*PM2_5*	0.333	3.106	0.042	0.040	*CO2*	*CH4*	*N2O*
									0.056	1.208	0.003	0.003			

Pickup Truck Travel - offsite

	Nursery	BB2	Nursery 6	Nursery 7
Total pickup loads	735	375	825	565
one-way trip distance (CalEEMod Vendor	7.3	7.3	7.3	7.3
Total miles	10,731	5,475	12,045	8,249

	General Information				Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Speed	Total miles	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin	LDT2	GAS	Aggregated	10,731	0.00213725	0.0019261	2.1746E-05	1.99967E-05	0.029078234	0.026204852	0.000295862	0.000272064	4.051272671	0.0045068	0.043618236
Bridge Building #2 Demolition and Ripari	LDT2	GAS	Aggregated	5,475	0.001090434	0.0009827	1.1095E-05	1.02024E-05	0.029078234	0.026204852	0.000295862	0.000272064	2.066975853	0.0022994	0.022254202
Nursery Site Detention Basin - Option 6	LDT2	GAS	Aggregated	12,045	0.002398954	0.0021619	2.4409E-05	2.24453E-05	0.029078234	0.026204852	0.000295862	0.000272064	4.547346876	0.0050587	0.048959244
Nursery Site Detention Basin - Option 7	LDT2	GAS	Aggregated	8,249	0.00164292	0.0014806	1.6716E-05	1.53716E-05	0.029078234	0.026204852	0.000295862	0.000272064	3.114243618	0.0034644	0.033529664

Idling

Annual Hours Idling	**Nursery**	**BB2**	**Nursery 6**	**Nursery 7**	***Equation***
Water Trucks	99	56	126	71	*= total truck days * hrs/day * 15% idling time*
Haul Trucks	561	105	803	760	*= total trips * 15 min per trip * 1/60 hrs per min*
Other Trucks	125	21	141	116	*= total trips * 15 min per trip * 1/60 hrs per min*

EMFAC2014 Idling Emissions Inventory - NOT USED

calendar_year	season_month	sub_area	vehicle_class	fuel	process	pollutant	emission
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CH4	0.0001012
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CO2	8.5811021
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	Fuel	0.7722992
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	NOx	0.0502548
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM10	9.126E-05
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM2_5	8.732E-05
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	ROG	0.0015049

Default_Marin_2019_Annual_emission_20171010102613

EMFAC2017 Idling Emission Rates (g/hr-veh)

GHGs = CO2e

calendar_year	season_month	sub_area	vehicle_class	Fuel	process	pollutant	emission_rat	Change from original EFs
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	NOx	40.6292045	8%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	ROG	2.49832886	125%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CO2	6271.59682	-3%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CH4	0.1160409	54%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM10	0.06610876	6%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM2_5	0.06324892	6%

PL_Marin_2019_Annual_Idling

Emissions

N2O separate calc

	General Information			Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Annual Hours Idling	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin														
Water Trucks	HHDT	D	99	0.00027264	0.004433816	7.214E-06	6.9023E-06	0.003709382	0.060324025	9.81547E-05	9.39085E-05	0.620888085	1.1488E-05	0.0290833
Haul Trucks	HHDT	D	561	0.001545646	0.025136153	4.09E-05	3.913E-05	0.0210292	0.341988477	0.000556458	0.000532386	3.519933714	6.5128E-05	0.1648788
Other Trucks	HHDT	D	125	0.000343553	0.005587056	9.091E-06	8.6976E-06	0.004674196	0.076014365	0.000123685	0.000118334	0.782381703	1.44761E-05	0.0366479
Total				**0.002161839**	**0.035157025**	**5.72E-05**	**5.473E-05**	**0.029412779**	**0.478326868**	**0.000778297**	**0.000744628**	**4.923203501**	**9.10921E-05**	**0.23061**
Bridge Building #2 Demolition and Riparian Restoration														
Water Trucks	HHDT	D	56	0.000155322	0.002525931	4.11E-06	3.9322E-06	0.004141919	0.067358172	0.0001096	0.000104859	0.35371806	6.54471E-06	0.0165687
Haul Trucks	HHDT	D	105	0.000287786	0.004680139	7.615E-06	7.2857E-06	0.0076743	0.124803706	0.000203071	0.000194286	0.655381867	1.21263E-05	0.030699
Other Trucks	HHDT	D	21	5.78326E-05	0.000940506	1.53E-06	1.4641E-06	0.001542204	0.025080171	4.08085E-05	3.90432E-05	0.131703533	2.43686E-06	0.0061692
Total				**0.000500941**	**0.008146577**	**1.326E-05**	**1.2682E-05**	**0.013358422**	**0.217242049**	**0.00035348**	**0.000338188**	**1.140803461**	**2.11078E-05**	**0.0534369**
Nursery Site Detention Basin - Option 6														
Water Trucks	HHDT	D	126	0.000346996	0.005643038	9.182E-06	8.7847E-06	0.00420601	0.068400465	0.000111296	0.000106481	0.790221199	1.46212E-05	0.0370151
Haul Trucks	HHDT	D	803	0.002210033	0.03594078	5.848E-05	5.595E-05	0.02678828	0.435645819	0.00070885	0.000678185	5.032956446	9.31228E-05	0.235751
Other Trucks	HHDT	D	141	0.000387616	0.006303632	1.026E-05	9.8131E-06	0.004698381	0.076407662	0.000124325	0.000118947	0.882727252	1.63328E-05	0.0413482
Total				**0.002944645**	**0.047887451**	**7.792E-05**	**7.4548E-05**	**0.035692671**	**0.580453947**	**0.000944471**	**0.000903613**	**6.705904897**	**0.000124077**	**0.3141143**
Nursery Site Detention Basin - Option 7														
Water Trucks	HHDT	D	71	0.000194152	0.003157414	5.138E-06	4.9153E-06	0.003436326	0.055883439	9.09293E-05	8.69957E-05	0.442147576	8.18088E-06	0.0207108
Haul Trucks	HHDT	D	760	0.002093679	0.034048571	5.54E-05	5.3005E-05	0.037056272	0.602629572	0.000980553	0.000938135	4.76798148	8.82201E-05	0.2233392
Other Trucks	HHDT	D	116	0.000319457	0.005195178	8.453E-06	8.0875E-06	0.005654097	0.091950056	0.000149614	0.000143142	0.727505231	1.34607E-05	0.0340774
Total				**0.002607288**	**0.042401163**	**6.899E-05**	**6.6007E-05**	**0.046146696**	**0.750463068**	**0.001221097**	**0.001168272**	**5.937634287**	**0.000109862**	**0.2781274**
				ROG	*NOx*	*PM10*	*PM2_5*					*CO2*	*CH4*	
								0.04	0.70	0.00	0.00			
								0.17	5.95	0.01	0.01			

Water Trucks
Haul Trucks
Other Trucks

B-8 CalEEMod Output Summary

CalEEMod Outputs

updated: 4/16/2018

Paste from CalEEMod: see *OutputSummary_v2_ops.xlsx*

Operation

					Annual Emissions (tons or MT per year for GHG)												
Site	Year	Category 1	Category 2	Mit / Unmit	ROG	NOX	CO	SOX	PM10 Exh	PM10 Dst	PM10 T	PM2.5 Ex	PM2.5 Dst	PM2.5 T	CO2	CH4	N2O
Nursery	2019	Fugitive Dust	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Off-Road	Offroad Equipment	Unmitigated	0.001	0.012	0.007	0.000	0.000	-	0.000	0.000	-	0.000	2.919	-	-
Nursery	2019	Paving	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Archit. Coating	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Hauling	Onroad Truck Travel	Unmitigated	0.001	0.029	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.000	7.027	-	-
Nursery	2019	Vendor	Onroad Truck Travel	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Worker	Worker Commute	Unmitigated	0.000	0.000	0.002	-	-	0.000	0.000	-	0.000	0.000	0.435	-	-

B-9 Health Risk Assessment

HRA - Screening

Updated: 4/5/2018

Since AERSCREEN calculates maximum 1-hr concentration based on continuous emissions (which is then converted to annual), the 1-hr emission rate should be based on the emission rate during the entire construction period (24 hrs/day, 7 days per week).

HRA Notes:

Concentrations modeled using AERSCREEN worst-case 1-hr, scaled to annual

BAAQMD recommends short-term projects "use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less." This was not done to be conservative.

Since AERSCREEN calculates maximum 1-hr concentration based on continuous emissions (which is then converted to annual), the 1-hr emission rate should be based on the emission rate during the entire construction period (24 hrs/day, 7 days per week).

Normally, we use a worker adjustment factor to estimate risk for school and daycare receptors, but this is used if AERMOD models sources using a non-continuous emissions schedule (e.g. work hours). However, because we use AERSCREEN, which assumes a continuous emission rate based on the actual construction schedule of 5 days per week and 8 hrs/day (and estimates maximum 1-hr concentrations), concentrations are based on continuous emissions, and we don't need the adjustment factor.

To estimate annual average PM2.5 concentrations, divided PM2.5 exhaust emissions by the full 24hrs/day and 7 days/week when construction is occurring. This is still conservative because emissions would not occur for 6-7 months of the year. Could divide by the full 365 days/year for the entire year to be less conservative, but did not do this.

4.12.2.1 Non-Continuous Sources

When modeling a non-continuously emitting source (e.g., operating for eight hours per day and five days per week), the modeled long-term average concentrations are based on 24 hours a day and seven days per week for the period of the meteorological data set. Even though the emitting source is modeled using a non-continuous emissions schedule, the long-term concentration is still based on 24 hours a day and seven days per week. Thus, this concentration includes the zero hours when the source was not operating. For the offsite worker inhalation risk, we want to determine the long-term concentration the worker is breathing during their work shift. Therefore, the long-term concentration needs to be adjusted so it is based only on the hours when the worker is present. For example, assuming the emitting source and worker's schedules are the same, the adjustment factor is 4.2 = (24 hours per day/8 hours per shift)×(7 days in a week/5 days in a work week). In this example, the long term residential exposure is adjusted upward to represent the exposure to a worker. Additional concentration adjustments may be appropriate depending on the work shift overlap. These adjustments are discussed below.

4.12.2.2 Continuous Sources

If the source is continuously emitting, then the worker is assumed to breathe the long-term annual average concentration during their work shift. Equation 4.1 becomes one and no concentration adjustments are necessary in this situation when estimating the inhalation cancer risk. Note however, if an assessor does not wish to apply the assumption the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

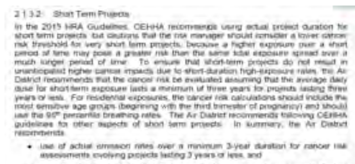
DPM Emissions (lbs)

DPM Emissions (lbs)	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	NOTES		
	34.60	6.56	18.03	5.61	42.00	8.76	21.86	5.86	<- Cancer		
	0.47	0.10	0.82	0.28	0.48	0.11	0.45	0.13	<- PM2.5		
Off-Road	71.27	9.92	21.01	4.91	82.44	13.08	48.57	8.27		-86%	-77%
Hauling	28.03	28.03	11.90	11.90	33.84	33.84	42.58	42.58			
Onsite Trucks	4.06	4.06	2.22	2.22	4.78	4.78	5.95	5.95			
Total	103.36	42.02	35.12	19.02	121.06	51.70	97.10	56.80			
Scaling Factor for HD trucks	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	haul trip = 20 mile one-way trip; assume 0.25 mile onsite segment (once incom		
DPM lbs - Scaled	75.68	14.34	23.38	7.27	87.64	18.28	55.05	14.75			
DPM lbs/hr	0.0155	0.0029	0.0094	0.0029	0.0159	0.0033	0.0147	0.0039	based on 7 days/week, 24 hrs/day; see note above		
DPM g/s	**0.0019**	**0.0004**	**0.0012**	**0.0004**	**0.0020**	**0.0004**	**0.0019**	**0.0005**	NOTE: original HRA based on 5 days/week, 10 hrs/day; see note above		
	0.0065	*0.0012*	*0.0039*	*0.0012*	*0.0067*	*0.0014*	*0.0061*	*0.0016*	*based on 5 days/week, 10 hrs/day; see note above*		
	3.33	*3.33*	*3.33*	*3.33*	*3.35*	*3.35*	*3.31*	*3.31*	*ratio*		

PM2.5 Exhaust Emissions (lbs)

DPM Emissions (lbs)	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	NOTES
Off-Road	66.43	9.92	19.68	4.91	77.10	13.08	45.53	8.27	
Hauling	26.82	26.82	11.38	11.38	32.38	32.38	40.74	40.74	
Onsite Trucks	3.88	3.88	2.11	2.11	4.57	4.57	5.68	5.68	
Total	97.13	40.62	33.17	18.40	114.04	50.02	91.96	54.69	
Scaling Factor for HD trucks	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	haul trip = 20 mile one-way trip; assume 0.25 mile onsite segment (once incoming, once outgoing)
PM2.5 lbs - Scaled	70.64	14.14	21.93	7.16	82.07	18.05	51.73	14.46	
PM2.5 lbs/hr	0.0144	0.0029	0.0088	0.0029	0.0149	0.0033	0.0138	0.0039	based on 7 days/week, 24 hrs/day; see note above
PM2.5 g/s	**0.0018**	**0.0004**	**0.0011**	**0.0004**	**0.0019**	**0.0004**	**0.0017**	**0.0005**	

1.5



2.1.3.2 Short Term Projects

In the 2015 HRA Guidelines, OEHHA recommends using actual project duration for short term projects, but cautions that the risk manager should consider a lower cancer risk threshold for very short term projects, because a higher exposure over a short period of time may pose a greater risk than the same total exposure spread over a much longer period of time. To ensure that short-term projects do not result in unanticipated higher cancer impacts due to short-duration high-exposure rates, the Air District recommends that the cancer risk be evaluated assuming that the average daily dose for short-term exposure lasts a minimum of three years for projects lasting three years or less. For residential exposures, the cancer risk calculations should include the most sensitive age groups (beginning with the third trimester of pregnancy) and should use the 95th percentile breathing rates. The Air District recommends following OEHHA guidelines for other aspects of short term projects. In summary, the Air District recommends:

- use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less, and
- use of actual project duration for cancer risk assessments on projects lasting longer than 3 years.

AERSCREEN Inputs - DPM

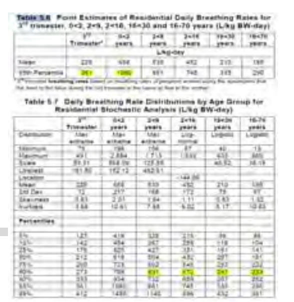
	Nursery	BB2	Notes
Title	Nursery	BB2	
Units	M	M	
Source Type	A	A	
DPM emission rate (g/s)	1	1	
Release Height above ground (meters)	3.89	3.89	Release height for off-road construction equipment and on-road operational mobile sources from the CRRP-HRA (BAAQMD, SF DPH & SF Planning, 2012).
Maximum horizontal dimension of area source (meters)	185	50	
Minimum horizontal dimension of area source (meters)	150	40	
Initial Vertical Dimension (meters)	1.4	1.4	Initial vertical dimension for off-road construction equipment and on-road operational mobile sources from the CRRP-HRA (BAAQMD, SF DPH & SF Planning, 2012).
rural/urban	rural	urban	
population of urban area	-	12,599	https://www.census.gov/quickfacts/fact/table/sananselmotowncalifornia,sanfranciscocountycalifornia,US/PST045216
min distance to ambient air (meters)	default	default	
NO2 chemistry	1	1	
max distance to probe	default	default	
include discrete receptors	no	no	
use flagpole receptors	yes	yes	
flagpole receptor height (meters)	1.5	1.5	BAAQMD 2012, Recommended Methods for Screening and Modeling Local Risks and Hazards
source elevation	default	default	
min ambient temperature (F)	*41*	*41*	http://www.intellicast.com/Local/History.aspx?location=USCA0976
max ambient temperature (F)	*85*	*85*	http://www.intellicast.com/Local/History.aspx?location=USCA0976
min ambient temperature (K)	278	278	
max ambient temperature (K)	303	303	
min wind speed (m/s)	default	default	
anemometer height (m)	default	default	
surface characteristics	2	2	
Dominant surface profile	7	7	
dominant climate profile	1	1	
adjust	no	no	
debug	no	no	
Output file name	Nursery.out	BB2.out	

DPM Concentrations - Maximum 1-hr (ug/m3)

Distance (m) Nursery	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	Distance (m) BB2
1	**1452.3**	*1452.30*	**4880.90**	*4880.90*	*1452.30*	*1452.30*	*1452.30*	*1452.30*	1
25	**1756.4**	1756.40	**7808.50**	*7808.50*	*1756.40*	*1756.40*	*1756.40*	*1756.40*	25
50	**2061.1**	2061.10	**7899.80**	*7899.80*	*2061.10*	*2061.10*	*2061.10*	*2061.10*	26
75	**2352.7**	2352.70	**5096.70**	*5096.70*	*2352.70*	*2352.70*	*2352.70*	*2352.70*	50
100	**2630.9**	2630.90	**3009.90**	*3009.90*	*2630.90*	*2630.90*	*2630.90*	*2630.90*	75
117	**2761.4**	2761.40	**2075.10**	*2075.10*	*2761.40*	*2761.40*	*2761.40*	*2761.40*	100
125	**2743.7**	2743.70	**1544.60**	*1544.60*	*2743.70*	*2743.70*	*2743.70*	*2743.70*	125
150	**2603.3**	2603.30	**1210.60**	*1210.60*	*2603.30*	*2603.30*	*2603.30*	*2603.30*	150
175	**2359.1**	2359.10	**983.80**	*983.80*	*2359.10*	*2359.10*	*2359.10*	*2359.10*	175
200	**2125.9**	2125.90	**821.26**	*821.26*	*2125.90*	*2125.90*	*2125.90*	*2125.90*	200
225	**1924.9**	1924.90	**700.24**	*700.24*	*1924.90*	*1924.90*	*1924.90*	*1924.90*	225
250	**1753.7**	1753.70	**607.01**	*607.01*	*1753.70*	*1753.70*	*1753.70*	*1753.70*	250
275	**1609.3**	1609.30	**533.30**	*533.30*	*1609.30*	*1609.30*	*1609.30*	*1609.30*	275
300	**1484**	1484.00	**473.54**	*473.54*	*1484.00*	*1484.00*	*1484.00*	*1484.00*	300
Concentrations - Maximum 1-hr (ug/m3)									
Residential	2761.40	2761.40	7899.80	7899.80	2761.40	2761.40	2761.40	2761.40	
Daycare	0.00	0.00	473.54	473.54	0.00	0.00	0.00	0.00	
School	2125.90	2125.90	607.01	607.01	2125.90	2125.90	2125.90	2125.90	
Concentrations - Average Annual (ug/m3)									
Residential	276.14	276.14	789.98	789.98	276.14	276.14	276.14	276.14	
Daycare	0.00	0.00	47.35	47.35	0.00	0.00	0.00	0.00	
School	212.59	212.59	60.70	60.70	212.59	212.59	212.59	212.59	
SCALED Concentrations - Average Annual (ug/m3)									
Residential	0.54	0.10	0.93	0.29	0.55	0.12	0.51	0.14	
Daycare	0.00	0.00	0.06	0.02	0.00	0.00	0.00	0.00	
School	0.41	0.08	0.07	0.02	0.43	0.09	0.39	0.11	

ESTIMATED PM2.5 Concentrations - Maximum 1-hr (ug/m3)

Distance (m) Nursery	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	Distance (m) BB2
1	*1355.64*	*1432.31*	*4579.08*	*4807.98*	*1359.92*	*1433.92*	*1364.68*	*1424.08*	1
25	*1639.51*	*1732.23*	*7325.65*	*7691.85*	*1644.68*	*1734.17*	*1650.43*	*1722.27*	25
50	*1923.93*	*2032.74*	*7411.30*	*7781.78*	*1930.00*	*2035.01*	*1936.75*	*2021.05*	26
75	*2196.12*	*2320.32*	*4781.54*	*5020.56*	*2203.05*	*2322.92*	*2210.76*	*2306.98*	50
100	*2455.80*	*2594.69*	*2823.78*	*2964.93*	*2463.56*	*2597.60*	*2472.17*	*2579.78*	75
117	*2577.62*	*2723.40*	*1946.78*	*2044.10*	*2585.76*	*2726.45*	*2594.80*	*2707.74*	100
125	*2561.10*	*2705.94*	*1449.09*	*1521.52*	*2569.18*	*2708.97*	*2578.17*	*2690.38*	125
150	*2430.04*	*2567.47*	*1135.74*	*1192.51*	*2437.71*	*2570.35*	*2446.24*	*2552.71*	150
175	*2202.09*	*2326.64*	*922.96*	*969.10*	*2209.05*	*2329.24*	*2216.77*	*2313.26*	175
200	*1984.41*	*2096.64*	*770.48*	*808.99*	*1990.68*	*2098.99*	*1997.64*	*2084.59*	200
225	*1796.79*	*1898.41*	*656.94*	*689.78*	*1802.46*	*1900.54*	*1808.77*	*1887.49*	225
250	*1636.99*	*1729.57*	*569.47*	*597.94*	*1642.15*	*1731.50*	*1647.90*	*1719.62*	250
275	*1502.20*	*1587.15*	*500.32*	*525.33*	*1506.94*	*1588.93*	*1512.21*	*1578.03*	275
300	*1385.23*	*1463.58*	*444.26*	*466.47*	*1389.61*	*1465.22*	*1394.47*	*1455.16*	300
Concentrations - Maximum 1-hr (ug/m3)									
Residential	2577.62	2723.40	7411.30	7781.78	2585.76	2726.45	2594.80	2707.74	
Daycare	0.00	0.00	444.26	466.47	0.00	0.00	0.00	0.00	
School	1984.41	2096.64	569.47	597.94	1990.68	2098.99	1997.64	2084.59	
Concentrations - Average Annual (ug/m3)									
Residential	257.76	272.34	741.13	778.18	258.58	272.64	259.48	270.77	
Daycare	0.00	0.00	44.43	46.65	0.00	0.00	0.00	0.00	
School	198.44	209.66	56.95	59.79	199.07	209.90	199.76	208.46	
SCALED Concentrations - Average Annual (ug/m3)									
Residential	0.47	0.10	0.82	0.28	0.48	0.11	0.45	0.13	Green = used in results table
Daycare	0.00	0.00	0.05	0.02	0.00	0.00	0.00	0.00	
School	0.36	0.08	0.06	0.02	0.37	0.09	0.35	0.10	



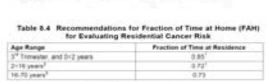
Dose Calculation

	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	
Dose Factors									
Daily Breathing Rate (DBR) [L/kg-day or L/kg-8hrs]									
Residential									
3rd Trimester	361	*361*	*361*	*361*	*361*	*361*	*361*	*361*	Table 5.6, 95th percentile
Age 0<2 Years	1090	*1090*	*1090*	*1090*	*1090*	*1090*	*1090*	*1090*	Table 5.6, 95th percentile
Daycare									
Age 0<2 Years	1200	*1200*	*1200*	*1200*	*1200*	*1200*	*1200*	*1200*	Table 5.8, moderate intensity, 95th
School									
Age 2<9 Years	640	*640*	*640*	*640*	*640*	*640*	*640*	*640*	Table 5.8, moderate intensity, 95th
Inhalation Absorption Factor (A)	1	*1*	*1*	*1*	*1*	*1*	*1*	*1*	
Exposure Frequency (EF) [days/365 days]									
Residential	0.96	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	
Daycare	0.68	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	
School	0.49	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	
Conversion	0.000001	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	
Dose Calculation									
Residential									
3rd Trimester	0.000186173	3.52704E-05	0.000322721	0.000100398	0.000191225	3.98882E-05	0.000177082	4.74505E-05	
Age 0<2 Years	0.000562128	0.000106495	0.000974419	0.000303142	0.000577382	0.000120438	0.000534679	0.000143272	
Total	0.0007483	0.000141765	0.00129714	0.00040354	0.000768607	0.000160326	0.000711761	0.000190722	
Daycare									
Age 0<2 Years	0	0	4.59318E-05	1.42894E-05	0	0	0	0	
Total	0	0	4.59318E-05	1.42894E-05	0	0	0	0	
School									
Age 2<9 Years	0.000130679	2.47572E-05	2.26091E-05	7.03369E-06	0.000134225	2.79985E-05	0.000124298	3.33067E-05	
Total	0.000130679	2.47572E-05	2.26091E-05	7.03369E-06	0.000134225	2.79985E-05	0.000124298	3.33067E-05	

Risk Calculation

	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated		
Risk Factors										
Inhalation Cancer Potency Factor (CPF)	1.1	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*		
Age Sensitivity Factor (ASF) [unitless]										
3rd Trimester	10	*10*	*10*	*10*	*10*	*10*	*10*	*10*		
Age 0<2 Years	10	*10*	*10*	*10*	*10*	*10*	*10*	*10*		
Age 2<9 Years	3	*3*	*3*	*3*	*3*	*3*	*3*	*3*		
Exposure Duration (ED) [years]										
Residential										
3rd Trimester	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
Age 0<2 Years	0.31	0.31	0.03	0.03	0.38	0.38	0.18	0.18		
Daycare										
Age 0<2 Years	0.56	0.56	0.28	0.28	0.63	0.63	0.43	0.43		
School										
Age 2<9 Years	0.56	0.56	0.28	0.28	0.63	0.63	0.43	0.43		
Averaging Time (AT) [years]	70	70	70	70	70	70	70	70		
Fraction of Time at Home (FAH) [unitless]										
3rd Trimester	1	1	1	1	1	1	1	1	1	Fraction of time at home is set to 1.
Age 0<2 Years	1	1	1	1	1	1	1	1	1	
Age 2<9 Years	1	1	1	1	1	1	1	1	1	
Model Adjustment Factor (MAF) [unitless] - NOT USED - see note at top of page										
Residential	1	1	1	1	1	1	1	1		
Chances per Million	1,000,000	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*		
Risk Calculation										
Residential										
3rd Trimester	7.31	1.39	12.68	3.94	7.51	1.57	6.96	1.86		
Age 0<2 Years	27.29	5.17	5.35	1.66	34.49	7.19	14.91	3.99		
Total	**34.60**	**6.56**	**18.03**	**5.61**	**42.00**	**8.76**	**21.86**	**5.86**	Green = used in results table	
Daycare										
Age 0<2 Years	0.00	0.00	2.06	0.64	0.00	0.00	0.00	0.00		
Total	**0.00**	**0.00**	**2.06**	**0.64**	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	
School										
Age 2<9 Years	3.44	0.65	0.30	0.09	3.99	0.83	2.50	0.67		
Total	**3.44**	**0.65**	**0.30**	**0.09**	**3.99**	**0.83**	**2.50**	**0.67**		

an one in a million.



	-81%	-69%
#DIV/0!		-69%
San Anselmo Wind Rose (see below):	-81%	-69%

https://www.meteoblue.com/en/weather/forecast/modelclimate/san-anselmo_united-states-of-america_5391615

Chronic Hazard Index

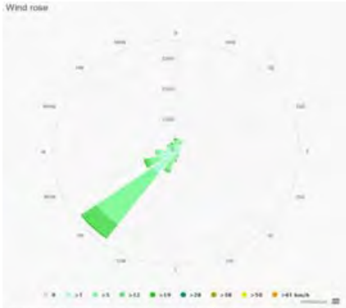
Chronic REL (µg/m3) 5.0

California Air Resources Board, "Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values" and "OEHHA/ARB Approved Chronic Reference Exposure Levels and Target Organs," http://www.arb.ca.gov/toxics/healthval/healthval.htm.

Table last updated: February 23, 2017. Downloaded 10/9/17

Chronic Hazard Index	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	
Residential	0.11	0.02	0.19	0.06	0.11	0.02	0.10	0.03	Green = used in results table
Daycare	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	
School	0.08	0.02	0.01	0.00	0.09	0.02	0.08	0.02	

Wind rose



The wind rose for San Antonio shows how many hours per year the wind blows from the indicated direction. Example SW: Wind is blowing from South-West (SW) to North-East (NE). Cape Horn, the southernmost land point of South America, has a characteristic strong west-wind, which makes crossings from East to West very difficult especially for sailing boats.

6. CPF = Substance-specific (see Table 7.1)
7. ASF = See Section 8.2.1
8. ED = 0.25 years for 3rd trimester; 2 years for 0<2; 7 years for 2<9; 14 years for 2<16; 14 years for 16<30; 54 years for 16-70
9. AT = 70 years
10. FAH = See Table 8.4

8.3.1 Calculation of Noncancer Inhalation Hazard Quotient and Hazard Index

To calculate the acute HQ, the maximum 1-hour ground level concentration (in µg/m³) of a substance at a receptor is divided by the acute 1-hour REL (in µg/m³) for the substance:

$$\text{Acute Hazard Quotient} = \frac{\text{1-hour Max Concentration } (\mu g/m^3)}{\text{Acute REL } (\mu g/m^3)}$$

To calculate the chronic HQ, the annual average ground level concentration of a substance is divided by the chronic REL for the substance:

$$\text{Chronic Hazard Quotient} = \frac{\text{Annual Average Concentration } (\mu g/m^3)}{\text{Chronic REL } (\mu g/m^3)}$$

To calculate the 8-hour HQ, the adjusted annual average ground level concentration of a substance (represented as "Adjusted C_{air}" in EQ 5.4.1.4.A) is divided by the 8-hour REL for the substance:

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B-10 Constants

Constants

Updated:	4/11/2018	
grams per ton	907185	
grams per MT	1000000	
grams per kg	1000	
lbs per ton	2000	
lbs per MT	2204.62	
hrs/day	24	
work hrs/day	10	*San Anselmo Flood Equipment & Work Durations R1*
seconds/hr	3600	
grams per lb	453.592	
kWh per MWh	1000	
1hr to annual concentration	0.1	https://www3.epa.gov/ttn/scram/models/screen/aerscreen_userguide.pdf
Days per year	365	

Renewable Diesel % reductions	Fuel, engine type RD, On-Road, FTP	B20 Soy, off-road	B100 Soy, off-road	**Source**
PM	-34.2%	-23.3%	-55.9%	On-Road: SF RD memo (Sachiko Tanikawa 2015) and Table ES-6: https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pd
THC	-3.4%	-5.2%	-27.5%	Off-Road: Table ES-7: https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pd
NOX	-9.9%	2.8%	13.8%	
CO2	-3.4%	1.2%	2.1%	
				SF RD memo for John Deere engine (Sachiko Tanikawa 2015) and https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pdf, and https://www.arb.ca.gov/fuels/multimedia/meetings/RenewableDieselStaffReport_Nov2013.pc
Percent reduction for low-VOC Arch	0.1			

GWPs

CH4	28	IPCC AR4
N2O	265	IPCC AR4

GHG EFs from Climate Registry for Off-road equipment

CH4 (g/gal)	0.58	Table 13.7 , Construction/Mining Equipment - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
N2O (g/gal)	0.26	Table 13.7 , Construction/Mining Equipment - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
Ratio: CH4:CO2	0.00006	
Ratio: N2O:CO2	0.00003	
CO2 (kg/gal) - Diesel	10.21	Table 13.1 - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pdf
CO2 (kg/gal) - Biodiesel (B100)	9.45	Table 13.1 - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pdf
percent reduction biodiesel	7.4%	

CH4 and N2O from EMFAC

Gasoline - N2O per Nox	4.16%	https://www.arb.ca.gov/msei/emfac2011-faq.htm#emfac2011_web_db_qstn07
Diesel - gN2O per gallon	0.3316	https://www.arb.ca.gov/msei/emfac2011-faq.htm#emfac2011_web_db_qstn07

B-11 CalEEMod Output – Operational Emissions

San Anselmo Flood Control - Operational

Marin County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	10.00	1000sqft	0.23	10,000.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 69

Climate Zone 5 **Operational Year** 2021

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - project modeling

Land Use -

Construction Phase - See AQ-GHG_calcs.xls. Assume all phases grading for simplicity.

Off-road Equipment - See AQ-GHG_calcs_v2.xls

Off-road Equipment - Information from PD and CH2M

Trips and VMT - Based on 10 workers (20 one-way trips per day) and 182 truck loads

On-road Fugitive Dust - See AQ-GHG_calcs_v2.xls

Grading - Information from PD and CH2M

Construction Off-road Equipment Mitigation - Assume all Tier 4 interim, per BAAQMD recommendations

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	5000	500
tblAreaCoating	Area_Nonresidential_Interior	15000	1500
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstructionPhase	NumDays	2.00	6.00
tblEnergyUse	LightingElect	3.58	3.67
tblEnergyUse	T24E	4.10	4.30
tblEnergyUse	T24NG	18.32	18.41
tblGrading	MaterialExported	0.00	1,600.00
tblOffRoadEquipment	HorsePower	212.00	245.00
tblOffRoadEquipment	HorsePower	158.00	266.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Sediment Removal
tblOffRoadEquipment	PhaseName		Sediment Removal
tblOnRoadDust	RoadSiltLoading	0.10	0.04
tblSolidWaste	SolidWasteGenerationRate	9.30	0.93
tblTripsAndVMT	HaulingTripNumber	158.00	182.00
tblTripsAndVMT	WorkerTripNumber	3.00	20.00
tblWater	IndoorWaterUseRate	1,777,337.48	177,733.75
tblWater	OutdoorWaterUseRate	1,089,335.87	108,933.59

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	2.2000e-003	0.0405	0.0175	1.1000e-004	4.5000e-004	5.1000e-004	9.5000e-004	3.3000e-004	4.7000e-004	8.0000e-004	0.0000	10.3809	10.3809	1.3500e-003	0.0000	10.4145
Maximum	**2.2000e-003**	**0.0405**	**0.0175**	**1.1000e-004**	**4.5000e-004**	**5.1000e-004**	**9.5000e-004**	**3.3000e-004**	**4.7000e-004**	**8.0000e-004**	**0.0000**	**10.3809**	**10.3809**	**1.3500e-003**	**0.0000**	**10.4145**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	1.6500e-003	0.0373	0.0274	1.1000e-004	1.1200e-003	1.7000e-004	1.3000e-003	3.3000e-004	1.7000e-004	5.0000e-004	0.0000	10.3809	10.3809	1.3500e-003	0.0000	10.4145
Maximum	**1.6500e-003**	**0.0373**	**0.0274**	**1.1000e-004**	**1.1200e-003**	**1.7000e-004**	**1.3000e-003**	**3.3000e-004**	**1.7000e-004**	**5.0000e-004**	**0.0000**	**10.3809**	**10.3809**	**1.3500e-003**	**0.0000**	**10.4145**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**25.00**	**8.07**	**-56.87**	**0.00**	**-148.89**	**66.67**	**-36.84**	**0.00**	**63.83**	**37.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	**Start Date**	**End Date**	**Maximum Unmitigated ROG + NOX (tons/quarter)**	**Maximum Mitigated ROG + NOX (tons/quarter)**
1	**1-1-2019**	**3-31-2019**	0.0409	0.0372
		Highest	0.0409	0.0372

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Energy	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	47.5127	47.5127	1.8800e-003	5.4000e-004	47.7198
Mobile	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Waste						0.0000	0.0000		0.0000	0.0000	0.1888	0.0000	0.1888	0.0112	0.0000	0.4677
Water						0.0000	0.0000		0.0000	0.0000	0.0564	0.3907	0.4471	5.8100e-003	1.4000e-004	0.6341
Total	**0.0630**	**0.0845**	**0.2583**	**8.8000e-004**	**0.0742**	**1.5800e-003**	**0.0757**	**0.0199**	**1.5300e-003**	**0.0214**	**0.2452**	**122.6355**	**122.8807**	**0.0214**	**6.8000e-004**	**123.6185**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Energy	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	47.5127	47.5127	1.8800e-003	5.4000e-004	47.7198
Mobile	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Waste						0.0000	0.0000		0.0000	0.0000	0.1888	0.0000	0.1888	0.0112	0.0000	0.4677
Water						0.0000	0.0000		0.0000	0.0000	0.0564	0.3907	0.4471	5.8100e-003	1.4000e-004	0.6341
Total	**0.0630**	**0.0845**	**0.2583**	**8.8000e-004**	**0.0742**	**1.5800e-003**	**0.0757**	**0.0199**	**1.5300e-003**	**0.0214**	**0.2452**	**122.6355**	**122.8807**	**0.0214**	**6.8000e-004**	**123.6185**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Sediment Removal	Grading	1/1/2019	1/8/2019	5	6	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Sediment Removal	Concrete/Industrial Saws	0	8.00	81	0.73
Sediment Removal	Crawler Tractors	0	10.00	245	0.43
Sediment Removal	Excavators	1	10.00	266	0.38
Sediment Removal	Rubber Tired Dozers	0	1.00	247	0.40
Sediment Removal	Tractors/Loaders/Backhoes	0	6.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Sediment Removal	1	20.00	0.00	182.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

3.2 Sediment Removal - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.0800e-003	0.0119	7.4400e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.6000e-004	3.6000e-004	0.0000	2.9186	2.9186	9.2000e-004	0.0000	2.9417
Total	**1.0800e-003**	**0.0119**	**7.4400e-003**	**3.0000e-005**	**0.0000**	**3.9000e-004**	**3.9000e-004**	**0.0000**	**3.6000e-004**	**3.6000e-004**	**0.0000**	**2.9186**	**2.9186**	**9.2000e-004**	**0.0000**	**2.9417**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.9000e-004	0.0285	8.4300e-003	7.0000e-005	3.8000e-004	1.2000e-004	5.0000e-004	2.6000e-004	1.1000e-004	3.7000e-004	0.0000	7.0271	7.0271	4.1000e-004	0.0000	7.0374
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.6000e-004	1.5800e-003	0.0000	6.0000e-005	0.0000	7.0000e-005	7.0000e-005	0.0000	7.0000e-005	0.0000	0.4352	0.4352	1.0000e-005	0.0000	0.4355
Total	**1.1200e-003**	**0.0286**	**0.0100**	**7.0000e-005**	**4.4000e-004**	**1.2000e-004**	**5.7000e-004**	**3.3000e-004**	**1.1000e-004**	**4.4000e-004**	**0.0000**	**7.4623**	**7.4623**	**4.2000e-004**	**0.0000**	**7.4729**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.3000e-004	8.6200e-003	0.0174	3.0000e-005		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	2.9186	2.9186	9.2000e-004	0.0000	2.9417
Total	**5.3000e-004**	**8.6200e-003**	**0.0174**	**3.0000e-005**	**0.0000**	**5.0000e-005**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**5.0000e-005**	**0.0000**	**2.9186**	**2.9186**	**9.2000e-004**	**0.0000**	**2.9417**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.9000e-004	0.0285	8.4300e-003	7.0000e-005	8.8000e-004	1.2000e-004	1.0000e-003	2.6000e-004	1.1000e-004	3.7000e-004	0.0000	7.0271	7.0271	4.1000e-004	0.0000	7.0374
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.6000e-004	1.5800e-003	0.0000	2.4000e-004	0.0000	2.5000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.4352	0.4352	1.0000e-005	0.0000	0.4355
Total	**1.1200e-003**	**0.0286**	**0.0100**	**7.0000e-005**	**1.1200e-003**	**1.2000e-004**	**1.2500e-003**	**3.3000e-004**	**1.1000e-004**	**4.4000e-004**	**0.0000**	**7.4623**	**7.4623**	**4.2000e-004**	**0.0000**	**7.4729**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Unmitigated	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Office Building	110.30	24.60	10.50	200,261	200,261
Total	110.30	24.60	10.50	200,261	200,261

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.589733	0.041719	0.200019	0.112200	0.017267	0.005142	0.010289	0.010866	0.002023	0.003460	0.005838	0.000685	0.000758

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	37.1494	37.1494	1.6800e-003	3.5000e-004	37.2950
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	37.1494	37.1494	1.6800e-003	3.5000e-004	37.2950
NaturalGas Mitigated	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248
NaturalGas Unmitigated	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	194200	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248
Total		**1.0500e-003**	**9.5200e-003**	**8.0000e-003**	**6.0000e-005**		**7.2000e-004**	**7.2000e-004**		**7.2000e-004**	**7.2000e-004**	**0.0000**	**10.3633**	**10.3633**	**2.0000e-004**	**1.9000e-004**	**10.4248**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	194200	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248

Total		**1.0500e-003**	**9.5200e-003**	**8.0000e-003**	**6.0000e-005**		**7.2000e-004**	**7.2000e-004**		**7.2000e-004**	**7.2000e-004**	**0.0000**	**10.3633**	**10.3633**	**2.0000e-004**	**1.9000e-004**	**10.4248**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	127700	37.1494	1.6800e-003	3.5000e-004	37.2950
Total		**37.1494**	**1.6800e-003**	**3.5000e-004**	**37.2950**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	127700	37.1494	1.6800e-003	3.5000e-004	37.2950
Total		**37.1494**	**1.6800e-003**	**3.5000e-004**	**37.2950**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Unmitigated	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0391					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Total	**0.0396**	**0.0000**	**9.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.8000e-004**	**1.8000e-004**	**0.0000**	**0.0000**	**1.9000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0391					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Total	**0.0396**	**0.0000**	**9.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.8000e-004**	**1.8000e-004**	**0.0000**	**0.0000**	**1.9000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.4471	5.8100e-003	1.4000e-004	0.6341
Unmitigated	0.4471	5.8100e-003	1.4000e-004	0.6341

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e

Land Use	Mgal	MT/yr			
General Office Building	0.177734 / 0.108934	0.4471	5.8100e-003	1.4000e-004	0.6341
Total		**0.4471**	**5.8100e-003**	**1.4000e-004**	**0.6341**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Office Building	0.177734 / 0.108934	0.4471	5.8100e-003	1.4000e-004	0.6341
Total		**0.4471**	**5.8100e-003**	**1.4000e-004**	**0.6341**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.1888	0.0112	0.0000	0.4677

Unmitigated	0.1888	0.0112	0.0000	0.4677

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.93	0.1888	0.0112	0.0000	0.4677
Total		**0.1888**	**0.0112**	**0.0000**	**0.4677**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.93	0.1888	0.0112	0.0000	0.4677
Total		**0.1888**	**0.0112**	**0.0000**	**0.4677**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

B-12 AERSCREEN Inputs – Sunnyside Nursery Site Basin

Nursery

```
Start date and time  04/04/18 14:01:38
                             AERSCREEN 16216

BB2

            BB2


         -----------------  DATA ENTRY VALIDATION -----------------
                       METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:           3.89 meters         12.76 feet
 Area Source Length:  185.00 meters        606.96 feet
 Area Source Width:   150.00 meters        492.13 feet
 Vertical Dimension:    1.40 meters          4.59 feet
 Model Mode:           RURAL
 Dist to Ambient Air:          1.0 meters            3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.5 meters            5. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  278.0 / 303.0 K   40.7 /  85.7 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 Nursery.Out


 *** AERSCREEN Run is Ready to Begin


 No terrain used, AERMAP will not be run
**************************************************
```

```
SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 04/04/18 14:04:00
 ********************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

****************************************************
```

```
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 04/04/18 14:04:41

REFINE       started 04/04/18 14:04:41

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 04/04/18 14:04:44

 **********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
```

****

Ending date and time 04/04/18 14:04:45

B-13 AERSCREEN Inputs – Downtown San Anselmo Site

```
Start date and time  04/04/18 14:11:57
                            AERSCREEN 16216

BB2

            BB2


         -----------------  DATA ENTRY VALIDATION -----------------
                        METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:           3.89 meters         12.76 feet
 Area Source Length:   50.00 meters        164.04 feet
 Area Source Width:    40.00 meters        131.23 feet
 Vertical Dimension:    1.40 meters          4.59 feet
 Model Mode:           URBAN
 Population:           12599
 Dist to Ambient Air:           1.0 meters             3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.5 meters             5. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  278.0 / 303.0 K   40.7 /  85.7 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 BB2.out


 *** AERSCREEN Run is Ready to Begin



 No terrain used, AERMAP will not be run
```

```
**************************************************

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 04/04/18 14:12:42
 *******************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
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****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
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****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
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****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
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****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

FLOWSECTOR   ended 04/04/18 14:13:02

REFINE       started 04/04/18 14:13:02

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

REFINE       ended 04/04/18 14:13:04

 **********************************************
 AERSCREEN Finished Successfully
 But with Warnings
```

Check log file for details
****

Ending date and time 04/04/18 14:13:05

B-14 AERSCREEN Outputs – Sunnyside Nursery Site Basin

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
0.14523E+04	1.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17564E+04	25.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20611E+04	50.00	0.00	30.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23527E+04	75.00	0.00	20.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26309E+04	100.00	0.00	20.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
* 0.27614E+04	117.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.27437E+04	125.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26033E+04	150.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23591E+04	175.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21259E+04	200.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19249E+04	225.00	0.00	35.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17537E+04	250.00	0.00	30.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16093E+04	275.00	0.00	30.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14840E+04	300.00	0.00	25.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13764E+04	325.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12818E+04	350.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11965E+04	375.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11198E+04	400.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10511E+04	425.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.98814E+03	450.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.93174E+03	475.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.88028E+03	500.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.83333E+03	525.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79022E+03	550.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75075E+03	575.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71502E+03	600.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.68129E+03	625.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65060E+03	650.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62182E+03	675.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59553E+03	700.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57093E+03	725.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54786E+03	750.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52639E+03	775.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50634E+03	800.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48760E+03	825.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47009E+03	850.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.45347E+03	875.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.43789E+03	900.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.42327E+03	925.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.40938E+03	950.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.39625E+03	975.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.38386E+03	1000.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.37216E+03	1025.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.36101E+03	1050.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.35035E+03	1075.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.34031E+03	1100.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.33071E+03	1125.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.32155E+03	1150.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.31285E+03	1175.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.30459E+03	1200.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.29671E+03	1225.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.28911E+03	1250.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.28186E+03	1275.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.27492E+03	1300.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26828E+03	1325.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26187E+03	1350.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.25570E+03	1375.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.24979E+03	1400.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.24415E+03	1425.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23871E+03	1450.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23347E+03	1475.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.22843E+03	1500.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.22359E+03	1525.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21891E+03	1550.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21439E+03	1575.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21004E+03	1600.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20586E+03	1625.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20183E+03	1650.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19793E+03	1675.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19417E+03	1700.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19050E+03	1725.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18695E+03	1750.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18351E+03	1775.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18019E+03	1800.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17694E+03	1825.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17379E+03	1850.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17073E+03	1875.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16776E+03	1900.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16489E+03	1924.99	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16211E+03	1950.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15940E+03	1975.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15679E+03	2000.01	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15425E+03	2025.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15179E+03	2050.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14939E+03	2075.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14703E+03	2100.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14474E+03	2125.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14252E+03	2150.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14035E+03	2175.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13824E+03	2200.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13618E+03	2225.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13417E+03	2250.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13222E+03	2275.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13033E+03	2300.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12848E+03	2325.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12668E+03	2350.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12491E+03	2375.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12319E+03	2400.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12151E+03	2425.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11987E+03	2450.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11828E+03	2475.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11672E+03	2500.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11519E+03	2525.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11370E+03	2550.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11225E+03	2575.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11082E+03	2600.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10942E+03	2625.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10806E+03	2650.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10671E+03	2675.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0

0.10540E+03	2700.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10411E+03	2725.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10285E+03	2750.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10161E+03	2775.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10040E+03	2800.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.99214E+02	2825.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.98051E+02	2850.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.96915E+02	2875.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.95803E+02	2900.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.94712E+02	2925.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.93640E+02	2950.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.92589E+02	2975.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.91558E+02	3000.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.90554E+02	3025.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.89567E+02	3050.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.88599E+02	3075.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.87648E+02	3100.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.86714E+02	3125.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.85798E+02	3150.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.84903E+02	3175.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.84024E+02	3200.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.83159E+02	3225.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.82308E+02	3250.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.81470E+02	3275.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.80645E+02	3300.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79834E+02	3325.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79037E+02	3350.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.78254E+02	3375.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.77484E+02	3400.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.76726E+02	3425.01	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75981E+02	3450.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75248E+02	3475.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.74527E+02	3500.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.73818E+02	3525.00	0.00	15.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.73122E+02	3550.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.72439E+02	3575.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71768E+02	3600.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71106E+02	3625.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.70456E+02	3650.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.69816E+02	3675.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.69186E+02	3700.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.68566E+02	3725.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.67956E+02	3750.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.67353E+02	3775.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.66760E+02	3800.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.66176E+02	3825.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65601E+02	3850.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65034E+02	3875.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.64476E+02	3900.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.63924E+02	3925.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.63381E+02	3950.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62846E+02	3975.00	0.00	10.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62321E+02	4000.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.61804E+02	4025.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.61295E+02	4050.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60793E+02	4075.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60298E+02	4100.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60303E+02	4125.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59812E+02	4150.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59328E+02	4175.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.58851E+02	4200.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.58381E+02	4225.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57916E+02	4250.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57459E+02	4275.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57007E+02	4300.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.56562E+02	4325.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.56123E+02	4350.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.55689E+02	4375.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.55261E+02	4400.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54839E+02	4425.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54423E+02	4450.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54012E+02	4475.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.53606E+02	4500.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.53206E+02	4525.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52811E+02	4550.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52421E+02	4575.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52035E+02	4600.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.51655E+02	4625.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.51280E+02	4650.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50909E+02	4675.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50543E+02	4700.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50181E+02	4725.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49824E+02	4750.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49471E+02	4775.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49123E+02	4800.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48779E+02	4825.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48439E+02	4850.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48103E+02	4875.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47771E+02	4900.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47443E+02	4925.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47119E+02	4950.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.46799E+02	4975.00	0.00	0.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.46482E+02	5000.00	0.00	5.0	Winter	0-360	10010101	- 1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0

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B-15 AERSCREEN Outputs – Downtown San Anselmo Site

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
0.48809E+04	1.00	0.00	30.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.78085E+04	25.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
* 0.78998E+04	26.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.50967E+04	50.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30099E+04	75.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20751E+04	100.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15446E+04	125.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12106E+04	150.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.98380E+03	175.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.82126E+03	200.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.70024E+03	225.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.60701E+03	250.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.53330E+03	275.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.47354E+03	300.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.42461E+03	325.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38374E+03	350.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34935E+03	375.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31998E+03	400.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29455E+03	425.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27238E+03	450.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25300E+03	475.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23592E+03	500.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22069E+03	525.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20709E+03	550.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19490E+03	575.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18388E+03	600.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17393E+03	625.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16488E+03	650.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15663E+03	675.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14996E+03	700.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14290E+03	725.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13639E+03	750.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13038E+03	775.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12482E+03	800.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11965E+03	825.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11484E+03	850.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11036E+03	875.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.10617E+03	900.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.10225E+03	925.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.98577E+02	950.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.95124E+02	975.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.91876E+02	1000.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.88815E+02	1025.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.85927E+02	1050.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.83197E+02	1075.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.80614E+02	1100.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.78167E+02	1125.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.75846E+02	1149.99	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.73641E+02	1175.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.71546E+02	1200.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.69551E+02	1224.99	0.00	40.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.67651E+02	1249.99	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.65839E+02	1275.00	0.00	30.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.64110E+02	1300.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.62457E+02	1325.00	0.00	30.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.60878E+02	1350.00	0.00	30.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.59366E+02	1375.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.57918E+02	1400.00	0.00	40.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.56530E+02	1425.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.55199E+02	1450.00	0.00	40.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.53921E+02	1475.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.52693E+02	1500.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.51513E+02	1525.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.50378E+02	1550.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.49286E+02	1574.99	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.48234E+02	1600.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.47221E+02	1625.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.46244E+02	1650.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.45301E+02	1675.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.44391E+02	1700.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.43512E+02	1725.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.42663E+02	1750.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.41842E+02	1775.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.41049E+02	1800.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.40281E+02	1824.99	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.39537E+02	1850.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38817E+02	1875.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38120E+02	1900.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.37444E+02	1924.99	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.36788E+02	1950.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.36152E+02	1975.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.35535E+02	2000.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34936E+02	2025.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34354E+02	2050.00	0.00	30.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.33788E+02	2075.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.33239E+02	2100.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.32705E+02	2125.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.32186E+02	2150.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31680E+02	2175.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31189E+02	2200.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30710E+02	2225.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30244E+02	2250.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29790E+02	2275.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29348E+02	2300.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28917E+02	2325.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28497E+02	2350.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28087E+02	2375.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27688E+02	2399.99	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27298E+02	2425.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26917E+02	2450.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26546E+02	2475.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26184E+02	2500.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25829E+02	2525.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25484E+02	2550.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25146E+02	2575.00	0.00	25.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24816E+02	2600.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24493E+02	2625.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24177E+02	2650.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23869E+02	2675.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0

0.23567E+02	2700.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23271E+02	2725.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22983E+02	2750.00	0.00	20.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22700E+02	2775.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22423E+02	2800.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22152E+02	2825.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21887E+02	2850.00	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21627E+02	2875.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21372E+02	2900.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21123E+02	2925.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20878E+02	2950.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20639E+02	2975.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20404E+02	3000.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20174E+02	3025.00	0.00	40.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19948E+02	3050.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19726E+02	3075.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19509E+02	3100.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19296E+02	3125.00	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19087E+02	3150.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18881E+02	3175.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18680E+02	3199.99	0.00	10.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18482E+02	3225.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18288E+02	3249.99	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18097E+02	3275.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17910E+02	3300.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17726E+02	3325.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17546E+02	3350.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17368E+02	3375.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17194E+02	3400.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17022E+02	3425.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16854E+02	3450.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16688E+02	3475.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16525E+02	3500.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16365E+02	3525.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16208E+02	3550.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16053E+02	3575.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15901E+02	3600.00	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15751E+02	3625.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15604E+02	3650.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15459E+02	3675.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15316E+02	3700.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15176E+02	3725.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15038E+02	3750.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14902E+02	3775.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14768E+02	3800.00	0.00	40.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14636E+02	3825.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14506E+02	3849.99	0.00	15.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14379E+02	3875.00	0.00	5.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14253E+02	3900.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14129E+02	3925.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14007E+02	3950.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13886E+02	3975.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13768E+02	4000.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13651E+02	4025.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13536E+02	4050.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13423E+02	4074.99	0.00	35.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13311E+02	4100.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13201E+02	4125.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13092E+02	4150.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12985E+02	4175.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12879E+02	4200.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12775E+02	4225.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12673E+02	4250.00	0.00	0.0	Winter	0-360	10011001	- 1.28	0.043	-9.000	0.020	-999.	21.		5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12595E+02	4275.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12543E+02	4300.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12492E+02	4325.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12442E+02	4350.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12392E+02	4375.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12342E+02	4400.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12293E+02	4425.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12245E+02	4450.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12197E+02	4475.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12149E+02	4500.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12102E+02	4525.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12055E+02	4550.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12009E+02	4575.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11963E+02	4600.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11918E+02	4625.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11873E+02	4650.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11828E+02	4675.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11784E+02	4700.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11740E+02	4725.00	0.00	25.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11697E+02	4750.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11654E+02	4775.00	0.00	30.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11611E+02	4800.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11569E+02	4825.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11527E+02	4850.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11486E+02	4875.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11445E+02	4900.00	0.00	5.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11404E+02	4925.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11363E+02	4950.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11323E+02	4975.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11283E+02	5000.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-	19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0

APPENDIX C

Hazards and Hazardous Materials Supporting Documentation

Hazardous Building Materials Survey

630, 634, and 636 San Anselmo Avenue
San Anselmo, California

County of Marin

3501 Civic Center Drive, Room 304 |San Rafael, California 94903

November 16, 2017 | Project No. 403163001

Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

Hazardous Building Materials Survey

630, 634, and 636 San Anselmo Avenue
San Anselmo, California

Mr. Russell Eberwein, Senior Civil Engineer
Marin County Department of Public Works
3501 Civic Center Drive, Room 304 |San Rafael, California 94903

November 16, 2017 | Project No. 403163001

David Blair Bridges, CAC 14-5173
Project Geologist

Duane Blamer, PG 6913
Principal Geologist
Manager, Environmental Sciences

DBB/DWB/vmn

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APPENDICES

1 INTRODUCTION

Ninyo & Moore was retained by the County of Marin to conduct hazardous building materials surveys (HBMSs) at 630, 634, and 636 San Anselmo Avenue, located in San Anselmo, California (Figure 1). Our services included the performance of asbestos-containing materials (ACM) surveys, lead-containing materials (LCM) surveys, and a review and quantification of miscellaneous hazardous building materials (potential mercury-containing thermostats/switches, poly chlorinated biphenyl (PCB)-containing items [transformers, light ballasts, etc.], fluorescent light tubes, exit signs, air conditioning units, and Freon™-containing refrigeration systems) at the three site buildings. For the purposes of this assessment, LCM refers to both lead-based paint (LBP), as defined by the California Department of Public Health (CDPH) and U.S. Department of Housing and Urban Development (HUD) and other potential LCMs (including ceramic tile).

The survey was performed in accordance with established guidelines for the assessment of ACM and LCM, and is based upon conditions of the site buildings at the time of the surveying/assessment activities. Our objective and scope of work for the survey are presented below.

1.1 Involved Parties

Mr. Blair Bridges of Ninyo & Moore conducted the HBMS sampling activities on November 2, 2017. Mr. Bridges is a State of California Division of Occupational Safety and Health (DOSH)-Certified Asbestos Consultant (No. 14-5173) and California Department of Public Health (DPH) Lead-related Construction Services Inspector/Assessor (No. 24052). Mr. Duane Blamer of Ninyo & Moore provided quality assurance and principal-level management for this project. Professional certifications are presented in Appendix A.

1.2 User Reliance

This report may be relied upon and is intended exclusively for use by the County of Marin. Any use or re-use of the findings, conclusions, and/or recommendations of this report by parties other than the Client is undertaken at said parties' sole risk.

2 OBJECTIVE AND SCOPE OF SERVICES

The purpose of this study is to provide information regarding the current site conditions to assist the County of Marin in implementing proposed site building demolition activities. Ninyo & Moore personnel performed the following services:

- Conducted a visual reconnaissance of the site buildings to document homogeneous areas of hazardous building materials and locate suspect ACM and LCMs.
- Collected 54 bulk samples of suspect ACMs and submitted them to a certified, independent laboratory for analysis of asbestos content.
- Collected 18 suspect LCM samples and submitted these samples to a certified, independent laboratory for analysis of lead content.
- Visually assessed and quantified potential mercury-containing thermostats/switches, PCB-containing items, fluorescent light tubes, exit signs, smoke detectors, air conditioning units, and FreonTM-containing refrigeration systems.
- Prepared this HBMS report, which presents our data and summarizes the assessed building materials. The report includes a site description, laboratory testing information, findings, conclusions, and recommendations, sample location maps, tables summarizing the building materials assessed, and the estimated quantities of identified materials.

3 SITE DESCRIPTION

The three buildings are located in the City of San Anselmo and are indicated on Figures 1 and 2. Descriptions of each of the site buildings are provided below.

636 San Anselmo Avenue: this building is an approximately 1,600 square-foot building with a kitchen, a dining area, storage rooms, and bathrooms. Building finishes include gypsum wallboard walls, vinyl floor sheeting (VFS), ceramic tile and painted concrete floors, and wood exterior walls.

634 San Anselmo Avenue: this building is an approximately 1,500 square-foot building including a real estate office (and bathroom), an optometrists office (and bathroom), and a barber shop. Building finishes include gypsum wallboard walls, ceramic tile floors, carpeted and wood floors, and exterior wood walls.

630 San Anselmo Avenue: this building is an approximately 140 square-foot building with CMU interior/exterior walls and a painted concrete floor.

4 PHYSICAL LIMITATIONS

No physical limitations were encountered during the site visit.

Underground utilities, such as suspect cementitious water lines or suspect insulated/coated gas or electrical lines were not assessed during these survey activities. If additional suspect materials and/or surfaces are encountered during the site building demolitions that have not been assessed, they should be assumed to be asbestos and/or lead-containing and handled accordingly, or should be sampled and analyzed to assess whether they are asbestos and/or lead-containing. As-built diagrams of the site buildings were not provided for review.

5 SAMPLE COLLECTION AND ANALYSES

On November 2, 2017, the site buildings were assessed for the presence of ACMs, LCMs, and miscellaneous hazardous building materials. The ACM and LCM surveys followed United States Environmental Protection Agency (EPA) guidelines, or industry standards, within the limitations of the scope of this assessment. Survey activities are discussed below.

5.1 Asbestos Survey

A preliminary visual assessment and bulk sampling survey of suspect ACMs were performed by a State of California Certified Asbestos Consultant. Representative samples of suspect ACMs were collected after identification of homogeneous sampling areas (areas in which the materials are consistent in color, texture, construction or application date, and general appearance). Each homogeneous area was observed for material type, location, condition, and friability. Representative samples were collected from each area (except from areas that were inaccessible). Samples were collected using USEPA-recommended sampling procedures.

A total of 54 bulk suspect asbestos samples were collected and analyzed. Building materials that were sampled and analyzed for the presence of asbestos are presented in Table 1.

After collection, the suspect ACM samples were transferred to EMSL Analytical, Inc., (EMSL) of San Leandro, California for analysis. EMSL is a laboratory accredited in the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fiber analysis. The samples were analyzed for the presence and quantification of asbestos fibers, using polarized light microscopy with dispersion staining (PLM/ds), in general accordance with USEPA Method 600/R-93/116. The lower limit of reliable detection for asbestos using the PLM method is approximately 1 percent by volume. Currently, the EPA and the State of California stipulate that materials containing more than 1% asbestos constitute an ACM and the State of California stipulates that a material containing greater than 0.1% asbestos constitutes an asbestos-containing construction material (ACCM). Building materials that were sampled and analyzed for the presence of asbestos are presented in the attached Table 1, and the locations from which bulk asbestos samples were collected are shown on Figures 3 and 4. Materials in which no asbestos was detected are defined in Table 1 as "ND" (for "None Detected") in the "Asbestos Detected" column. Copies of the laboratory analytical reports and chain-of-custody records for suspect ACMs are presented in Appendix B. ACMs reported in the Ninyo & Moore survey are listed in Section 6.1 below.

5.2 Lead-Containing Materials Survey

After collection, the suspect LCM samples were also transferred to EMSL for analysis of total lead content by Flame Atomic Absorption Spectrometry (Flame AAS/SW 846 3050B/7000B).

EMSL is an American Industrial Hygiene Association accredited Environmental Lead Laboratory (AIHA ELLA). Currently, the USEPA stipulates what concentrations of lead in non-volatile components of surface coatings or materials indicate whether a material is considered to be lead-containing. The USEPA stipulates that paint containing an amount equal to or in excess of 1 milligram per square centimeter (1.0 mg/cm^2), or more than half of one percent (0.5%) by weight (or 5,000 milligrams per kilogram [mg/kg]), constitute a lead-based paint (LBP). Coatings with any detectable amount of reported lead would be considered lead-containing paint (LCP).

Paint that is chipping or peeling, or that may be readily removed from surfaces, and has a lead content equal to or more than 1,000 mg/kg, would require handling as a California Title 22 hazardous waste. The analytical results associated with paint chip samples collected from the building are summarized in Table 2 and copies of the laboratory analytical report and chain-of-custody record are presented in Appendix C.

5.3 Miscellaneous Hazardous Building Materials Survey

Confirmation of miscellaneous hazardous building materials, via analytical testing, was not performed for this survey. Potentially hazardous miscellaneous building materials observed and quantified at the site buildings are presented in Table 3.

A visual assessment and quantification was performed of potential mercury-containing thermostats/switches, PCB-containing items (transformers, light ballasts, etc.), fluorescent light tubes, exit signs, smoke detectors, air conditioning units, and Freon™-containing refrigeration systems.

6 FINDINGS

HBMSs were performed at the site buildings to evaluate if potential hazards associated with the building materials, paint or other suspect LCMs, and/or other miscellaneous hazardous building materials (potential mercury-containing thermostats, potential PCB-containing items, fluorescent light tubes, exit signs with radioactive sources, and Freon™-containing refrigeration systems) may exist.

Based upon the analytical results of bulk samples collected, and observations made, during this survey, ACMs and/or ACCMs are not located at the site buildings; LCMs are located at 630 and 634 San Anselmo Avenue; and miscellaneous hazardous building materials are located at 634 and 636 San Anselmo Avenue. These materials are discussed below.

6.1 Asbestos-Containing Materials

No materials were found to be asbestos-containing through Ninyo & Moore’s sampling activities.

6.2 Lead-Containing Materials

A total of 18 suspect lead-containing samples were collected for analysis of lead content. This included 12 paint chip samples and six ceramic tile samples. One of the paint chip samples contained lead at a reported concentration greater than 5,000 mg/kg (or 0.5% by weight). This lead concentration was 2.0% by weight (or 20,000 mg/kg) for a sample collected on the upper ceiling of 634 San Anselmo Avenue (LBP-01). This paint sample is considered LBP. The lead concentrations associated with 10 of the paint chip samples and all of the six ceramic tile samples were reported by the analytical laboratory EMSL to be less than their associated reporting limit of 0.010% by weight (100 mg/kg). The reported lead concentration of the remaining paint chip sample was 0.020% by weight (or 200 mg/kg), collected on the exterior wall of 630 San Anselmo Avenue. This paint sample is considered LCP. Occupational Health and Safety Administration (OSHA) regulations apply whenever materials with any detectable amounts of lead are disturbed.

Copies of the CDPH form 8552 “Lead Hazard Evaluation Report” for the site buildings are included in Appendix D.

6.3 Miscellaneous Hazardous Building Material Survey

Miscellaneous hazardous building materials observed at the site buildings included potential PCB-containing light ballasts; fluorescent light tubes; exit signs (potential low-level radioactive sources); refrigerators, air conditioning units, and smoke detectors. No attempt was made to disassemble or sample any of the observed miscellaneous hazardous building materials.

7 RECOMMENDATIONS

Since LCMs and miscellaneous hazardous building materials have been reported at the site buildings, the following recommendations and precautions are provided:

The LCMs reported at the site building should be incorporated into building-specific O&M Plans and should not be disturbed. Any LCMs found in a damaged or non-intact condition should be abated and/or stabilized. Prior to renovation or demolition work that would disturb the identified LCMs a licensed lead abatement removal contractor should stabilize and/or remove the identified LCMs in compliance with the most recent applicable federal, state, and local laws, regulations, standards, and/or codes governing abatement, transport, and disposal of LCMs. All lead waste must be properly characterized prior to disposal to determine waste classification, packaging, transportation, and disposal requirements. ***While Ninyo & Moore provided an estimate of the quantity of LCMs present at the site buildings (Table 2), it is the responsibility of abatement contractors to assess the actual LCM quantities present.***

Prior to demolition or renovation activities, potential mercury-containing thermostats/switches, PCB-containing items (light ballasts, transformers, etc.), fluorescent light tubes, smoke detectors, exit signs, air conditioning units, and FreonTM-containing refrigeration systems should be removed and recycled or disposed of by a licensed contractor according to applicable federal, state, and local laws/regulations. All light fixtures should be visually inspected, prior to disposal, to assess if they contain PCBs (checked for “No PCBs” or “PCB free” stickers). ***While Ninyo & Moore provided an estimate of the quantity of miscellaneous hazardous building materials present at the site buildings (Table 3), it is the abatement contractor’s responsibility to assess the actual quantities of items present.***

There is a possibility that additional suspect ACMs/ACCMs, LCMs, or other miscellaneous hazardous building materials may be discovered during building renovation and/or demolition activities. Therefore, Ninyo & Moore recommends that, should additional suspect materials not sampled or assessed in this report be uncovered during demolition/renovation activities, (a) samples of suspect materials should be collected for laboratory analysis and activities that may impact the materials should cease until laboratory analytical results are reviewed or (b) the materials should be assumed to be hazardous and handled as such.

8 LIMITATIONS

Ninyo & Moore's opinions and recommendations regarding environmental conditions, as presented in this report, are based on limited sampling and chemical analysis. Further assessment of potential adverse environmental impacts may be accomplished by conducting a more comprehensive assessment. The samples collected and used for testing, and the observations made, are believed to be representative of the areas evaluated. However, if additional suspect hazardous building materials are encountered during renovation/demolition activities, these materials should be sampled by qualified personnel, and analyzed for content prior to further disturbance. ***In addition, please note that quantities of impacted hazardous building materials are approximate. It is the contractor’s responsibility to assess the actual quantities of hazardous building materials present.***

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard of care exercised by environmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Variations in site conditions may exist and conditions not observed or described in this report may be encountered during subsequent activities.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information, or has questions regarding content, interpretations presented, or completeness of this document.

The environmental interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and concentration of specific chemical or physical constituents in samples collected from the subject site. The testing and analyses have been conducted by an independent laboratory that is certified by the State of California to conduct such tests. Ninyo & Moore has no involvement in, or control over, such testing and analysis. Ninyo & Moore, therefore, disclaims responsibility for any inaccuracy in such laboratory results.

Our findings, opinions, and recommendations are based on an analysis of the observed site conditions. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

Table 1 - Bulk Asbestos Sampling Results

Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-01	636 San Anselmo Ave	Restaurant - Storage Area	Wallboard/Joint Compound	NA	NA	NA	ND
ASB-02	636 San Anselmo Ave	Restaurant - Storage Area	Wallboard/Joint Compound	NA	NA	NA	ND
ASB-03	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-04	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-05	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-06	634 San Anselmo Ave	Real Estate Office - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-07	634 San Anselmo Ave	Real Estate Office - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-08	634 San Anselmo Ave	Real Estate Office - Back Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-09	634 San Anselmo Ave	Real Estate Office - Conference Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-10	634 San Anselmo Ave	Real Estate Office - Conference Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-11	634 San Anselmo Ave	Real Estate Office - Bathroom Floor	12-inch by 12-inch Beige Ceramic Tile (CT) with Mortar & Grout	NA	NA	NA	ND
ASB-12	634 San Anselmo Ave	Real Estate Office - Entryway	12-inch by 12-inch Black CT with Mortar & Grout	NA	NA	NA	ND
ASB-13	634 San Anselmo Ave	Optometrist - Bathroom Floor	12-inch by 12-inch Beige CT with Mortar & Grout	NA	NA	NA	ND
ASB-14	634 San Anselmo Ave	Optometrist - Bathroom Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-15	634 San Anselmo Ave	Optometrist - Bathroom Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-16	634 San Anselmo Ave	Optometrist - Exam Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-17	634 San Anselmo Ave	Optometrist - Main Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-18	634 San Anselmo Ave	Optometrist - Main Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-19	634 San Anselmo Ave	Barber - Southwest Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-20	634 San Anselmo Ave	Barber - Northwest Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-21	634 San Anselmo Ave	Barber - Southeast Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-22	634 San Anselmo Ave	Barber - Floor	12-inch by 12-inch White CT with Mortar & Grout	NA	NA	NA	ND
ASB-23	634 San Anselmo Ave	Roof (Lower)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-24	634 San Anselmo Ave	Roof (Upper)	Rolled Roof Assembly	NA	NA	NA	ND

Table 1 - Bulk Asbestos Sampling Results							
Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-25	634 San Anselmo Ave	Roof (Barber Shop)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-26	636 San Anselmo Ave	Roof (Upper)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-27	636 San Anselmo Ave	Roof (Lower)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-28	636 San Anselmo Ave	Roof - Vent on Lower Roof	Black Penetration Mastic	NA	NA	NA	ND
ASB-29	636 San Anselmo Ave	Roof - on Horizontal Pipe on Lower Roof	Black Mastic	NA	NA	NA	ND
ASB-30	636 San Anselmo Ave	Roof - at Base of Air Handler	Black Patch Material	NA	NA	NA	ND
ASB-31	636 San Anselmo Ave	Roof - on Air Handler Duct	Gray Alligatored Sealant	NA	NA	NA	ND
ASB-32	634 San Anselmo Ave	Real Estate Office Roof - on Vent	Black Penetration Mastic	NA	NA	NA	ND
ASB-33	634 San Anselmo Ave	Optometry Roof - on Horizontal Pipe	Black Mastic	NA	NA	NA	ND
ASB-34	634 San Anselmo Ave	Optometry Roof - on Large Green Duct	Gray Mastic	NA	NA	NA	ND
ASB-35	634 San Anselmo Ave	Lower Roof - on Vent	Gray Mastic (painted green)	NA	NA	NA	ND
ASB-36	634 San Anselmo Ave	Barber Roof - on Vent	Black Penetration Mastic	NA	NA	NA	ND
ASB-37	630 San Anselmo Ave	Exterior Wall	Cinder Block & Mortar	NA	NA	NA	ND
ASB-38	630 San Anselmo Ave	Exterior Wall	Mortar	NA	NA	NA	ND
ASB-39	630 San Anselmo Ave	Exterior Wall	Mortar	NA	NA	NA	ND
ASB-40	630 San Anselmo Ave	Exterior Window	Window Putty	NA	NA	NA	ND
ASB-41	630 San Anselmo Ave	Roof	Brown Asphaltic Tile	NA	NA	NA	ND
ASB-42	634 San Anselmo Ave	Optometrist - Brick Wall	Brick & Mortar	NA	NA	NA	ND
ASB-43	634 San Anselmo Ave	Optometrist - Brick Wall	Mortar	NA	NA	NA	ND

Table 1 - Bulk Asbestos Sampling Results

Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-44	634 San Anselmo Ave	Optometrist - Brick Wall	Mortar	NA	NA	NA	ND
ASB-45	636 San Anselmo Ave	Kitchen Floor	5-inch by 5-inch Brownish-Red CT with Mortar & Grout	NA	NA	NA	ND
ASB-46	636 San Anselmo Ave	Bar Floor	5-inch by 5-inch Gray CT with Mortar & Grout	NA	NA	NA	ND
ASB-47	636 San Anselmo Ave	Kitchen Wall Base	White Sealant	NA	NA	NA	ND
ASB-48	636 San Anselmo Ave	Bathroom	Gray Mottled Vinyl Floor Sheeting (VFS) with Gray Flooring Beneath	NA	NA	NA	ND
ASB-49	636 San Anselmo Ave	Bathroom	Gray 3-inch Covebase with White Mastic	NA	NA	NA	ND
ASB-50	636 San Anselmo Ave	Dining Area Wall	Red Brick with Gray Sealant	NA	NA	NA	ND
ASB-51	636 San Anselmo Ave	Exterior Front Patio	2-foot by 2-foot Concrete Tile with Grout	NA	NA	NA	ND
ASB-52	636 San Anselmo Ave	Kitchen Wall	Cinder Block & Mortar	NA	NA	NA	ND
ASB-53	636 San Anselmo Ave	Kitchen Wall	Mortar	NA	NA	NA	ND
ASB-54	636 San Anselmo Ave	Kitchen Wall	Mortar	NA	NA	NA	ND

NOTES:

Analysis by Polarized Light Microscopy (EPA 600/R-93/116 Method).

NA = Not Applicable

ND = None Detected

Table 2 - Lead-Containing Material Sampling Results

Sample I.D.	Building	Sample Location	Lead-Containing Surface (LCS) (e.g., door, wall, frame)	Sample Description (Color / # of Layers / Substrate)	Condition	Estimate of Surface Area	Total Lead	
							Weight Percent	Parts per Million (or mg/kg)
LBP-01	634 San Anselmo Avenue	Real Estate Office - Above Ceiling on Upper Ceiling	Ceiling	White/2/Metal	Non-Intact	1,100 SF	2.0	20,000
LBP-02	634 San Anselmo Avenue	Real Estate Office - Bathroom Floor	Floor	Beige 12-inch by 12-inch Ceramic Tile (CT)	Intact	30 SF	<0.010	<100
LBP-03	634 San Anselmo Avenue	Real Estate Office - Entryway	Floor	Black 12-inch by 12-inch CT	Intact	15 SF	<0.010	<100
LBP-04	634 San Anselmo Avenue	Real Estate Office - Bathroom	Wall	Olive-Green/2/Wallboard	Intact	900 SF	<0.010	<100
LBP-05	634 San Anselmo Avenue	Optometry - Bathroom	Floor	Beige 12-inch by 12-inch CT	Intact	70 SF	<0.010	<100
LBP-06	634 San Anselmo Avenue	Optometry - Examination Room Door	Door Frame	White/2/Wood	Intact	1,500 SF	<0.010	<100
LBP-07	634 San Anselmo Avenue	Barber	Floor	White 12-inch by 12-inch CT	Intact	180 SF	<0.010	<100
LBP-08	634 San Anselmo Avenue	Barber	Wall	Brownish-Red/2/Wallboard	Intact	300 SF	<0.010	<100
LBP-09	634 San Anselmo Avenue	Optometry - Exterior Rear	Pipe	Dark-Green/2/Metal	Intact	1,000 SF	<0.010	<100
LBP-10	636 San Anselmo Avenue	Exterior Rear	Pipe	Dark-Green/2/Metal	Intact	1,200 SF	<0.010	<100
LBP-11	630 San Anselmo Avenue	Exterior Wall	Wall	Dark-Green/2/Concrete	Intact	320 SF	0.020	200*
LBP-12	634 San Anselmo Avenue	Optometry - Bathroom Wall	Wall	Cream/2/Wallboard	Intact	400 SF	<0.010	<100
LBP-13	636 San Anselmo Avenue	Kitchen	Floor	Brownish-Red 5-inch by 5-inch CT	Intact	450 SF	<0.010	<100
LBP-14	636 San Anselmo Avenue	Bar	Floor	Gray 5-inch by 5-inch CT	Intact	25 SF	<0.010	<100
LBP-15	636 San Anselmo Avenue	Kitchen Door	Door Frame	White/2/Wood	Intact	1,700 SF	<0.010	<100
LBP-16	636 San Anselmo Avenue	Wine Storage Area	Wall	Light-Brownish Yellow/2/Wallboard	Intact	700 SF	<0.010	<100
LBP-17	636 San Anselmo Avenue	Wine Storage Area	Floor	Gray/2/Concrete	Intact	600 SF	<0.010	<100
LBP-18	630 San Anselmo Avenue	Interior Wall	Wall	White/2/Concrete	Intact	400 SF	<0.010	<100

NOTES:
Total lead analyzed in accordance with EPA Test Method EPA SW-846 3050B/7000B.
mg/kg = Milligrams per kilogram
SF = Square feet
* indicates lead-containing paint
Estimated quantities are not intended for use in bidding calculations.

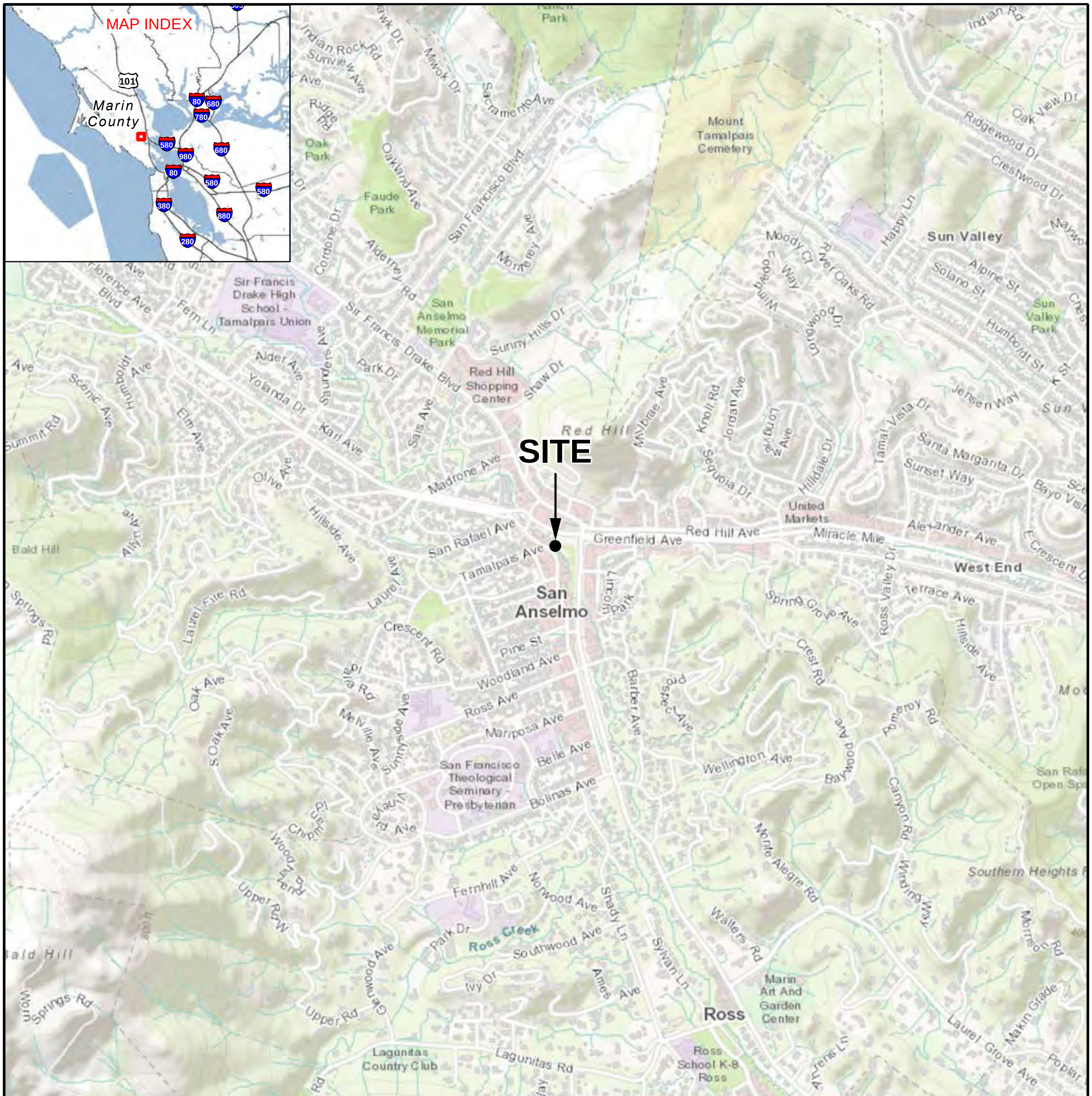
Table 3 - Miscellaneous Hazardous Building Materials Survey Results

Building	Number of Transformers	Number of Light Ballasts	Number of Mercury Thermostats	Number of A/C Units	No. of Fluorescent Light Tubes	Number of Smoke Detectors	Number of Exit Signs	No. of Freon Refrigerator Systems
636 San Anselmo Avenue	0	8	0	1	16	4	1	2
634 San Anselmo Avenue	0	0	0	0	0	5	0	0
630 San Anselmo Avenue	0	0	0	0	0	0	0	0

NOTES:

A/C = Air Conditioning

FIGURES



N

FEET

0 1,500 3,000

1_403163001_SL.mxd 11/10/2017 AOB

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: ESRI WORLD TOPO, 2017

FIGURE 1

SITE LOCATION

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

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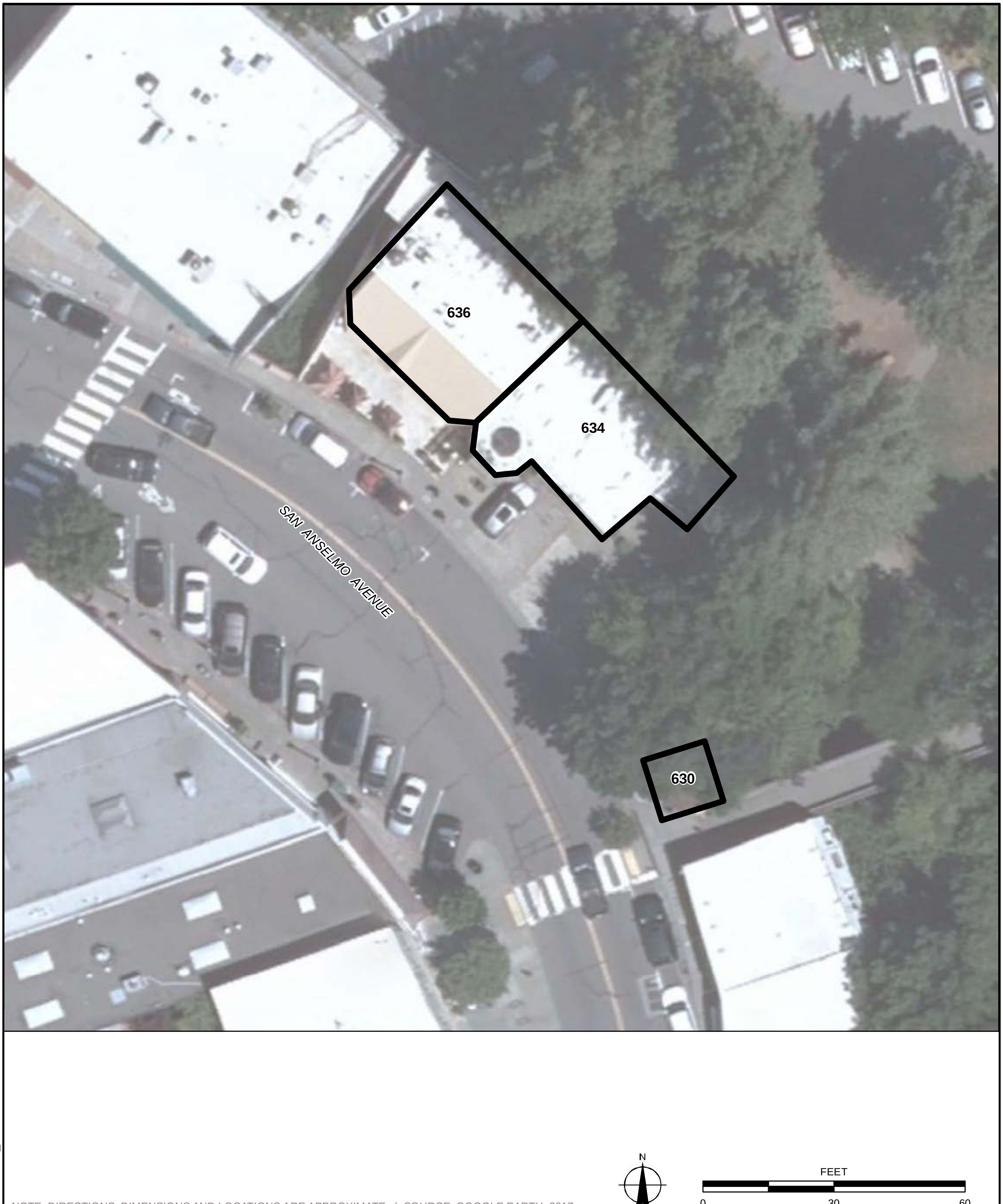
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: GOOGLE EARTH, 2017

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FIGURE 2

SITE PLAN

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

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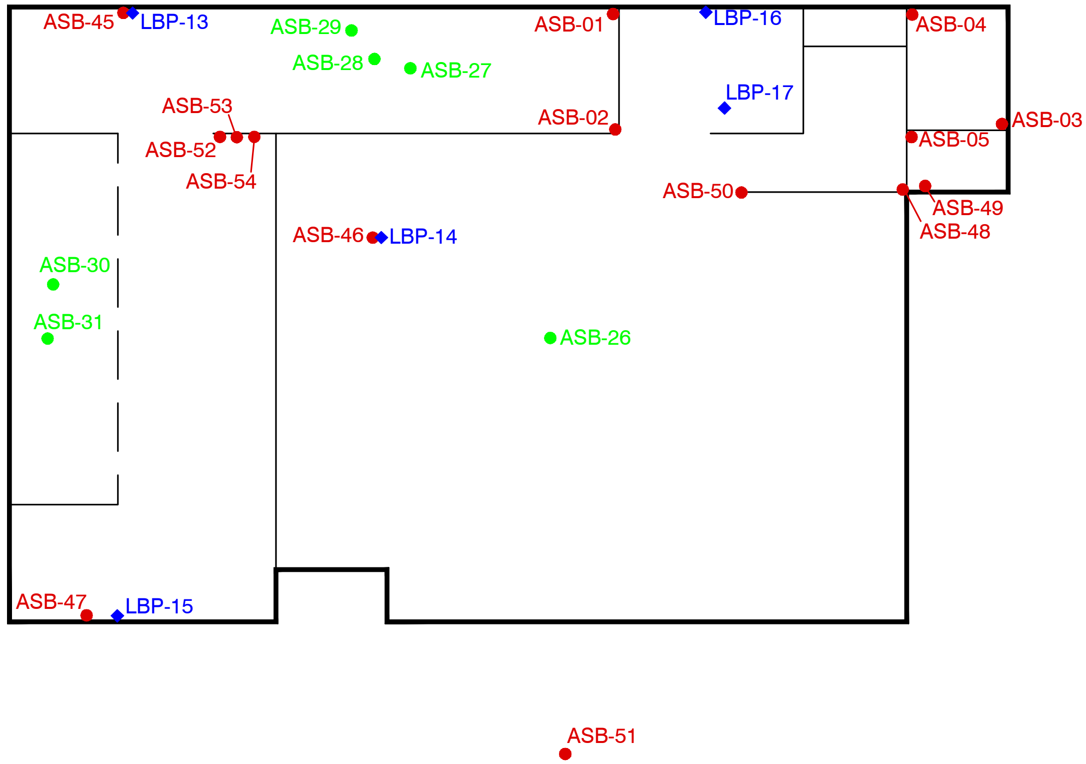
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



LEGEND

ASB-51 ● SUSPECT ASBESTOS SAMPLE

ASB-31 ● SUSPECT ASBESTOS ROOF SAMPLE

LBP-17 ◆ SUSPECT LEAD PAINT CHIP SAMPLE

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

3 403163001 SPL 636.DWG

FIGURE 3

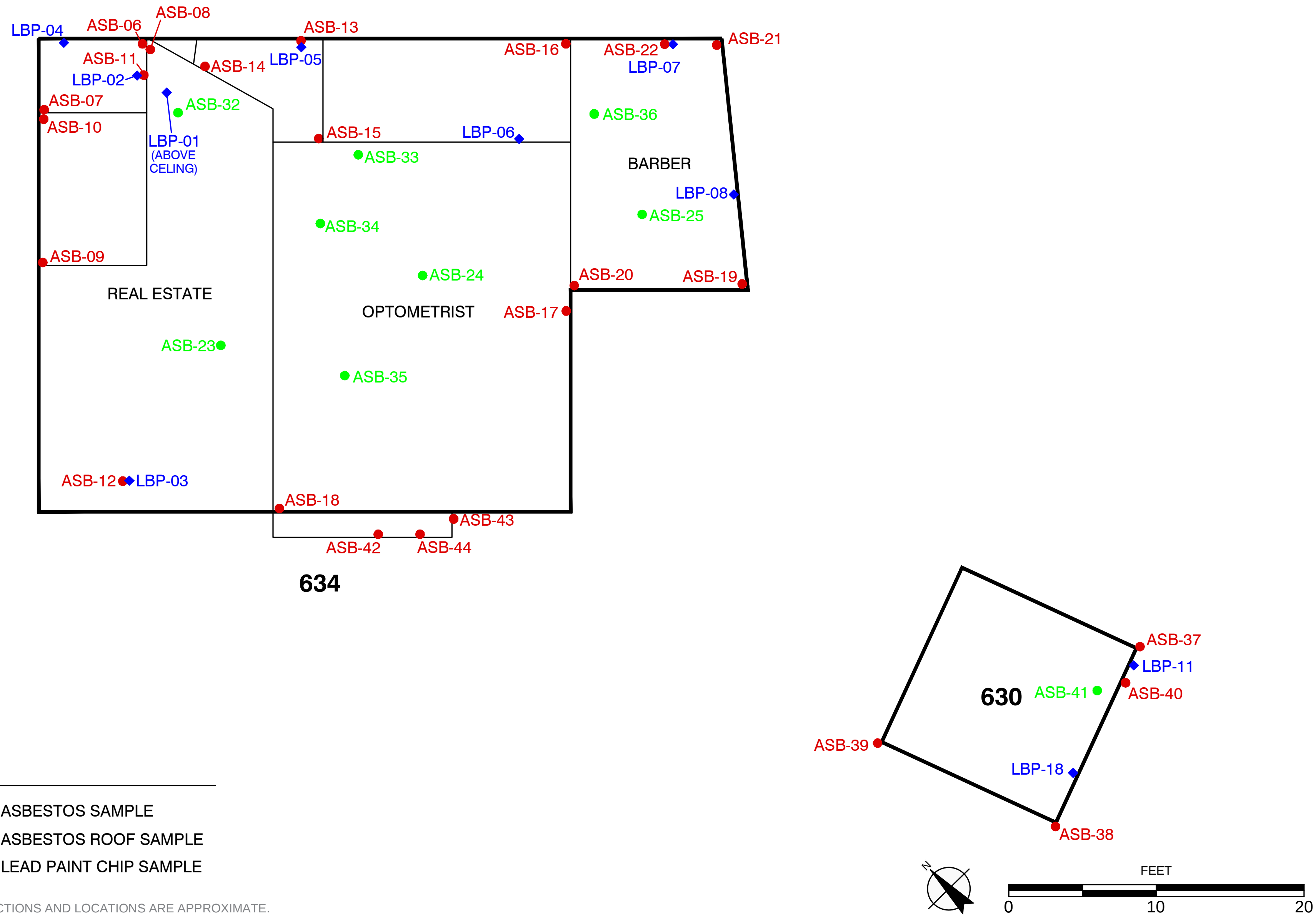
Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

SAMPLE LOCATIONS, 636 SAN ANSELMO AVENUE

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

403163001 I 11/17



LEGEND

ASB-40 ●	SUSPECT ASBESTOS SAMPLE
ASB-41 ●	SUSPECT ASBESTOS ROOF SAMPLE
LBP-18 ◆	SUSPECT LEAD PAINT CHIP SAMPLE

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

4 403163001 SPL 630 634.DWG

FIGURE 4

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

SAMPLE LOCATIONS, 630 AND 634 SAN ANSELMO AVENUE

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

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APPENDIX A

Certifications

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

David B Bridges
Name

Certification No. **14-5173**

Expires on **02/12/18**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related Construction Certificate	Certificate Type	Expiration Date
	Inspector/Assessor	10/11/2018

David B. Bridges ID #: **24052**

Conditions of Certification

This individual meets the requirements of the State of California, Department of Public Health (CDPH), to perform lead-related construction. CDPH may suspend or revoke certification for:

1. any false statement in the application (for certification);
2. violations of relevant local, state or federal statutes or regulations;
3. misrepresentation, failure to disclose relevant facts, fraud, or issuance by mistake; or
4. failure to comply with any relevant regulation or order of the Department.

This certificate was issued by the Department of Public Health as authorized by 17 CCR 35001 et seq., and is non-transferable.

To verify authenticity call
(800) 597-LEAD or
510-620-5600

03164508

APPENDIX B

Asbestos Laboratory Analytical Report and Chain-of-Custody Records

EMSL Analytical, Inc.

464 McCormick Street San Leandro, CA 94577

Tel/Fax: (510) 895-3675 / (510) 895-3680

http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order: 091721313
Customer ID: NOMO22
Customer PO: 403163001
Project ID:

Attention: Blair Bridges
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612

Project: 403163001 - San Anselmo

Phone: (510) 715-7224
Fax: (510) 633-5646
Received Date: 11/03/2017 11:15 AM
Analysis Date: 11/06/2017
Collected Date: 11/02/2017

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-01-Joint Compound *091721313-0001*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-01-Wallboard *091721313-0001A*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-02-Joint Compound *091721313-0002*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-02-Wallboard *091721313-0002A*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-03-Joint Compound *091721313-0003*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-03-Wallboard *091721313-0003A*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-03-Texture *091721313-0003B*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-04-Joint Compound *091721313-0004*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-04-Wallboard *091721313-0004A*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-04-Texture *091721313-0004B*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-05-Joint Compound *091721313-0005*	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-05-Wallboard *091721313-0005A*	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected

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ASB-05-Texture 091721313-0005B	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-06-Wallboard 091721313-0006	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-06-Joint Compound 091721313-0006A	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-06-Texture 091721313-0006B	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-07-Joint Compound 091721313-0007	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-07-Wallboard 091721313-0007A	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-07-Texture 091721313-0007B	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-08-Joint Compound 091721313-0008	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-08-Wallboard 091721313-0008A	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-08-Texture 091721313-0008B	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-09-Joint Compound 091721313-0009	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-09-Wallboard 091721313-0009A	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Cellulose 1% Glass	80% Gypsum 17% Non-fibrous (Other)	None Detected
ASB-09-Texture 091721313-0009B	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-10-Joint Compound 091721313-0010	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-10-Wallboard 091721313-0010A	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-10-Texture 091721313-0010B	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-11-Ceramic Tile 091721313-0011	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar	Beige Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-11-Grout 091721313-0011A	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-11-Mortar 091721313-0011B	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar				Insufficient Material
ASB-12-Ceramic Tile 091721313-0012	Building 634 - Entryway (RE) - Black 12" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-12-Grout 091721313-0012A	Building 634 - Entryway (RE) - Black 12" CT w/ Grout & Mortar	Black Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-13-Ceramic Tile 091721313-0013	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	Brown Non-Fibrous Homogeneous		10% Quartz 30% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-13-Grout 091721313-0013A	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	Brown Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-13-Mortar 091721313-0013B	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	White Non-Fibrous Homogeneous		20% Quartz 70% Ca Carbonate 10% Non-fibrous (Other)	None Detected
ASB-14-Joint Compound 091721313-0014	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-14-Wallboard 091721313-0014A	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-14-Texture 091721313-0014B	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

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Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-15-Wallboard *091721313-0015*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-15-Joint Compound *091721313-0015A*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-15-Texture *091721313-0015B*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-16-Joint Compound *091721313-0016*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-16-Wallboard *091721313-0016A*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-16-Texture *091721313-0016B*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-17-Wallboard *091721313-0017*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-17-Joint Compound *091721313-0017A*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-17-Texture *091721313-0017B*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-18-Wallboard *091721313-0018*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-18-Joint Compound *091721313-0018A*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-18-Texture *091721313-0018B*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-19-Wallboard *091721313-0019*	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-19-Joint Compound *091721313-0019A*	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

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Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
ASB-19-Texture *091721313-0019B*	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-20-Joint Compound *091721313-0020*	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-20-Wallboard *091721313-0020A*	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-20-Texture *091721313-0020B*	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-21-Wallboard *091721313-0021*	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-21-Joint Compound *091721313-0021A*	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-21-Texture *091721313-0021B*	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-22-Ceramic Tile *091721313-0022*	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar	White Non-Fibrous Homogeneous		10% Quartz 30% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-22-Grout *091721313-0022A*	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar	Tan Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
ASB-22-Mortar *091721313-0022B*	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar				Insufficient Material
ASB-23 *091721313-0023*	Building 634 - Roof (lower) - Rolled Roof Assembly	White/Black Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-24 *091721313-0024*	Building 634 - Roof (upper) - Rolled Roof Assembly	White/Black Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-25 *091721313-0025*	Building 634 - Roof of Barber Shop - Rolled Roof Assembly	White/Black Non-Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-26 *091721313-0026*	Building 636 - Roof of Restaurant (upper) - Rolled Roof Assembly	Black Non-Fibrous Homogeneous	15% Cellulose 10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix	None Detected
ASB-27 *091721313-0027*	Building 636 - Restaurant Lower Roof - Rolled Roof Assembly	Black Non-Fibrous Homogeneous	15% Cellulose 10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix	None Detected

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Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-28 *091721313-0028*	Building 636 - Roof on Lower Roof Vent - Black Penetration Mastic	White/Black Non-Fibrous Homogeneous		5% Quartz 80% Matrix 15% Non-fibrous (Other)	None Detected
ASB-29 *091721313-0029*	Building 636 - Roof on Pipe Exterior on Lower Roof - Black Mastic	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-30 *091721313-0030*	Building 636 - Roof at Base of Air Handlers - Black Patch Material	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-31 *091721313-0031*	Building 636 - Roof on Air Handler Duct - Gray Alligatored Sealant	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-32 *091721313-0032*	Building 634 - Bank Roof on Vent - Black Penetration Mastic	Black Non-Fibrous Homogeneous	25% Cellulose	70% Matrix 5% Non-fibrous (Other)	None Detected
ASB-33 *091721313-0033*	Building 634 - Optometry Roof on Pipe Exterior - Black Mastic	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-34 *091721313-0034*	Building 634 - Optometry Roof on Large Green Duct - Gray Mastic (painted green)	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-35 *091721313-0035*	Building 634 - Lower Roof on Vent Penetration - Black (newer) Sealant/Mastic	Black Fibrous Homogeneous	10% Cellulose	5% Quartz 80% Matrix 5% Non-fibrous (Other)	None Detected
ASB-36 *091721313-0036*	Building 634 - Barber Roof on Vent - Black Penetration Mastic	Black Non-Fibrous Homogeneous	15% Cellulose	80% Matrix 5% Non-fibrous (Other)	None Detected
ASB-37 *091721313-0037*	Building 630 - Exterior Wall - Cinderblock & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-38 *091721313-0038*	Building 630 - Exterior Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-39 *091721313-0039*	Building 630 - Exterior Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-40 *091721313-0040*	Building 630 - Exterior Window - Window Putty	Gray Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
ASB-41 *091721313-0041*	Building 630 - Roof - Tile (Brown)	Black Fibrous Homogeneous	5% Glass	35% Quartz 60% Matrix	None Detected
ASB-42-Brick *091721313-0042*	Building 634 - Optometrists Front Garden Wall - Brick & Mortar	Brown Non-Fibrous Homogeneous		20% Quartz 25% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-42-Mortar *091721313-0042A*	Building 634 - Optometrists Front Garden Wall - Brick & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected

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ASB-43 091721313-0043	Building 634 - Optometrists Front Garden Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-44 091721313-0044	Building 634 - Optometrists Front Garden Wall - Mortar	Tan Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-45-Ceramic Tile 091721313-0045	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Brown Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-45-Grout 091721313-0045A	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Gray Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
ASB-45-Mortar 091721313-0045B	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-46-Ceramic Tile 091721313-0046	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		10% Quartz 25% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-46-Grout 091721313-0046A	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
ASB-46-Mortar 091721313-0046B	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar				Insufficient Material
ASB-47 091721313-0047	Building 636 - Kitchen Base CT/Wall - White Sealant	White Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-48-Vinyl Sheet Flooring 091721313-0048	Building 636 - Bathroom - Gray Mottled VFS w/ Gray Flooring beneath	Gray Non-Fibrous Homogeneous		30% Ca Carbonate 70% Matrix	None Detected
ASB-48-Leverer 091721313-0048A	Building 636 - Bathroom - Gray Mottled VFS w/ Gray Flooring beneath	Gray Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
ASB-49-Cove Base 091721313-0049	Building 636 - Bathroom - 3" Gray Cove Base w/ Mastic	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-49-Mastic 091721313-0049A	Building 636 - Bathroom - 3" Gray Cove Base w/ Mastic	Tan Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-50-Brick 091721313-0050	Building 636 - Dining Area Wall - Brick w/ Gray Sealant	Red Non-Fibrous Homogeneous		15% Quartz 20% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-50-Sealant 091721313-0050A	Building 636 - Dining Area Wall - Brick w/ Gray Sealant	Gray Non-Fibrous Homogeneous		20% Quartz 70% Matrix 10% Non-fibrous (Other)	None Detected
ASB-51-Concrete 091721313-0051	Building 636 - Exterior Front Patio - 2'x2' Concrete Tile w/ Grout	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-51-Grout 091721313-0051A	Building 636 - Exterior Front Patio - 2'x2' Concrete Tile w/ Grout	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected

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ASB-52 *091721313-0052*	Building 636 - Kitchen Wall - Cinder Block w/ Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-53 *091721313-0053*	Building 636 - Kitchen Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-54 *091721313-0054*	Building 636 - Kitchen Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected

Analyst(s)

Jared Martin (92)

Matthew Batongbacal
or Other Approved Signatory

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OrderID: 091721313

3 day TAT

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	**Laboratory:** EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
B Bridges / Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/		11/3/17	11:15AM WI	theariel / TR	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-01	636	Storage Area	wallboard / Joint Compound		Y	Good
	ASB-02		" "	Wallboard / Joint Compound			
	ASB-03		Men's Bathroom	" / " " w/texture			
	ASB-04		" "	" / " " " "			
	ASB-05		women's "	" / " " " "			
	ASB-06	634	Bathroom (LE ~~Suda~~)	" / " " " "	1500sf.		
	ASB-07		" (")				
	ASB-08		Back Wall (")				
	ASB-09		conference Room (")				
	ASB-10		" " (")				
	ASB-11		Bathroom Floor (")	Beige 12" CT w/ grout & mortar	30SF	N	
	ASB-12		Entryway (")	Black " " " " " "	15SF		
	ASB-13		Bathroom Floor (optometry)	Beige 12" " " " " white "	70SF		

OrderID: 091721313

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	**Laboratory:** EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
B Bridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB- 14	634	Bathroom (optometry)	Wallboard/Joint compound w/ texture	2400 SF	Y	Good
	ASB- 15		" (")				
	ASB- 16		Exam Room (")				
	ASB- 17		Main " (")				
	ASB- 18		" " (")				
	ASB- 19		SW corner (Barber)		700SF		
	ASB- 20		NW " (")				
	ASB- 21		SE " (")				
	ASB- 22		Floor (")	12" white CT w/ grout + Mortar	180SF	N	
	ASB- 23		Roof (lower)	Rolled Roof Assembly	420SF		
	ASB- 24		" upper	" " "	800SF		
	ASB- 25		" of Barber shop	" " "	200SF		
	ASB- 26	636	" of Restaurant (upper)	" " "	850 SF		

Ninyo & Moore

OrderID: 091721313

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-27	636	Restaurant Lower Roof	Rolled Roof Assembly	360SF	N	Good
	ASB-28	↓	Roof on ~~Roof~~ " " vent	Black Penetration Mastic	16SF	↓	↓
	ASB-29	↓	" on pipe exterior on lower roof	" mastic	15SF	↓	Poor
	ASB-30	↓	" at base of air handler	Black Patch material	60SF	↓	Good
	ASB-31	↓	" on Air handler duct.	Gray Alligatored Sealant	8SF	↓	↓
	ASB-32	634	Bank Roof on vent	Black Penetration Mastic	25SF	↓	↓
	ASB-33	↓	Optometry Roof on Pipe Exterior	" mastic	10SF	↓	↓
	ASB-34	↓	" " " large Green Duct	Gray mastic (painted Green)	30SF	↓	↓
	ASB-35	↓	Lower roof on vent Penetration	Black (newer) Sealant/mastic	15SF	↓	↓
	ASB-36	↓	Barber Roof on vent	Black Penetration mastic	8SF	↓	↓
	ASB-37	630	Exterior Wall	Cinderblock Mortar	120SF	↓	↓
	ASB-38	↓	" "	mortar		↓	↓
	ASB-39	↓	" "	mortar		↓	↓

Ninyo & Moore

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	/
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-40	~~360~~ 636	Exterior Window	window putty	190 LF	N	Good
	ASB-41	↓	Roof	Tile (Brown)	200 SF	↓	
	ASB-42	634	optometrists Front Garden wall	Brick + Mortar	400SF		
	ASB-43			Mortar			
	ASB-44		↓	"			
	ASB-45	636	Kitchen Floor	Brownish-Red CT w/ Grout + Mortar (5")	450SF		
	ASB-46		Bar Floor	Gray 5" CT w/ Grout + Mortar	25SF		
	ASB-47		Kitchen Base CT/wall	white Sealant	100LF		
	ASB-48		Bathroom	Gray mottled VFS w/ Gray Flooring beneath	120SF		
	ASB-49		"	3" Gray Cove base w/ mastic	60 LF		
	ASB-50		Dining Area Wall	Brick w/ Gray sealant	300SF		
	ASB-51		Exterior Front Patio	2'x2' Concrete Tile w/ Grout	700SF		
	ASB-52		Kitchen Wall	Cinder Block w/ mortar	100SF		
	ASB-53		~~Kit~~ " "	Mortar			
	ASB-54	↓	" "	Mortar		↓	↓

Ninyo & Moore

APPENDIX C

Lead-Containing Material Laboratory Analytical Report and Chain-of-Custody Records

EMSL Analytical, Inc
464 McCormick Street, San Leandro, CA 94577
Phone/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order: 091721244
CustomerID: NOMO22
CustomerPO:
ProjectID:

Attn: **Blair Bridges**
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612

Phone: (510) 633-5640
Fax: (510) 633-5646
Received: 11/03/17 11:15 AM
Collected: 11/2/2017

Project: **SAN ANSELMO**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
LBP-01 *091721244-0001*	11/2/2017	11/4/2017 Site: ABOVE CEILING ON UPPER CEILING	0.20 % wt	2.0 % wt
LBP-02 *091721244-0002*	11/2/2017	11/4/2017 Site: BATHROOM FLOOR	0.010 % wt	<0.010 % wt
LBP-03 *091721244-0003*	11/2/2017	11/4/2017 Site: ENTRYWAY	0.010 % wt	<0.010 % wt
LBP-04 *091721244-0004*	11/2/2017	11/4/2017 Site: BATHROOM	0.010 % wt	<0.010 % wt
LBP-05 *091721244-0005*	11/2/2017	11/4/2017 Site: BATHROOM (OPTOMETRY)	0.010 % wt	<0.010 % wt
LBP-06 *091721244-0006*	11/2/2017	11/4/2017 Site: EXAM ROOM DOOR	0.010 % wt	<0.010 % wt
LBP-07 *091721244-0007*	11/2/2017	11/4/2017 Site: FLOOR (BARBER)	0.010 % wt	<0.010 % wt
LBP-08 *091721244-0008*	11/2/2017	11/4/2017 Site: WALL	0.010 % wt	<0.010 % wt
LBP-09 *091721244-0009*	11/2/2017	11/4/2017 Site: REAR OF OPTOMETRY ON PIPE	0.010 % wt	<0.010 % wt
LBP-10 *091721244-0010*	11/2/2017	11/4/2017 Site: EXTERIOR REAR PIPE	0.010 % wt	<0.010 % wt
LBP-11 *091721244-0011*	11/2/2017	11/4/2017 Site: EXTERIOR WALL	0.010 % wt	0.020 % wt

Julian Neagu, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Cert #2845.09

Initial report from 11/04/2017 17:48:59

EMSL Analytical, Inc
464 McCormick Street, San Leandro, CA 94577
Phone/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order: 091721244
CustomerID: NOMO22
CustomerPO:
ProjectID:

Attn: **Blair Bridges**
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612

Phone: (510) 633-5640
Fax: (510) 633-5646
Received: 11/03/17 11:15 AM
Collected: 11/2/2017

Project: **SAN ANSELMO**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
LBP-12 *091721244-0012*	11/2/2017	11/4/2017 Site: OPTOMETRIST BATHROOM WALL	0.010 % wt	<0.010 % wt
LBP-13 *091721244-0013*	11/2/2017	11/4/2017 Site: KITCHEN	0.010 % wt	<0.010 % wt
LBP-14 *091721244-0014*	11/2/2017	11/4/2017 Site: BAR	0.010 % wt	<0.010 % wt
LBP-15 *091721244-0015*	11/2/2017	11/4/2017 Site: KITCHEN DOOR	0.010 % wt	<0.010 % wt
LBP-16 *091721244-0016*	11/2/2017	11/4/2017 Site: WINE AREA	0.010 % wt	<0.010 % wt
LBP-17 *091721244-0017*	11/2/2017	11/4/2017 Site: FLOOR IN WINE AREA	0.010 % wt	<0.010 % wt
LBP-18 *091721244-0018*	11/2/2017	11/4/2017 Site: INTERIOR WALL	0.010 % wt	<0.010 % wt

Julian Neagu, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Cert #2845.09

Initial report from 11/04/2017 17:48:59

OrderID: 091721244

3day TAT 091721244 Page 1 of 1

LEAD BASED PAINT BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: Project Manager: Blair Bridges/Bill Larkin Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	**Laboratory:** EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
B Bridges /Blair Bridges	Ninyo&Moore	11/3/17	1110	/	
/		11/3/17	11:15AM WI	[illegible] / TR	

Sample ID	Building	Sample Location	Building Component	Sample Description (Color /# Layers /Substrate)	Estimated Surface Area	Condition
LBP-01	634	Above ceiling on upper ~~[illegible]~~ ceiling ~~[illegible]~~ (RE)	Ceiling	white/2/metal	600SF	Non-intact
LBP-02		Bathroom Floor ~~[illegible]~~ (RE)	Floor	Beige 12" CT	30SF	Intact
LBP-03		Entryway (")	"	Black 12" CT	15 SF	
LBP-04		Bathroom (")	wall	olive green/2/wallboard	900SF	
LBP-05		" (optometry)	Floor	12" Beige CT	70 SF	
LBP-06		Exam Room Door (")	Door Frame	white/2/wood	1500SF	
LBP-07		Floor (Barber)	Floor	12" white CT	180SF	
LBP-08		wall	wall	Brownish Red/2/wallboard	300SF	
LBP-09		Rear of optometry on Pipe	Pipe	Dark Green/2/metal		
LBP-10	636	Exterior Rear Pipe	Pipe			
LBP-11	630	" wall	wall	Dark Green/2/concrete		
LBP-12	634	Optometrist Bathroom wall	"	cream/2/wallboard	400SF	
LBP-13	636	Kitchen	Floor	Brownish-Red 5" CT	450SF	
LBP-14		Bar	"	Gray 5" CT	25SF	
LBP-15		Kitchen Door	Door Frame	white/2/wood	1700SF	
LBP-16		Wine Area	wall	Brownish light Yellow/2/wallboard	700SF	
LBP-17	636	Floor in Wine Area	Floor	Gray/2/concrete	600 SF	
LBP-18	630	Interior Wall	wall	white/2/concrete	400SF	

Paint Chip Sample COC

APPENDIX D

CDPH Form 8552 – Lead Hazard Evaluation Report

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 11/2/2018

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify) ____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
634 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure:

Type of structure: ☑ Multi-unit building ☐ School or daycare ☐ Single family dwelling ☐ Other____

Children living in structure? ☐ Yes ☑ No ☐ Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
County of Marin	(415) 473-7579

Address [number, street, apartment (if applicable)]	City	State	Zip Code
3501 Civic Center Drive, Suite 304	San Rafael	CA	94903

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☐ No lead-based paint detected ☐ Intact lead-based paint detected ☑ Deteriorated lead-based paint detected

☐ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
David Blair Bridges	5107157224

Address [number, street, apartment (if applicable)]	City	State	Zip Code
1956 Webster St, #400	Oakland	CA	94612

CDPH certification number	Signature	Date
24052	B Bridges	11/8/2017

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 11/2/2018

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

[✓] Lead Inspection [ ] Risk assessment [ ] Clearance Inspection [ ] Other (specify) ______

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
630 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure:

Type of structure: [ ] Multi-unit building [ ] School or daycare [ ] Single family dwelling [✓] Other Art Studio

Children living in structure? [ ] Yes [✓] No [ ] Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name		Telephone number	
County of Marin		(415) 473-7579	
Address [number, street, apartment (if applicable)]	**City**	**State**	**Zip Code**
3501 Civic Center Drive, Suite 304	San Rafael	CA	94903

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

[✓] No lead-based paint detected [ ] Intact lead-based paint detected [ ] Deteriorated lead-based paint detected

[ ] No lead hazards detected [ ] Lead-contaminated dust found [ ] Lead-contaminated soil found [ ] Other______

Section 6 — Individual Conducting Lead Hazard Evaluation

Name		Telephone number	
David Blair Bridges		5107157224	
Address [number, street, apartment (if applicable)]	**City**	**State**	**Zip Code**
1956 Webster St, #400	Oakland	CA	94612
CDPH certification number	**Signature**		**Date**
24052	B Bridges		11/8/2017

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
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850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 11/2/2018

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

[✓] Lead Inspection [ ] Risk assessment [ ] Clearance Inspection [ ] Other (specify) ______

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
636 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure:

Type of structure: [ ] Multi-unit building [ ] School or daycare [ ] Single family dwelling [✓] Other Restaurant

Children living in structure? [ ] Yes [✓] No [ ] Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name		Telephone number	
County of Marin		(415) 473-7579	
Address [number, street, apartment (if applicable)]	**City**	**State**	**Zip Code**
3501 Civic Center Drive, Suite 304	San Rafael	CA	94903

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

[✓] No lead-based paint detected [ ] Intact lead-based paint detected [ ] Deteriorated lead-based paint detected

[✓] No lead hazards detected [ ] Lead-contaminated dust found [ ] Lead-contaminated soil found [ ] Other______

Section 6 — Individual Conducting Lead Hazard Evaluation

Name		Telephone number	
David Blair Bridges		5107157224	
Address [number, street, apartment (if applicable)]	**City**	**State**	**Zip Code**
1956 Webster St, #400	Oakland	CA	94612
CDPH certification number	**Signature**		**Date**
24052	B Bridges		11/8/2017

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

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Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

TRANSMISSION VERIFICATION REPORT

TIME : 11/08/2017 12:50
NAME : NINYO MOORE
FAX : 4159830171
TEL :
SER.# : BROH5J323279

DATE,TIME	11/08 12:49
FAX NO./NAME	6205656
DURATION	00:01:06
PAGE(S)	04
RESULT	OK
MODE	STANDARD ECM

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

1956 Webster Street, Suite 400 | Oakland, California 94612 | p. 510.343.3000

SAN DIEGO | IRVINE | LOS ANGELES | FONTANA | OAKLAND | SAN FRANCISCO | SACRAMENTO

SAN JOSE | PHOENIX | TUCSON | PRESCOTT | LAS VEGAS | DENVER | BROOMFIELD | HOUSTON

www.ninyoandmoore.com

Former Nursery Detention Basin Project

Geotechnical Report

Fairfax, California

Submitted to:
Marin County Flood Control and Water Conservation District
3501 Civic Center Drive, Room 304
P.O. Box 4186
San Rafael, CA 94913

Submitted by:
GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400
Rancho Cordova, CA 95670
96-631-4500

March 2017

Project 1610277

Robert Jaeger, Ph.D., P.E.
Senior Engineer

Graham Bradner, P.G., C.E.G. C.HG.
Senior Engineering Geologist

Table of Contents

Tables

Figures

Appendices

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1. Introduction

1.1 Program Overview

GEI Consultants Inc. (GEI) is assisting the Marin County Flood Control and Water Conservation District (District) in a preliminary geotechnical evaluation of the Former Nursery Detention Basin Project (Project) site located in Fairfax, CA (Figure 1-1). The overall goal of the Project is to provide temporary storage of floodwaters for peak flow attenuation on Fairfax Creek. The geotechnical evaluation described herein is based on site-specific information on the soil and groundwater conditions at the site.

1.2 Purpose and Scope

The preliminary plan for the detention basin includes excavation of the site to lower the ground elevation, and construction of an earthen dike on the downstream (eastern) boundary. A diversion structure and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows. GEI has reviewed background documentation and completed geotechnical explorations within the former nursery as part of an assessment of the current conditions at the project site. The purpose of the explorations was to obtain information on environmental and geotechnical subsurface conditions and refine soil properties for engineering analyses. The results of the geotechnical explorations and environmental testing are documented in the *Field Investigation Report* (FIR), submitted as draft to the District in December 2016 (GEI, 2016).

This Geotechnical Report (GR) includes a review of geologic and geotechnical conditions, an assessment of project feasibility, and preliminary design recommendations and considerations for further project development. The assessment is based on the proposed flood detention basin design concept provided by the District on September 8, 2016. The GR contains:

- A summary of geotechnical conditions, geologic hazards, and groundwater conditions at the site,
- Soil characteristics for potential for reuse as embankment fill, including geotechnical properties, environmental constituents, and suitability,
- A preliminary evaluation of project fill requirements and borrow availability,
- Geotechnical analyses of the proposed basin concept, including seepage analysis, stability analyses for steady-state seepage, rapid drawdown, post-seismic, and pseudostatic conditions, and seismic deformation analyses.

2. Site Conditions

2.1 Project Location and Site Description

The Former Nursery Detention Basin site is a seven acre parcel previously used as a growing grounds for a retail landscaping nursery. Existing structures at the site include a 942 square foot (SF) sales office, 10,400 SF of shade structures, an 800 SF residence, 1,748 SF art gallery/studio, a well and water tank, a Marin Municipal Water District water service, and a septic tank system. Fairfax Creek flows from west to east in an incised natural channel at the southern boundary of the property (Figure 2-1). The center portion of the property is relatively flat, sloping gently from west to east. The northern portion of the parcel is a steep hillside. Typical ground surface elevations within the property range from about El. 238 ft on the western edge to 230 ft on the eastern edge. Fairfax Creek is incised an additional six to eight feet below the central portion of the property. The northern hillslope climbs steeply for several hundred feet. The site is accessed across a bridge over Fairfax Creek from Sir Francis Drake Blvd.

2.2 Site Geology

The project site is situated in the Coast Range province, along an east-west trending valley flanked to the north and south by relatively steep hillsides. According to Blake (2000), the hills are Franciscan Complex, and appear to consist of variably deformed Cretaceous sandstone and shale (see Photo 1) on the lower slope, with mélange and Serpentinite on the upper slope, as shown on Figure 2-2. The valley floor is filled with Quaternary alluvial and colluvial sediments of uncertain depths, which underlie the project site. The alluvial sediments thin and pinch out or merge with Quaternary hillside slope deposits at the edges of the valley.

Photo 1. Exposure of weathered Franciscan Complex from northern hillslope adjacent to Former Nursery site.

2.3 Subsurface Conditions

2.3.1 Soil Conditions

Subsurface conditions within the project extents are discussed below based on site reconnaissance and recent GEI explorations. Data collection details and methods are further discussed in Section 3 of the FIR (GEI, 2016). As described in the FIR, the recently performed exploration program consisted of six borings distributed across the site and on Sir Francis Drake Blvd (Figure 2-1). Three of the borings were converted to monitoring wells, which were outfitted with datalogging transducers to measure and record groundwater level measurements.

A geologic cross-section traversing the site was prepared based on existing conditions (Figure 2-3). The subsurface conditions within the site consist of interbedded layers of gravel, sand, silt, and clay sediments extending beyond the depths explored in the central portion of the site, but overlying bedrock near the flanks of the valley. As depicted on cross-section, the foundation generally consists of four zones – three alluvial deposits underlain by bedrock. The upper zone is about 5 ft thick consisting of loose to medium dense clayey and silty sand. The intermediate zone is very soft to very stiff lean clay, and varies from approximately 10 feet in the middle of the site to 20 feet on the east side of the site. The deeper alluvial zone is medium dense to very dense clayey sand and gravel. Claystone bedrock and clay with relic rock structure was encountered in the site investigations near the flanks of the valley. SPTs attempted in the claystone found it to be very hard (50 blows over a 4-inch drive and 50 blows over a 2-inch drive).

Although not encountered in the site investigations, it is likely that unconsolidated alluvial deposits are present in the Fairfax Creek channel. These deposits could range from clay to gravel, depending on the source material and depositional history. The conditions in Fairfax Creek should be further evaluated as part of detailed design.

2.3.2 Groundwater Conditions

Groundwater was not encountered during the field investigation program, which was performed in early-August 2016. However, as shown Figure 2-4, groundwater levels at the site increased through the fall and winter seasons, corresponding to significant increases in precipitation.

The monitoring wells were installed on August 4 & 5, 2016, with the bottom of the well screens at about 19.0 to 20.0 ft below ground surface (i.e. about El. 214 ft). No groundwater was present at the time of installation. The transducers were installed on November 23, 2016, at which time the groundwater was measured at about 8.5 to 9.0 ft below ground surface (i.e. about El. 224.5 to 225.5 ft). As shown on Figure 2-4, about 11 inches of precipitation had fallen in the area, which was followed by more substantial precipitation events. Consequently, groundwater levels have continued to increase in the monitoring wells. Since groundwater monitoring began in November 2016, levels have fluctuated between from a minimum of El. 224.3 ft at MW-3 located furthest downstream to a maximum of 233.6 ft at MW-1 located immediately adjacent to the northern hillside.

It is notable that the general groundwater flow regime during non-precipitation periods is different than during storm events. During non-precipitation periods, the highest values are observed in MW-2, which is closest to Fairfax Creek and furthest upstream indicating recharge from Fairfax Creek. However, during precipitation events, groundwater levels in MW-1 increase significantly rising to within a foot of the ground surface during the monitoring period, indicating recharge from the steep hills on the northern side of the property immediately adjacent to MW-1.

As described above, groundwater levels fluctuate at the site likely in response to precipitation, and that groundwater levels measured in the monitoring wells are at times above the floor of the proposed detention basin. However, based on review of site stratigraphy, it appears that the potentially water-bearing alluvial strata beneath the site is a unit of clayey sand and gravel, which is overlain by an intermediate lean clay layer. The floor of the detention basin would be positioned at El. 224 ft, which is mid-depth in the intermediate lean clay layer, thus providing a thickness of lean clay about five to eight feet thick below the bottom of the basin. Additionally, if water is shedding off of the adjacent northern slope during precipitation events, it is likely to be shallow baseflow through the Franciscan Complex bedrock which could connect with the surficial silty/clayey sand. The described soil types are unlikely to have hydraulic conductivities capable of producing quantities of water that would affect the performance of the basin. It is probable that seepage or surface runoff would enter the basin during the winter and spring months, but the quantity of water could likely be managed through surface contouring to promote drainage within the basin. Additional investigations and testing are recommended to better understand the deeper stratigraphy of the alluvial deposits and the properties of the adjacent hillslope to confirm this condition.

2.4 Geologic Hazards

Potential geological hazards such as landslides and fault rupture were assessed qualitatively using available information, and based on site reconnaissance performed on July 19, 2016, and will further discussed in the following sections. Analysis of additional geotechnical conditions, such as seepage, stability, liquefaction potential, and seismic deformation are discussed in Section 4.0 of this report.

2.4.1 Landslides

A landslide occurring on the slopes bordering the project site could impact the detention basin by damaging the earthen dikes, or if the basin contains water when a landslide occurs, by creating a wave that could overtop the downstream embankments. Landslide potential was assessed using the mapping developed Smith, Rice, and Strand titled *Geology of the Upper Ross Valley and the Western Part of the San Rafael Area, Marin County, California* (Smith et al, 1976), which has been annotated to make interpretation of the maps more readable for those features relevant to the detention basin site (Figure 2-5). The inventory summarizes evidence of historic landslide activity in terms of:

- Debris flow landslides, which are unconsolidated and unsorted soil and rock debris (colluvium) that has moved downslope by flow or creep processes.
- Block slump landslides, which are masses of bedrock [or soil] that have moved downslope by rotational or translational slip along a planar surface.
- Slopes exhibiting evidence of downslope creep.
- Small landslide deposits and debris avalanche scars too small to be delineated on the map.

The mapping and site reconnaissance demonstrates some evidence of slope creep on the hillslope bordering the northern side of the property, which is within areas underlain by Franciscan mélange. The movement could be due to either debris flow or surface creep, but large-scale rotational block landslides were not apparent. No significant cracking was observed during reconnaissance of the site, however, small-scale headscarps were noted adjacent to the access road. It is possible that saturated conditions along the hillside could trigger movement. Based on the observed landslide history in the site vicinity, the uncertain nature of Franciscan mélange deposits, and the significant amount of recharge that appears in MW-1 during storm events, there is moderate risk of slope instability.

2.4.2 Fault Rupture

Both the California Geological Survey and Caltrans fault mapping resources were used to determine if active faults pass through the site. Several major faults have been identified in the region, including the San Andreas, Hayward, and Rodgers Creek faults. However, no active faults are in the immediate project area (Figure 2-6). The California Division of Mines and Geology (CDMG) has prepared Alquist-Priolo Fault Zone and Seismic Hazard Maps to reduce losses from surface fault rupture on a statewide basis. The proposed detention basin site is not located within a Special Studies Zone. Therefore, the potential for fault surface rupture at the sites is remote.

The site will experience seismic ground shaking similar to other areas in the seismically active Bay Area. The fault likely to cause the greatest seismic activity is the San Andreas (North Coast) fault. This fault is approximately 10.8 km (6.7 miles) from the project site, and is believed to be capable of producing a magnitude 8.0 earthquake. The intensity of ground shaking will depend on the magnitude and duration of the earthquake. Potential geotechnical hazards such as liquefaction, seismic deformation, and seismic induced settlement will be further evaluated in Section 4.0 of this report.

2.5 Environmental Soil Testing

As part of the field investigation program documented in the FIR, GEI collected samples and assigned laboratory testing for contaminants within potential borrow materials. Soil samples collected at the site were tested for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), organochlorine pesticides, polychlorinated biphenyls (PCBs), and heavy metals. According to the results of laboratory testing, there were some low detections of VOCs, SVOCs, and organochlorine pesticide constituents at the site, but none exceeded the San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels, rev. 3, February 2016 (ESLs). Metals concentrations were generally consistent across the site, with slightly elevated levels of arsenic, chromium, and nickel above the ESLs. However, these metals are common to the region and typical of background values. Therefore, the on-site soils does not appear to pose a hydrological hazard if used as embankment fill material. Based upon soil analytical results, constituent concentrations are less than the Total Limit Threshold Concentration (TTLC) values as defined in California Code of Regulations 22 §66261.24 Characteristics of Toxicity, and would therefore be considered non-hazardous. However, some of the metals concentrations are slightly elevated, such that off-site disposal of soil excavated at the site may require a Class II landfill accepting “designated” soils. This should be further evaluated based on supplemental environmental testing of borrow soil at the site.

3. Project Conceptual Layout

The conceptual layout of the Former Nursery Detention Basin is shown on Figure 3-1. The grading shown on the figure was based on the District's conceptual figure provided to GEI on September 8, 2016. The preliminary plan for the detention basin includes excavation in the central portion of the site to lower the ground to El. 224 ft, and construction of an earthen dike on the downstream (eastern) boundary with a crest elevation of 238 ft. The natural ground in the vicinity of the embankment is at approximately El. 230 ft, so the structure would be eight feet tall on the downstream side. Natural ground on the western (upstream) side of the basin, high ground on the northern side, and the right (south) bank of Fairfax Creek, which abuts Sir Francis Drake Blvd, complete the perimeter impoundment. A floodwall along the right bank of Fairfax Creek with a top elevation of 238 ft will be needed to maintain the basin crest elevation. A diversion structure and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows. Fairfax Creek is incised down to an elevation of about 225 ft, so the diversion structure would have a height of 13 feet tall. The conceptual design includes a concrete spillway at El. 235 ft.

It is our understanding that the near-surface soils within the basin are being considered for potential use as borrow materials. For the proposed basin configuration, the estimated volume of soil to be excavated is 33,000 CY and the amount of fill required to construct the downstream berm is 11,500 CY. Assuming the upper 12 inches of existing soil will be removed and not considered for borrow due to organics and 30% shrinkage, the available borrow volume was calculated to be sufficient, but will need to be confirmed as design progresses.

4. Geotechnical Evaluation

Geotechnical analyses for evaluation of the proposed basin included:

- Seepage and stability analyses,
- Liquefaction susceptibility and triggering evaluations,
- Estimation of post-seismic reconsolidation settlements, and
- Seismic deformation analyses.

The analyses were performed at two analysis cross sections representing the maximum sections of the downstream dike and the dam/spillway section (Figures 4-1 and 4-2). The locations of the cross sections are shown on Figure 3-1. The analysis approach, analysis criteria, parameters, and design input ground motions are presented in the following sections.

4.1 Analysis Sections and Stratigraphy

Two cross sections were developed for analysis of the downstream berm of the proposed basin, as shown in Figures 4-1 and 4-2. Characterization of the subsurface conditions was performed by evaluating the site geology and the results of subsurface explorations and laboratory testing. Review of available information indicated the foundation generally consists of four zones:

- Zone 1: Upper zone consisting predominantly of silty to clayey sand, with some clayey gravel. This zone was encountered between El. 234 and El. 225 (NAVD 88) in explorations MW#1, MW#2, MW#3, SB#2, and SB#3. The fines contents measured from seven tests on samples from Zone 1 ranged from 15 to 38%, with an average of about 28%. The plasticity index (PI) measured from two tests on samples from Zone 1 were either non-plastic (NP) or 7. SPT energy-corrected blow counts (N_{60}) in Zone 1 ranged from 5 to 40, with an average of about 15.

- Zone 2: Intermediate zone consisting predominantly of lean clay, with limited intervals of high-plasticity clay and high-fines SC-SM (47% fines). This zone was encountered between El. 225 and El. 207 (NAVD 88) in explorations MW#1, MW#2, MW#3, SB#1, and SB#2. The fines contents measured from three tests on samples from Zone 2 ranged from 47 to 61%, with an average of about 55%. The plasticity index (PI) measured from seven tests on samples from Zone 2 ranged from 7 to 13, with an average of about 10. SPT energy-corrected blow counts (N_{60}) in Zone 2 ranged from 0 to 46, with an average of about 16. The higher blow counts were encountered near bottom of the unit in close proximity to the underlying bedrock.

- Zone 3: Deep zone consisting predominantly of clayey sand and clayey gravel. This zone was encountered between El. 218 and El. 201 (NAVD 88) in explorations MW#2, MW#3, and SB#1, which are closer to the middle of the valley. The borings near the edges of the valley (MW#1 and SB#2) did not encounter Zone 3 materials before encountering claystone bedrock or lean clay with rock structure. The fines contents measured from three tests on samples from Zone 3 ranged from 14 to 20%, with an average of about 17%. The plasticity index (PI) measured from three tests on samples from Zone 3 ranged from 9 to 26, with an average of about 16. SPT energy-corrected blow counts (N_{60}) in Zone 3 ranged from 15 to 21, with an average of about 19.

- Zone 4: Claystone bedrock encountered beginning at El. 217.5 in boring MW#1. Boring SB#2 encountered a sample of lean clay with rock structure at the bottom of the borehole, but did not encounter claystone. Two SPTs were attempted in claystone in boring MW#1; however, refusal was encountered on both attempts (50 blows over a 4-inch drive and 50 blows over a 2-inch drive).

The stratigraphy shown on Figures 4-1 and 4-2 is idealized based on the materials encountered during subsurface investigations superimposed on the basin conceptual layout (Figure 3-1). The finished topography shown on the concept plan was used for development of analysis cross sections. It is assumed that the upper portion of the foundation within the basin limits will be excavated and reused for embankment fill. As such, the material properties for the embankment are based on materials described above for Zone 1, but assumed to be reworked, homogenized, and placed under controlled conditions. The seepage and stability analyses described herein do not include Zone 1 or Zone 4, since Zone 1 does not appear to extend beneath the embankment (see boring SB-1), and Zone 4 is bedrock assumed to have little impact on the geotechnical performance of the embankment. Additional investigations are recommended beneath the footprint of the embankment to verify the subsurface conditions and better evaluate the extent of Zone 1 deposits at the site.

4.2 Criteria

The following table summarizes the design criteria for seepage and slope stability analyses for the proposed basin. These values were selected based on criteria from USACE EM 1110-2-1902 (2003) and DSOD, as published in “Strength of Materials for Embankment Dams” (USSD, 2007). As indicated in the table below, no safety factor criterion is applied to pseudostatic analysis as it is only used to estimate the yield acceleration for use in seismic deformation analyses.

Analysis Type	Criterion
Steady-State Seepage	Exit gradient, i = 0.50 at the downstream toe
Steady-State Stability	Factor of safety, FS = 1.5
Rapid Drawdown Stability	Factor of safety, FS = 1.3
Post-Seismic Stability	Factor of safety, FS = 1.1
Pseudostatic Stability	N/A

4.3 Seepage and Stability Analyses

4.3.1 Analysis Approach and Analysis Cases

Seepage and stability analyses were performed using software developed by GEO-SLOPE International, Ltd. SEEP/W is a two-dimensional finite element analysis computer program that was used to generate steady-state phreatic surfaces and pore water pressures within the embankment and foundation soils for the design water surface at El. 236 ft (NAVD 88). Stability analyses were performed with SLOPE/W, using the Spencer analysis method, which satisfies both moment and force equilibrium. Slip surfaces were defined using the entry-and-exit method. Stability analyses were performed on the same analysis cross sections evaluated for seepage.

For the steady-state stability case, it is assumed the proposed basin is filled to the design water surface elevation (El. 236 ft, NAVD 88) and the water surface elevation remains constant long enough to establish steady-state seepage conditions through the embankment, in accordance with USACE EM 1110-2-1902 guidelines. The phreatic surfaces and pore water pressures from our seepage analyses were used in the stability evaluations. Drained strengths were assigned to all soils in these analyses as steady-state seepage is a long-term condition.

For the rapid drawdown case, it is commonly assumed the embankment has been saturated for a sufficient length of time under the design water level to develop steady-state seepage conditions, followed by rapid drawdown of the basin. It is also assumed that excess pore pressures during drawdown would not develop in coarse-grained soils because these materials are relatively free-draining. Fine-grained soils were assumed to be non-free-draining and would generate excess pore pressures during loading.

The Improved Method for Rapid Drawdown was used as outlined in Appendix G of EM 1110-2-1902 (USACE, 2003) to evaluate the rapid drawdown case. This method of evaluating rapid-drawdown stability assumes that the water level drops instantaneously from the design water level to the bottom of the basin at El. 224 ft (NAVD 88), resulting in instantaneous excess pore pressure development in the embankment and foundation soils that is directly proportional to the assumed water level drop. In reality, the water level recedes gradually, and some pore pressure dissipation occurs as the water level drops. As a result, the rapid drawdown analysis is generally considered to be inherently conservative.

4.3.2 Seepage Analysis Parameters

Hydraulic conductivities for seepage analyses were selected for each soil type based on material index properties, laboratory and in-situ testing by DWR (2015), and review of relevant geotechnical references. Hydraulic conductivities were developed for each material type encountered within the basin. A summary table of horizontal and vertical hydraulic conductivities for each material type is provided below.

Material Type	k_v (cm/sec)	k_h/k_v	k_h (cm/sec)
SC (Embankment)	4.0E-06	4	1.6E-05
CL	2.5E-06	4	1.0E-05
SC (Foundation)	4.0E-05	4	1.6E-04

The hydraulic conductivity for the clayey sand (SC) embankment material was based on typical values for controlled placement of the excavated material to be used as berm fill. The clay (CL) in the foundation was assumed to not be intact due to possible penetrations during previous use of the site. Hydraulic conductivity for the clay was selected based on typical values for natural, damaged deposits. For the sandy (SC) foundation material below the clay, hydraulic conductivities selected were based on typical values for natural deposits with similar fines content.

4.3.3 Slope Stability Analysis Parameters

Soil strength parameters for slope stability analyses were selected for each layer. Strength parameters vary based on a number of factors such as material type, relative density, overconsolidation, and plasticity. Unit weights for each soil strata were selected based on blow counts and typical ranges for each soil type.

In selecting strength parameters, distinction was made between coarse-grained materials and fine-grained materials. Coarse-grained materials are defined as soils with fines contents less than 50%. Fine-grained soils are defined as soils with fines contents of 50% or more. The approaches for strength parameter selection are described below and illustrated on the plots included in Appendix A.

4.3.3.1 Coarse-Grained Soils

The drained friction angle (φ') for coarse-grained materials was estimated with the Hatanaka and Uchida (1996) relationship with normalized SPT blowcounts:

$$\varphi' = \sqrt{15.4 \times (N_1)_{60}} + 20°$$

The berm fill (Layer 1) will be placed using modern construction techniques and would be constructed with a high-level of compaction. Foundation layer 3 (SC) was also found to be dense based on SPT blowcounts in the layer. Based on the density of these layers, these materials are expected to dilate when sheared. Therefore, the undrained strengths of the coarse-grained soils were conservatively taken as the drained strengths.

4.3.3.2 Fine-Grained Soils

The maximum past pressure for fine-grained material was estimated using a relationship between SPT blowcounts (N_{60}) and maximum past pressure (σ'_p) by Kulhawy and Mayne (1990):

$$\sigma'_p = 0.47 N_{60} P_a,$$

where P_a is atmospheric pressure. Based on the range of σ'_p estimated using this relationship, a maximum past pressure of 4 ksf was selected for use in characterizing the fine-grained layer present in both analysis cross sections (Layer 2).

The drained cohesion (c') was calculated based on recommendations in the Urban Levee Evaluations Guidance Document for Geotechnical Analyses (DWR, 2015) for foundation CL soils:

$$c' = 0.015 \sigma'_p.$$

Using this relationship with the estimated maximum past pressure of 4 ksf, a c' of 60 psf was calculated and rounded to the nearest 25 psf (c' = 50 psf was selected for Layer 2).

The drained friction angle for fine-grained materials was estimated using the relationship between φ' and PI by Terzaghi et al. (1996). A lower third φ' value of 30° was selected from the relationship using the average PI of the layer (average PI = 10 for Layer 2).

The undrained strength (s_u) of the fine-grained layer was estimated from SPT blowcounts using a correlation from Terzaghi et al. (1996) between undrained strength, N_{60}, and PI. For Layer 2 with an average PI of 10, the relationship can be written as:

$$s_u = 115 N_{60} \text{ (psf)}$$

Based on the SPT blowcounts in Layer 2, an undrained shear strength of 1000 psf was conservatively selected for analysis. Undrained strengths were also estimated from pocket penetrometer measurements performed during the field explorations. The undrained strength was estimated as the pocket penetrometer measurement divided by two per Blum (1997). Comparison of the undrained strengths estimated with the SPT correlation and the pocket penetrometer indicated the pocket penetrometer strengths were typically greater than or equal to the SPT-estimated strengths, with relatively few exceptions.

4.3.4 Results from Seepage and Stability Analyses

Seepage and slope stability analyses results are summarized in Table 4-1. Analysis result figures are presented in Appendix B. For each cross section, the seepage analysis results are illustrated by figures that show the seepage model with soil layering and parameters, and a total head plot for design water surface elevation. Likewise, for each cross section the stability analysis results are presented on figures that show soil stratigraphy, parameters, and the critical failure surfaces with corresponding factors of safety for each analysis case.

The results from the seepage and stability analyses indicate the proposed configuration for the downstream berm meets criteria for seepage and slope stability, as described in Section 4.2.

4.4 Seismic Stability and Deformation Analyses

4.4.1 Design Input Ground Motions

Deterministic ground motion acceleration response spectra (ARS) were calculated for the project site using the geometric average of all five NGA West2 Ground Motion Prediction Equations (GMPEs), where each GMPE was equally weighted. A site V_{s30} of 620 m/s was estimated using the USGS V_{s30} map server online (USGS, 2017). The Caltrans ARS Online tool (Caltrans, 2017) was used to characterize fault parameters and to calculate source-to-site distances.

The controlling seismic source was identified as the San Andreas fault – North Coast Section, which has a moment magnitude of 8.0 and is located approximately 11 km away from the site. The San Andreas fault has an estimated slip rate of 24 mm per year (Field et al. 2013), which is characterized as a very high slip rate (greater than 9.0 mm/year) per the Department of Water Resources' Division of Safety of Dams (DSOD) Consequence-Hazard Matrix (DSOD, 2002). The proposed basin as shown in the concept configuration would impound up to 11 ft of water in the creek channel, and would therefore be DSOD jurisdictional structure. The structure would not be classified as Low Consequence since it is located upstream of residential communities. Therefore, based on the DSOD Consequence Hazard Matrix, deterministic 84th percentile ARS will be required by DSOD. The deterministic 84th percentile PGA for the controlling seismic source was 0.69g. The deterministic 84th percentile ARS curves are provided in Appendix C. The controlling seismic source, fault parameters, source-to-site distance, and 84th percentile peak ground acceleration are also presented below.

Fault Parameters				Site Parameters	
Name	Fault Type	Dip (deg)	M_w	R_{RUP} (km)	84th Percentile PGA (g)
San Andreas (North Coast Fault)	SS	90	8.0	10.8	0.69

4.4.2 *Liquefaction Susceptibility and Triggering*

Liquefaction describes the loss of shear strength in saturated soils as a result of pore pressure increasing due to ground shaking. Liquefaction typically occurs in saturated near-surface soil layers consisting of poorly graded loose sands and gravels, non-plastic silts, and low plasticity clays. Liquefaction susceptibility of the foundation soils was evaluated using the Idriss and Boulanger (2008) criteria based on fines content and PI. According to their criteria, fine-grained soils (50% or more fines) with PI ≥ 7 are considered to behave clay-like and are not susceptible to liquefaction-related strength loss. Soils not meeting these criteria are classified as sand-like and require a liquefaction triggering evaluation to estimate the potential for liquefaction at the design seismic input ground motions. Results from the liquefaction susceptibility screening analysis are summarized below and in Table 4-2.

- Zone 1 fines contents and PIs indicate that the material will exhibit sand-like behavior as described in Section 3.2.2. However, this zone will be excavated and used as borrow for the proposed embankment. Therefore, this layer was not included in the seepage and stability models as a foundation material. If this material is encountered during design of the downstream berm, additional analyses should be performed to determine appropriate actions.

- Zone 2 fines contents and PIs indicate that the material will exhibit clay-like behavior, and is judged to not be susceptible to liquefaction triggering. Within this zone, a single sample had fines content slightly less than 50% (47%) and a PI of 7. Although the fines content of this sample falls just below the liquefaction susceptibility criteria by Idriss and Boulanger (2008), this material will likely exhibit clay-like behavior. Therefore, Zone 2 was judged to be not susceptible to liquefaction.

- Zone 3 fines contents and PIs indicate that the material will generally exhibit sand-like behavior, and is judged to be susceptible to liquefaction triggering during a seismic event.

Liquefaction triggering analyses were performed for all borings presented in the FIR. Liquefaction triggering evaluations were performed according to the methods recommended by Idriss and Boulanger (2008), with updates per Boulanger and Idriss (2014). The potential for liquefaction triggering is evaluated using SPT blow counts to estimate a cyclic resistance ratio (CRR), or cyclic strength, in sand-like soils. The cyclic loading due to the design input ground motions is characterized as a cyclic stress ratio (CSR). The potential for liquefaction is evaluated by calculating a factor of safety against liquefaction (FS_L) as the ratio of the CRR to the CSR.

As discussed in Section 4.4.1, the deterministic 84th percentile design seismic loading (PGA of 0.69g, magnitude 8.0) were used for the analyses. The analyses assumed the basin is filled to the design water surface elevation (El. 236) by specifying a depth to the water table at design of 0.0 feet in the analyses. A factor of safety against liquefaction triggering (FS_L) of 1.4 was used to identify materials where liquefaction was expected to occur. Intervals with FS_L greater than or equal to 1.4 would not be expected to trigger liquefaction due to the design earthquake loading, whereas intervals with FS_L less than 1.0 would be expected to trigger liquefaction for the design earthquake loading. Intervals with FS_L between 1.0 and 1.4 were not expected to trigger liquefaction, but may incur some build-up of excess pore pressures during cyclic loading. For the present feasibility-level analyses, intervals with FS_L less than 1.4 were considered to trigger liquefaction.

The liquefaction triggering evaluations indicate the factors of safety against liquefaction (FS_L) between 0.2 and 0.6 in Zone 3 and thus liquefaction triggering is expected in Zone 3 (Appendix D). These values are lower than the liquefaction threshold criteria (FS_L = 1.4) and therefore some liquefaction should be anticipated at the site for the design earthquake. However, the $(N_1)_{60cs}$ values are very high and indicate the materials are prone to cyclic mobility but not strength loss. Cyclic mobility, as described in Youd et al. (2001) and MSHA (2009), is a progressive softening of dense materials where increased cyclic shear strains may develop, but the tendency of these materials "to dilate during shear inhibits major strength loss and large ground deformations." Additionally, given the depth of Zone 3, it is unlikely to impact embankment stability.

Seismic induced settlement can occur with soils above the water table where looser zones are densified effectively decreasing void space between soil particles. Seismically induced settlement was evaluated by reviewing layer densities, thicknesses and continuity. During significant ground motions, expected settlements would likely be minimal and localized where thicker layers of sandy soil exist. Vertical reconsolidation settlement due to cyclic loading was calculated for all six borings using the procedures by Idriss and Boulanger (2008) (Appendix D). The vertical reconsolidation settlements were estimated to be negligible (0.3 ft or less). Based on the site-specific explorations by GEI, settlement caused by ground shaking does not pose a significant hazard to the site.

4.4.3 Seismic Deformation

Post-seismic stability analyses evaluate the potential for slope instabilities considering undrained strengths (where applicable) and potential strength loss in soils where liquefaction is estimated to trigger. Post-seismic stability was performed with undrained strengths from the pseudo-static analyses to account for potential strength loss due to excess pore pressure generation. Where applicable, residual undrained strengths were applied to materials where liquefaction-induced strength-loss was expected.

For the pseudostatic case, it is assumed that an earthquake causes an additional horizontal force in the direction of failure. This horizontal force is represented by a static force equal to the weight of the sliding soil mass multiplied by a seismic coefficient. The horizontal yield acceleration (k_y) represents the minimum horizontal acceleration required to produce a factor of safety equal to 1.0. The values of k_y for the berm slopes were computed using staged pseudostatic analysis in SLOPE/W, where undrained strengths are calculated using the same approach as described above for rapid drawdown. However for these analyses, the undrained strengths were reduced to 80% of the static undrained strengths used in rapid drawdown to account for development of excess pore pressures during cyclic loading (Duncan et al. 2014).

Seismic deformations were estimated by a simplified semi-empirical predictive relationship for estimating permanent displacements developed by Bray and Travasarou (2007). Bray and Travasarou analyzed 688 recorded strong-motion records from 41 earthquakes to estimate Newmark-type displacement. They chose earthquakes with a magnitude between 5.5 and 7.6, recorded at geotechnical sites B, C, or D (rock, soft rock, or deep stiff soil), and whose time histories in which the frequencies in the range of 0.25 to 10 Hz have not been filtered out.

Bray and Travasarou performed nonlinear coupled viscoelastic analyses with strain-dependent material properties to estimate the seismic displacements. From their analyses, Bray and Travasarou (2007) developed the following regression to estimate Newmark-type seismic deformations:

$$\begin{aligned} Ln(D) = {} & -1.10 - 2.83\ln(k_y) - 0.333\left(\ln(k_y)\right)^2 + 0.566\ln(k_y)\ln\left(S_a(1.5T_s)\right) \\ & + 3.04\ln\left(S_a(1.5T_s)\right) - 0.244\left(\ln\left(S_a(1.5T_s)\right)\right)^2 + 1.50T_s + 0.278(M-7) \\ & \pm \varepsilon \end{aligned}$$

where D is the displacement in centimeters, k_y is the yield acceleration, M is the magnitude of the earthquake, T_s is the fundamental period of the structure, and ε is a normally distributed random variable with zero mean and standard deviation of 0.66. The fundamental period was calculated as $2.6H/V_s$ where H is the height of the embankment and V_s is the shear wave velocity of the embankment fill. A V_s of 1,100 ft/sec was assumed for the embankment based on an anticipated high degree of compaction. For the present evaluation, median (50th percentile) displacements are reported.

The results of the seismic deformation calculations are summarized in Table 4-2, with details included in Appendix E. Calculated seismic deformations for the two analysis sections were between 0.3 and 0.6 ft for both slopes of the maximum section and the upstream slope of the spillway section. The largest seismic deformation was calculated for the downstream slope at the spillway section and was 1.9 ft. For the 3:1 slopes at the site, the associated crest settlement would be approximately 0.6 ft. Given the design freeboard of 2 ft above the design WSE, these displacements are expected to be acceptable.

5. Project Feasibility and Recommendations

5.1 Detention Basin

Based on available information, preliminary site characterization, and analysis results, the construction of a floodwater detention basin at the Former Nursery site adjacent to Sir Francis Drake Boulevard is feasible. Explorations and analyses performed by GEI indicate the proposed berm will be able to withstand the design seismic event without major failure and proposed berm geometry meets slope stability design criteria.

Basin construction is expected to consist of a combination of excavation and fill placement. Estimations of excavation and fill needs to construct the downstream berm indicate there is sufficient borrow material on-site to construct the downstream detention berm. To be used in construction, the berm fill should meet the following guidelines:

1. Liquid Limit less than 45
2. Plasticity index between 8 and 30
3. 100% by weight passing the 3-inch sieve, and greater than/equal to 30% passing the No. 200 sieve
4. The material should be compacted to a relative compaction of 90% per ASTM D 1557 or higher with a water content between 1% dry-of-optimum and 2% wet-of-optimum.

If encountered, highly permeable or loose soils within the limits of embankment construction should be stripped and replaced with compacted fill meeting the guidelines above.

5.2 Floodwall/Gravity Wall

Based on available information from explorations, the construction of a gravity floodwall along Sir Francis Drake Boulevard is feasible. The exploration performed on the shoulder of Sir Francis Drake Boulevard suggest that the subsurface conditions are adequate for bearing capacity of a concrete gravity floodwall, and do not appear to contain materials susceptible to liquefaction triggering.

The concrete gravity floodwall would extend from the downstream edge of the access bridge to the Former Nursery site along Sir Francis Drake Boulevard to the crest of the proposed downstream berm with a length of approximately 400 ft. The top of the wall would remain constant at Elevation 238 ft. Based on the existing ground surface, the height of the wall would be up to 11 ft high in areas where the wall would extend the Fairfax Creek channel bottom, but on average 1 to 2 ft high.

5.3 Groundwater Control and Dewatering During Construction

If groundwater is encountered, dewatering will be necessary to perform temporary and permanent excavations. Based on groundwater level data collected from November 2016 through January 2017, the water table in the alluvial sediments can rise to elevations near the ground surface. No groundwater was encountered during investigations in early-August 2016, so it would also appear that groundwater levels fluctuate several feet annually likely in response to precipitation. If basin construction occurs during the summer months, dewatering may not be needed, except perhaps if performing deep excavations within Fairfax Creek. However, for the current conceptual configuration, groundwater infiltration into the basin during the winter months would be likely, since groundwater is observed to rise above the floor of the detention basin.

The recently completed investigation program terminated at a maximum depth of about 30 ft below ground surface, so the deeper stratigraphy within the alluvium is unknown. It is recommended that in-situ testing and additional deep investigations be performed at the site to evaluate the subsurface conditions related to groundwater.

5.4 Additional Explorations and Laboratory Testing

Additional explorations (borings and Cone Penetration Tests) and geophysical surveying are recommended at the site to further refine alternatives and develop detailed project designs. These explorations will improve the understanding of subsurface stratigraphy and laboratory testing will allow for the determination of strength and consolidation parameters to evaluate settlement and consolidation of the proposed earth structures.

Based on the interpretation of site conditions, it appears that the surficial granular soils (Zone 1) do not extend into the eastern portion of the site (based on SB-1) where the downstream berm would be constructed. Investigations (borings, cone penetration tests, or excavated test pits) are recommended within the footprint of the earthen dike to more accurately evaluate the foundation and assess liquefaction, seismically induced settlement, and consolidation potential. The effect of near-surface granular soils beneath the downstream berm may also have an impact on underseepage during periods of water storage. If encountered, these soils would either need to be removed or cutoff with a low permeability trench to prevent seepage from impacting nearby residences.

Although not encountered in the site investigations, it is likely that unconsolidated alluvial deposits are present in the Fairfax Creek channel. These deposits could range from clay to gravel, depending on the source material and depositional history. The conditions in Fairfax Creek within the embankment footprint should be further evaluated as part of detailed design.

We recommend excavated test pits be performed within the footprint of the basin for the purpose of borrow soil characterization. Samples should be collected from the test pits and submitted for environmental and geotechnical testing.

Based on the observed landslide history in the site vicinity, there is moderate risk of instability of the natural slope on the northern portion of the property, immediately adjacent to the proposed basin. Failure of this natural slope would not directly result in a loss of reservoir containment, but could impact basin capacity. A geotechnical investigation of the slope is recommended to evaluate the soil, rock, and groundwater conditions, and further assess impacts on the proposed basin configuration.

6. Limitations

This Geotechnical Report was prepared for the District for use in planning of the Former Nursery Detention Basin Project.

GEI prepared the conclusions, recommendations, and professional opinions of this report in accordance with the generally accepted geotechnical principles and practices at this time and location.

Soil and rock deposits can vary in type, strength, and other geotechnical properties between points of observations and explorations. The recommendations presented within this report are based on these projected explorations, and are subject to confirmation based on further exploration and testing at the site.

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Tables

Former Nursery Detention Basin Project
Fairfax, California
Table 4-1. Summary of Seepage, Stability, and Seismic Deformation Analysis Results

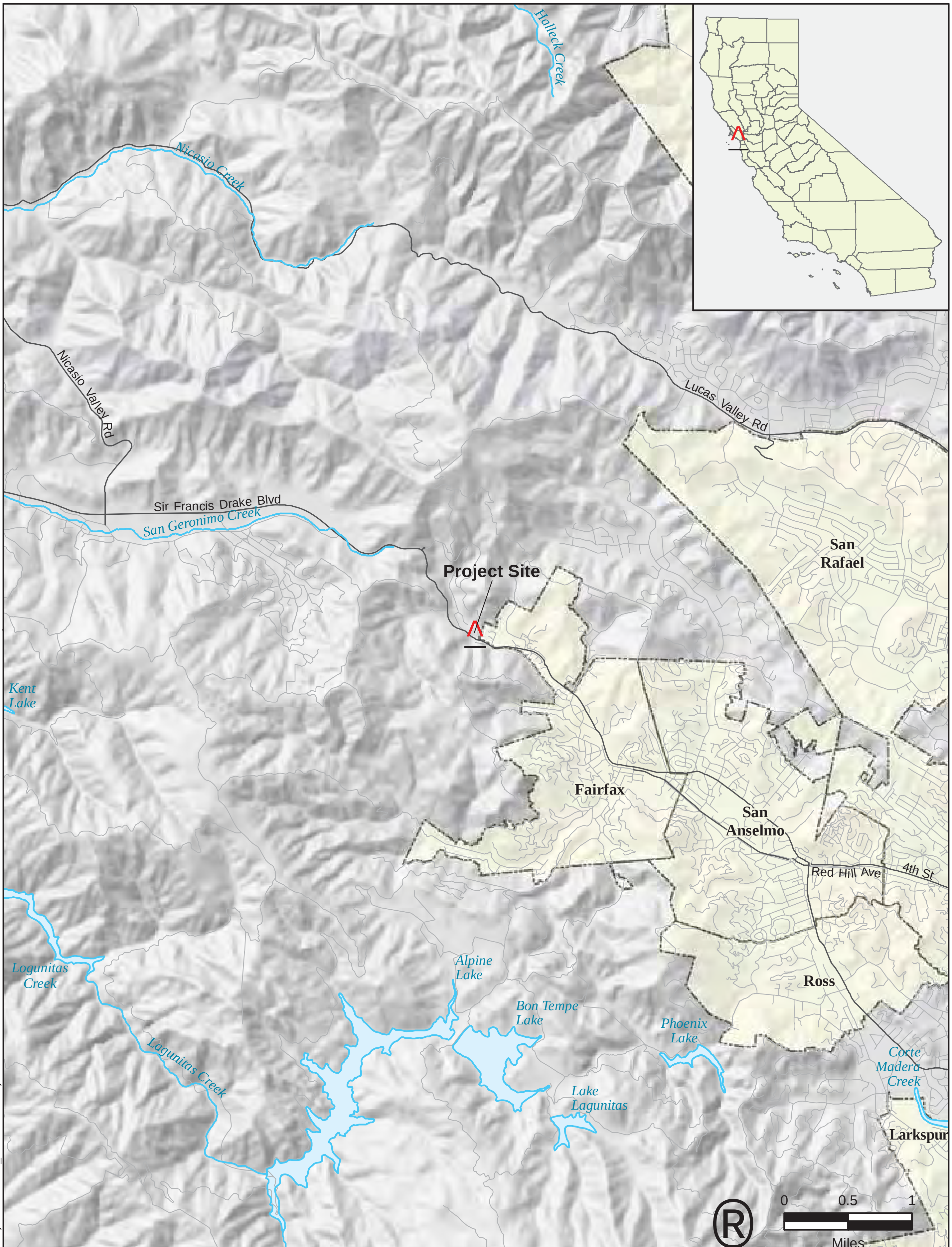
Analysis Section	Seepage		Stability					Seismic Deformation			
	Vertical Gradient at D/S Toe	Breakout Height above D/S Toe (ft)	Steady State Stability F.O.S.		Upstream Rapid Drawdown F.O.S.[1]	Post-Seismic Stability F.O.S.		Pseudo-Static k_y (g)		Deformation (ft)	
			D/S Slope	U/S Slope		D/S Slope	U/S Slope	D/S Slope	U/S Slope	D/S Slope	U/S Slope
Downstream Berm Maximum Section	0.14	2.0	1.79	2.81	2.13	1.79	2.81	0.24	0.31	0.6	0.3
Downstream Berm Spillway Section	0.28	4.9	1.50	3.05	2.15	1.50	3.05	0.16	0.31	1.9	0.5

Notes
F.O.S. = Factor of Safety
D/S = Downstream
U/S = Upstream
1. Rapid drawdown analyses were performed for drawdown from the maximum pool (EL. 236 ft, NAVD 88) to the bottom of the basin (EL. 224 ft, NAVD 88).

Former Nursery Detention Basin Project
Fairfax, California
Table 4-2. Liquefaction Susceptibility Screening for GEI Data

Material Zone	Exploration	Sample ID	Sample Depth (ft)	Sample Elevation (ft, NAVD 88)	Soil Classification	PI	% Fines	Clay-like Behavior
1	MW#2	S02A	2.5	232.1	SC	-	34	No
	MW#2	S04A	6	228.6	SM	NP	38	No
	MW#3	S03A	2.5	230.4	SC-SM	-	20	No
	MW#3	S04A	6	226.9	SC-SM	7	15	No
2	MW#1	S05A	7.5	226.4	CL	11	61	Yes
	MW#2	S07A	13.5	221.1	CL	12	-	Yes
	MW#3	S07A	13.5	219.4	CL	13	57	Yes
	SB#1	S02A	3.5	226.1	CL	10	-	Yes
	SB#1	S05A	11	218.6	CL	11	-	Yes
	SB#1	S06A	13.5	216.1	SC-SM	7	47	No
	SB#2	S06A	13.5	222.1	CL	9	-	Yes
3	MW#2	S10A	21	213.6	SC	-	17	No
	MW#3	S08A	16	216.9	GC	13	20	No
	SB#1	S10A	23.5	206.1	SC	9	17	No
	SB#1	S12A	28.5	201.1	SC	-	14	No
	SB#2	S12A	28.5	207.1	CL	26	-	Yes

Figures



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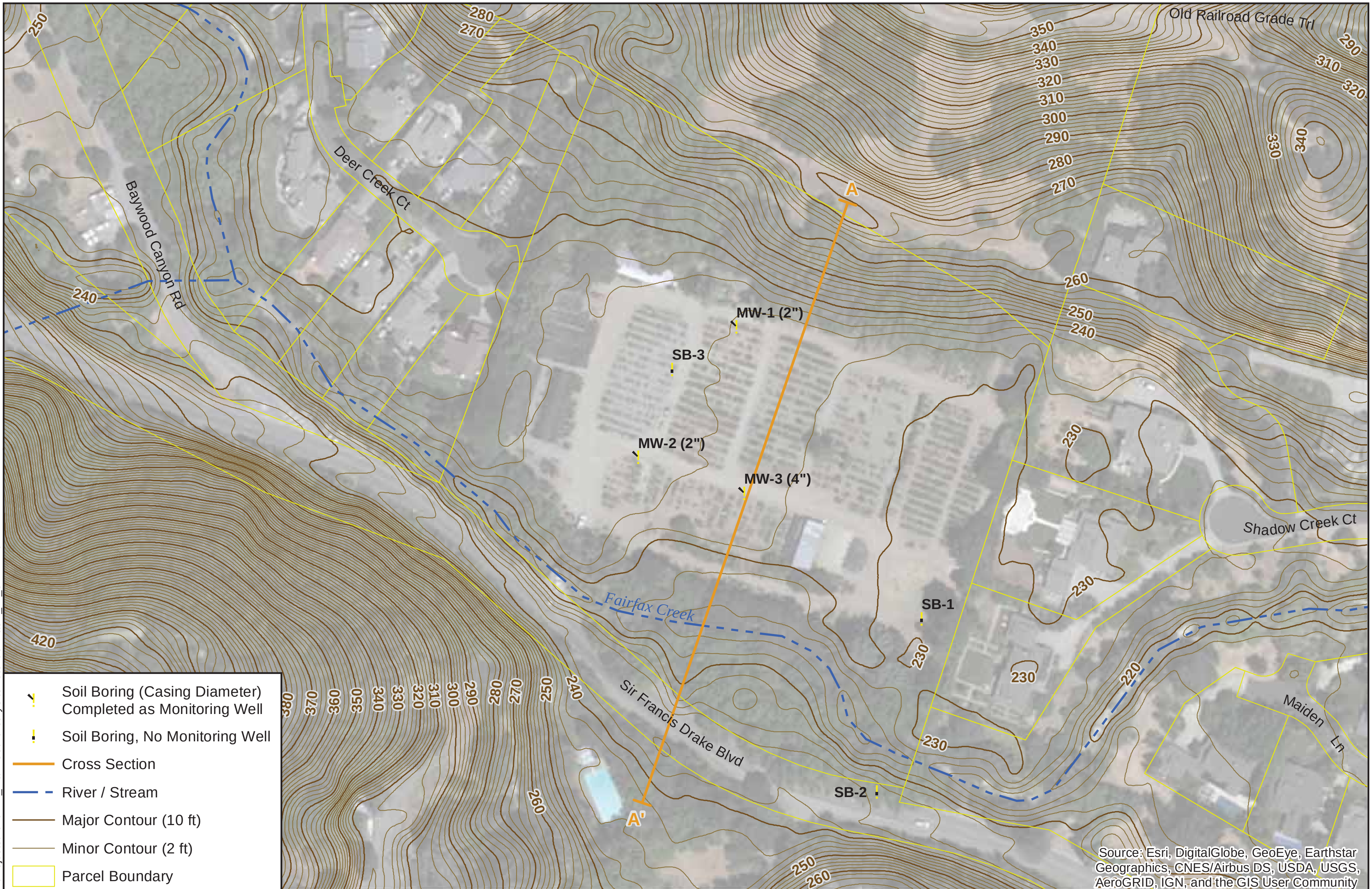
Former Nursery Detention Basin Fairfax, California	GEI Consultants	Site Vicinity
Marin County Flood Control and Water Conservation District		FEBRUARY 2017 FIGURE 1-1



150 75 0 150

Feet

Former Nursery Detention Basin Project
Fairfax, California

Marin County Flood Control
and Water Conservation District

GEI Consultants

SITE PLAN

FEBRUARY 2017

FIGURE 2-1

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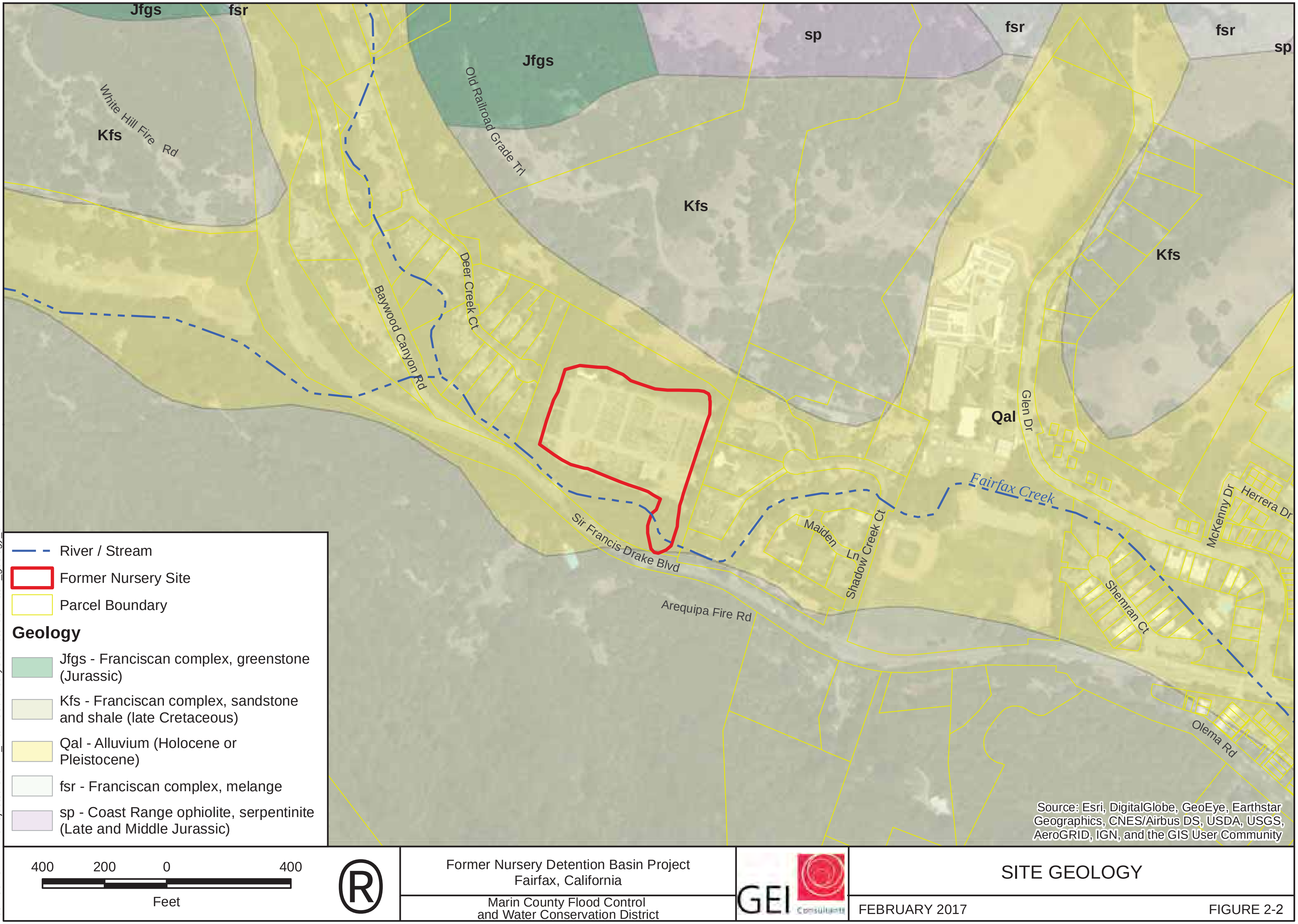


Former Nursery Detention Basin Project
Fairfax, California

Marin County Flood Control
and Water Conservation District

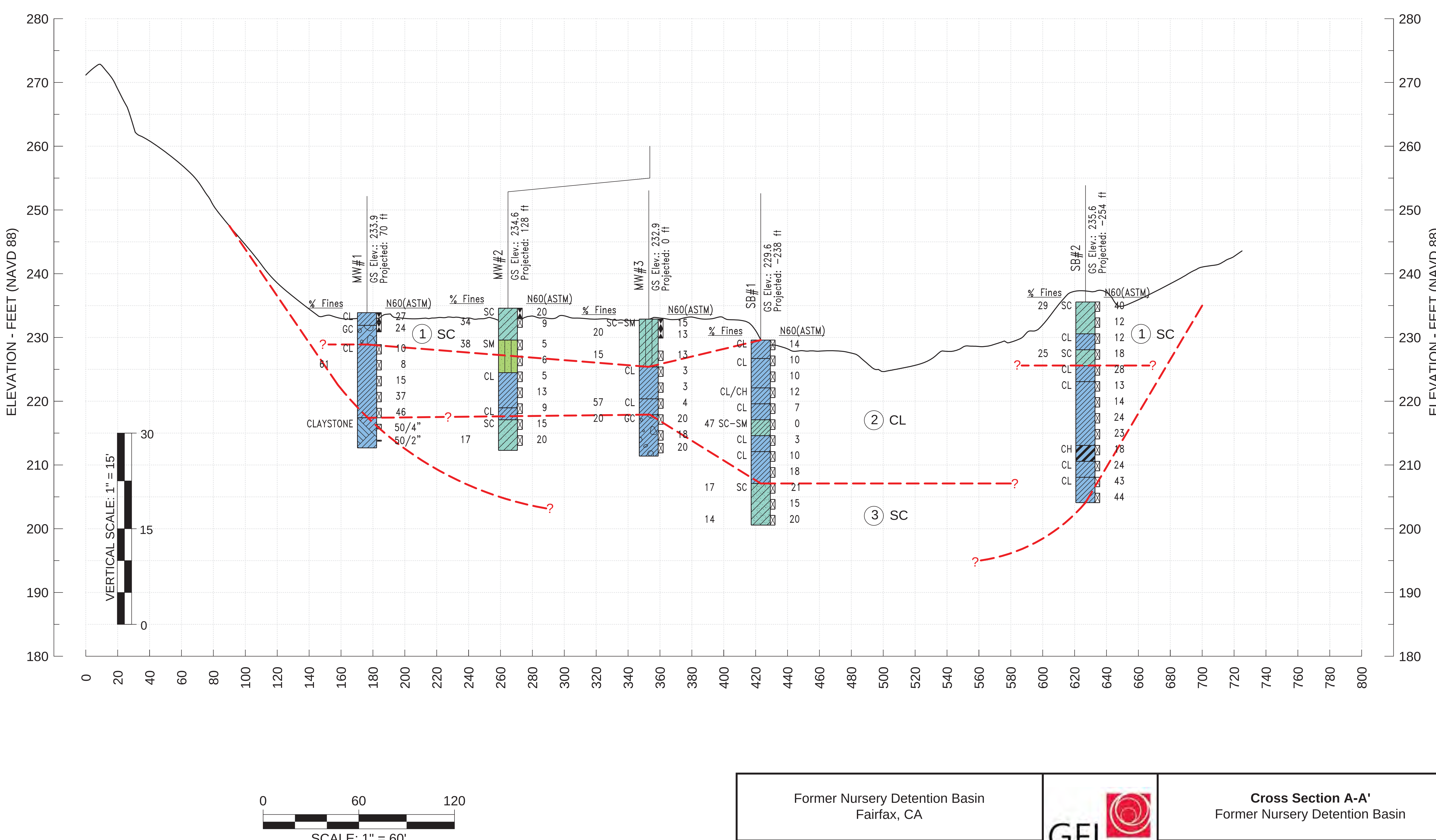
GEI Consultants

SITE GEOLOGY

FEBRUARY 2017

FIGURE 2-2

03-Feb-2017 Z:\Projects\1610277_MarinCoNurserySiteDetentionBasin_geology_8x11.mxd KLM



Former Nursery Detention Basin
Fairfax, CA

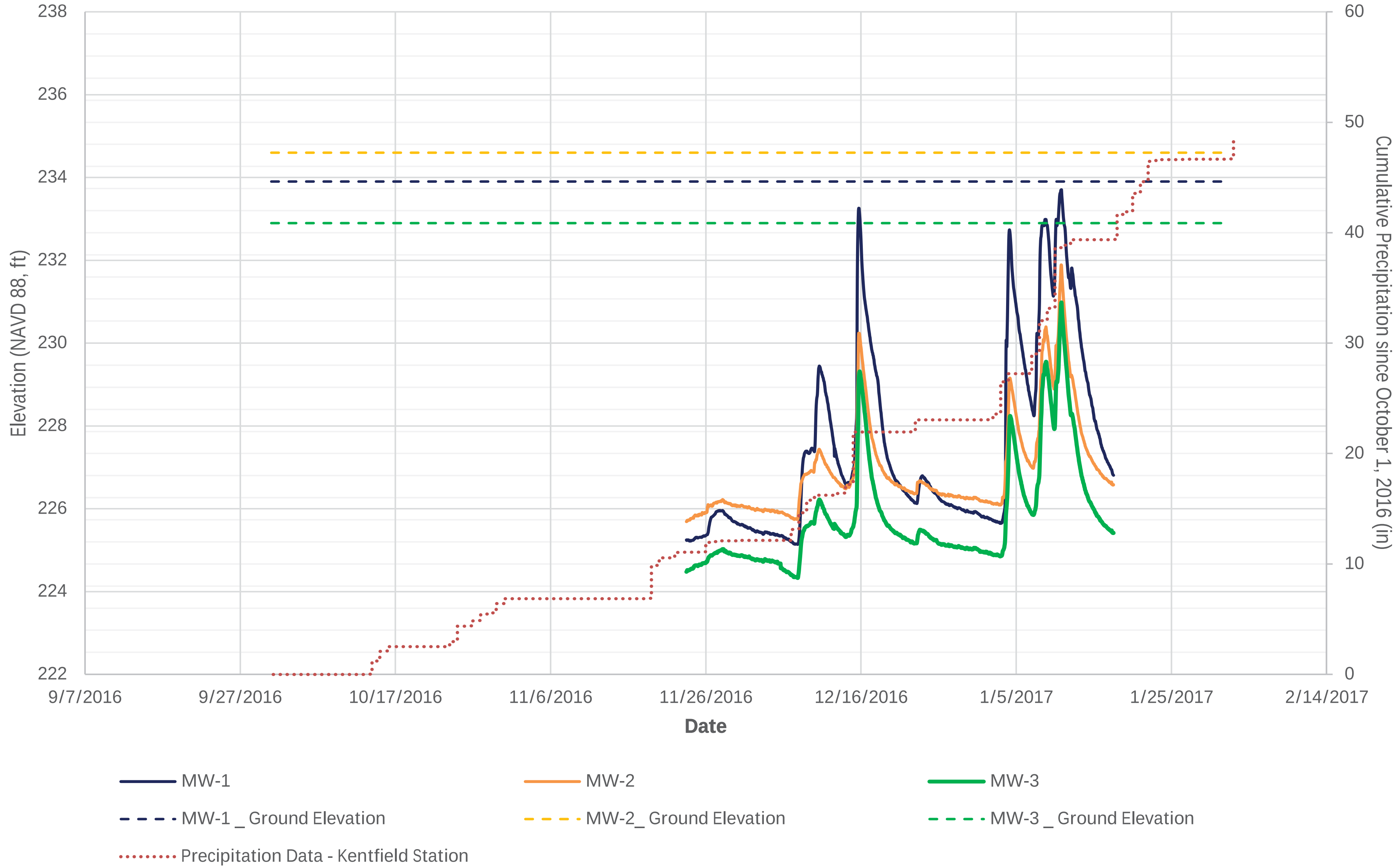
Marin County Flood Control and Water Conservation District

GEI Consultants

Cross Section A-A'
Former Nursery Detention Basin

February 2017

Figure 2-3



Former Nursery Detention Basin Marin County, California	GEI Consultants	Nursery Site Groundwater Levels and Precipitation
Marin County Flood Control and Water Conservation District San Rafael, California	Project 1610277	February 2017 Figure 2-4

SYMBOLS

Contact between adjacent geologic units. Mostly approximately located except in rare well-exposed locations. Also contacts between all units within Franciscan melange, most all of which are faulted.

Fault, shown solid where fault traces are located with confidence, dashed where approximately located in bedrock areas, and dotted where assumed to be located but buried beneath Quaternary deposits. Queried where considerable doubt exists as to the location of the concealed trace. No evidence of recent faulting was found for any of the faults on this map, therefore all of the faults shown are presumed to be inactive.

Landslide deposits and debris avalanche scars that are too small to be delineated at this scale.

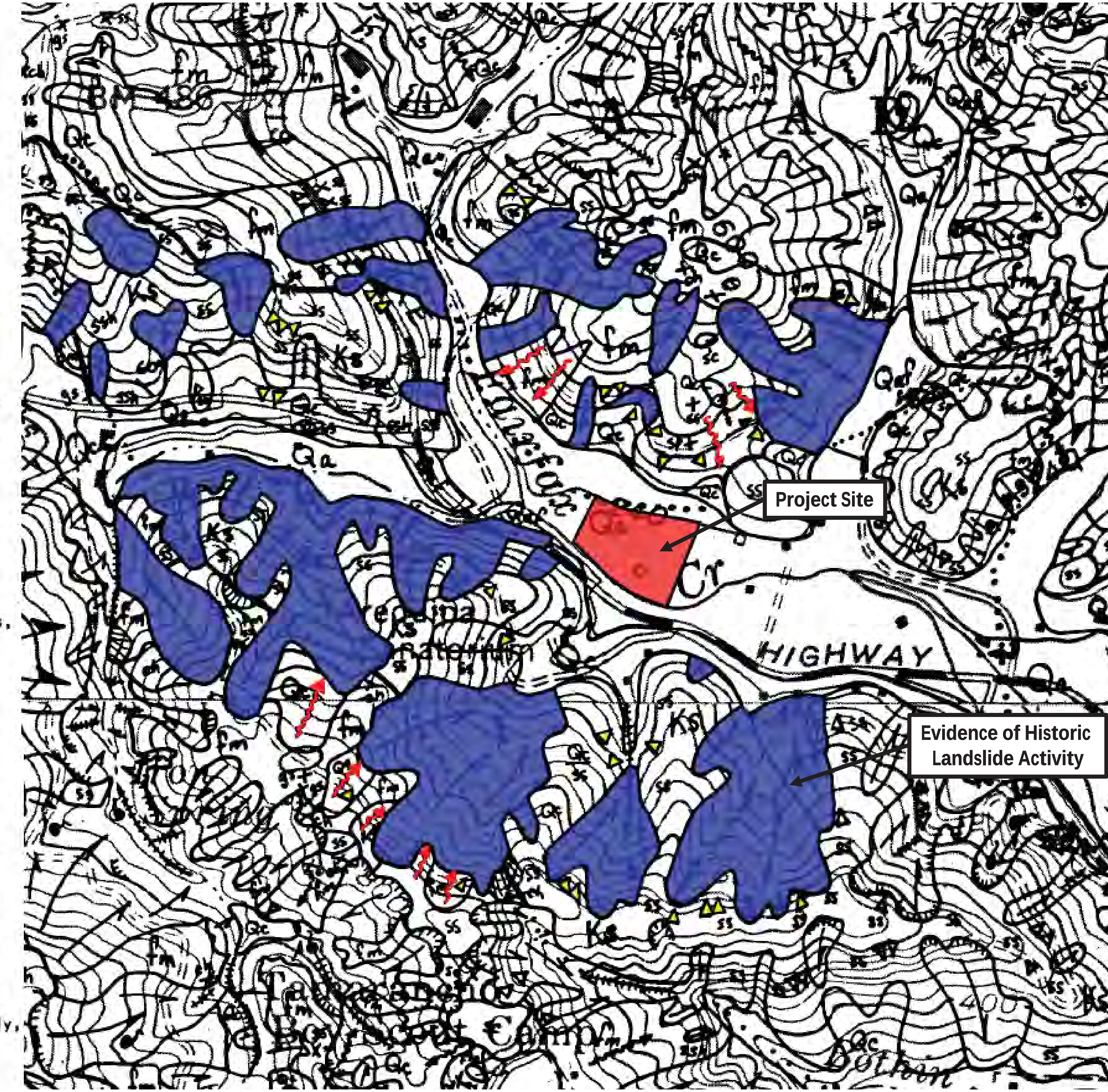
Slopes exhibiting evidence of continuous or intermittent downslope creep of surface zone. Boundaries of such zones commonly are obscure; however, attempts were made, where possible, to delineate the boundaries of the affected areas. Found principally within debris flow landslide deposits and within areas underlain by Franciscan melange. Evidence includes wrinkled topographic surfaces, leaning structures and trees that normally would be straight, tension cracks in soils, and cracked, sagged, or otherwise disrupted pavements and retaining walls.

Headwall scarps of block slump and debris flow landslides, and scars left at sources of soil and rock debris avalanches.

Gully; maximum depth given in feet.

DEBRIS FLOW LANDSLIDES. Predominantly deposits of unconsolidated and unsorted soil and rock debris (colluvium) that have moved downslope en masse or in increments by flow or creep processes. Slip surfaces in the base materials of these landslides are roughly planar and approximately parallel to the slope surface. Includes some soil and rock debris avalanche deposits that have accumulated outward from the base of slopes by rapid flow. Estimated maximum thickness in feet is indicated where such estimates could be made with reasonable confidence from surface observations.

BLOCK SLUMP LANDSLIDES. Masses of relatively intact to highly disrupted bedrock that have moved downslope by rotational slip along deep concave slip planes, or rarely, by translational slip along planar surfaces. Commonly flanked by, and succeeded downslope by, debris flow deposits.



Former Nursery Detention Basin
Marin County, California

Marin County Flood Control and Water Conservation District
San Rafael, California

GEI Consultants

Site Landslide History

Project 1610277 | February 2017 | Figure 2-5

Former Nursery Detention Basin Project

Field Investigation Report

Fairfax, California

Submitted to:
Marin County Flood Control and Water Conservation District
3501 Civic Center Drive, Room 304
P.O. Box 4186
San Rafael, CA 94913

Submitted by:
GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400
Rancho Cordova, CA 95670
96-631-4500

February 2017
Project 1610277

Graham Bradner, P.G., C.E.G. C.HG.
Senior Engineering Geologist

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1. Introduction

1.1 Program Overview

GEI Consultants Inc. (GEI) is assisting the Marin County Flood Control and Water Conservation District (District) in a preliminary geotechnical evaluation of the Former Nursery Detention Basin Project (Project) site located in Fairfax, CA (Figure 1). The overall goal of the Project is to provide temporary storage of floodwaters for peak flow attenuation on Fairfax Creek. The investigation described herein provides site-specific information on the soil and groundwater conditions at the site to support preliminary geotechnical evaluations of project alternatives.

1.2 Purpose and Scope

The preliminary plan for the detention basin includes excavation of the site to lower the ground elevation by about 6 to 12 feet (to Elevation 224 ft NAVD88), and construction of an earthen dike on the downstream (eastern) boundary. Natural ground on the western side of the basin, and high ground on the northern and southern sides of the basin complete the perimeter impoundment. An earthen or concrete dam and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows.

GEI has undertaken geotechnical explorations within the former nursery as part of a comprehensive assessment of the current conditions at the project site. The purpose of the explorations was to obtain information on environmental and geotechnical subsurface conditions and refine soil properties for engineering analyses.

This Field Investigation Report (FIR) summarizes data collection, subsurface investigations, and laboratory testing performed as part of this project. This report includes boring logs, laboratory test results, piezometer as-builts, transducer installation records, and a site plan showing exploration locations.

The scope of this geotechnical exploration program included:

- Background review of existing data;
- Completion of the geotechnical explorations utilizing auger boring methods;
- Construction of monitoring wells;
- Documentation of exploration locations and elevations;

- Preparation of boring logs and monitoring well construction as-builts;
- Environmental and geotechnical laboratory testing; and
- Installation of water level monitoring transducers in the monitoring wells.

A Geotechnical Report will be prepared by GEI as a companion to this FIR, which will evaluate the results of the environmental testing and will include seepage and stability analysis. It should be noted that future additional design-level explorations and analyses may be required to assist in the final design phase and the development of construction plans and specifications for the project components.

2. Site Conditions

2.1 Site Description

The Former Nursery Detention Basin site is a seven acre parcel previously used as a growing grounds for a retail landscaping nursery. Existing structures at the site include a 942 square foot (SF) sales office, 10,400 SF of shade structures, an 800 SF residence, 1,748 SF art gallery/studio, a well and water tank, a MMWD water service, and a septic tank system. Fairfax Creek flows from west to east in a natural channel in the southern portion of the parcel. The center portion of the parcel is relatively flat and the northern portion of the parcel is a steep hillside. The site is accessed across a bridge over Fairfax Creek from Sir Francis Drake Blvd.

2.2 Subsurface Conditions

Subsurface conditions within the Project extents are discussed below based on review of historic geologic mapping, site reconnaissance, and recent GEI explorations. Data collection details and methods are further discussed in Section 3 of this FIR.
The site is situated in the Coast Range province, along an east-west trending valley flanked to the north and south by relatively steep hillsides. The hills are Franciscan Complex, and appear to consist of mélange on the north side of the site, and variably deformed Cretaceous sandstone and shale on the south side of the site, south of Sir Francis Drake Blvd (Blake, 2000). The valley floor is filled with Quaternary alluvial and colluvial sediments of uncertain depths, which underlie the project site. Based on the slope of the adjacent hillsides, the sediment accumulations could be as thick as 100 to 150 feet in the deepest section of the valley. The alluvial sediments thin and pinch out or merge with Quaternary hillside slope deposits at the edges of the valley.

The subsurface conditions within the site consist of interbedded layers of gravel, sand, silt, and clay sediments extending beyond the depths explored in the central portion of the site, but overlying weathered bedrock near the flanks of the valley. The upper soil is commonly sand and gravel material to depths of about 5 feet, which is underlain by clayey soils. The thickness of the clay layer varies from approximately 15 feet in the middle of the site to 22.5 feet on the east side of the site. Sandy, gravelly sediments underlie the clay layer in some portions of the site. Groundwater was not encountered during this field investigation program, which was performed in early-August 2016.

3. Field Exploration

3.1 General

The field exploration program summarized in this report was performed as described in the *Subsurface Exploration Work Plan, Former Nursery Detention Basin* (Work Plan), dated August 2016 (GEI, 2016). The work plan was reviewed and approved by the District. Table 1 summarizes the subsurface explorations performed as part of this investigation. Figure 2 shows an aerial image of the former nursery, investigation locations, and other site features. Borings logs, monitoring well as-builts, laboratory test results, and transducer installation documentation are provided as Appendices A through D, respectively.

Prior to the beginning field investigations, the goals and challenges of the exploration program were identified through discussion and site reconnaissance with District staff and exploration subcontractors. Other significant considerations of the exploration program included:

- Project goals and objectives;
- Project Health and Safety Plan;
- The scope of field investigations;
- Sampling procedures and sample requirements;
- Exploration depth targets;
- Site access and contact information;
- Utility clearance and permits;
- Site security and noise;
- Backfill requirements;
- Disposal of cuttings; and
- Applicable standards.

3.2 Health and Safety

A project-specific Health and Safety Plan (HASP) was developed for the field investigation. Field personnel were given a health and safety briefing by the Project Manager, and attended health and safety tailgate meetings. Field personnel were also provided with specific guidelines and information about emergency action protocols, including the location of the closest emergency medical facility. Field personnel had no reportable incidents during field investigations.

3.3 County Drilling Permits

A Marin County “test hole/soil boring” permit was issued by the Environmental Health Services Department. The permit is applicable for one year, beginning on July 22, 2016. The permit requires that field operations follow all Marin County rules, regulations, Codes, laws and statutes as per County well drilling procedures. Copies of the applicable permits were provided in the Work Plan, and are also available upon request.

3.4 Utility Clearance

The locations were visually observed for the presence of overhead and underground utilities and then outlined in white paint as required by Underground Service Alert (USA). USA was then contacted a minimum of 48 hours before subsurface investigation of the site. A USA ticket number as well as the clearance date, expiration date and extension date were obtained for the work area and documented in the project file.

Prior to performing exploration activities at each location, the presence of underground utilities was also evaluated by Subtronic Corporation of Concord, CA, a private utility locator. In general, no major utility conflicts were encountered and each exploration could be performed at, or very close to, the planned location.

3.5 Field Program Description

The exploration program consisted of six borings, with monitoring wells constructed within three borings. Exploration locations and depths are summarized in Table 1, and are shown in Figure 2.

3.5.1 Exploration Methods

Vertical borings were drilled by Gregg Drilling and Testing, Inc. (Gregg) on August 3 and 4, 2016 using a truck-mounted drill rig with hollow-stem augers. GEI personnel coordinated the drilling program, logged the borings, collected and transported the soil samples, and observed the monitoring well installations.

Sampling of the subsurface material was performed using SPT (Standard Penetration Test) samplers, for both environmental and geotechnical samples, and Modified California (MC) barrel samplers in accordance with the procedures described in ASTM D 1586-11. Environmental samples were collected within three feet of the ground surface at explorations within the operational area of the former nursery using SPT and MC samplers with stainless steel liners. After environmental samples were collected, SPT geotechnical samples were driven at 2.5-foot intervals to the bottom depth of each exploration for soil classification and index testing.

Both the environmental and geotechnical SPT samplers had a 2-inch outside diameter with a 1.375-inch inside diameter shoe, but the environmental SPT sampler had a 1.5-inch inside diameter for use with 6-inch long stainless steel liners. The SPT geotechnical sampler had an inner diameter of 1.375-inches without liners. The MC sampler has a 2.5-inch outside diameter and 2-inch inside diameter with a 1.875-inch inside diameter shoe; this sampler was advanced with 6-inch long stainless steel liners.

Drive samples were attached to either AWJ or NWJ rod, and were driven using a 140-pound automatic trip hammer with a free fall of 30 inches. Due to mechanical issues that occurred with Gregg's drill rig during the project, a second rig was used to complete the geotechnical investigations. The drill rigs and associated hammer efficiencies are as follows:

- Rig D-26 (Mobile B-53) = 76% per testing on October 29, 2014; used for MW#1 and MW#3.
- Rig D-12 (Mobile B-61) = 69% per testing on March 2, 2016; used for MW#2, SB#1, SB#2, and SB#3.

The densities of coarse-grained soils were described in the field using the number of measured blow counts to drive an SPT sampler. Consistencies of fine-grained soils were based on pocket penetrometer measures, and evaluated qualitatively from measured blow counts.

3.5.2 Boring Logs

A field boring log was completed by the field logger for each boring drilled. Logs are included in Appendix A. The procedures for logging are described in detail in the Work Plan. Subsurface conditions observed in soil samples and drill cuttings or perceived through the performance of the drill rig (for example, ease/difficulty of drilling, rig chatter in gravel) were described in the "Remarks" column on the log. Besides descriptions of individual soil samples, boring logs indicate the tops and bottoms of soil layers. Descriptions were included for each soil layer, with horizontal lines drawn to separate subjacent layers.

3.5.3 Monitoring Wells

Three of the geotechnical borings were converted to open standpipe monitoring wells. Well locations are summarized on Table 1 and as-built details are included in Appendix B.

MW-1 and MW-2 were installed in 8-inch diameter borings with 2-inch diameter Schedule 40 polyvinyl chloride (PVC) blank casing and screen. MW-3 was installed in a 10-inch diameter boring with 4-inch diameter PVC blank casing and screen. The piezometers included a 15 to 16-foot well screen consisting of mill-slot (0.020 inch) PVC screen. Piezometer screens were surrounded by a 2 x 12 sand pack, extending from just below the transition seal to the bottom of the borehole. The sand was tremied in place through the hollow-stem augers, with a measuring tape in the hole to ensure bridging was not occurring, and tamped once in the hole. A 1-foot thick bentonite transition seal was placed above the sand pack, to prevent grout from infiltrating the sand pack. Bentonite chips were hydrated for at least 30 minutes prior to installation of the transition seal. Neat cement grout containing five percent powdered bentonite was installed above the transition seal, extending to within about one foot of the ground surface. Groundwater was not present at the time of installation, so the wells were not developed. However, because the wells were installed using hollow stem auger methods with no introduction of bentonite or other drilling fluids, the well screens are expected to be clean and free of significant sediment accumulation. A flush-mounted well vault was installed at the ground surface with sufficient rise to shed water and prevent ponding. The piezometers are protected with locking vault covers.

3.5.4 Exploration Completion and Site Restoration

For those soils borings not converted to monitoring wells, the drilling contractor sealed the borehole with a neat cement grout in accordance with Marin County Environmental Health standards and State Department of Water Resources Bulletin 74-81 and 74-90. All grout was mixed in batches using 55-gallon drums. The grout was placed in the boreholes through the augers, with the augers extending to the bottom of the boreholes. Grout levels were monitored during equipment tear-down at the work sites and any loss of grout was noted and grout was replaced.

Drill sites were cleaned and restored as closely as practicable to pre-drilling conditions. At the completion of drilling, all equipment and materials, tools and unused materials were removed and trash was disposed offsite.

3.6 Description and Classification of Soils

Soils were described in general accordance with ASTM D2487 and D2488 procedures and as outlined in the Work Plan. Soil descriptions are presented on the boring logs included in Appendix A.

3.7 Documentation of Exploration Locations

Field personnel used a handheld GPS unit to record boring and monitoring well locations in the field. GPS coordinates and spatial references in the field were used to position the exploration locations in a geographic information system (GIS). Topographic data for the site provided by the District was then used to estimate the ground surface elevations at these locations. The District provided LiDAR data was mostly assembled from surveys flown in April/May 2010 by the Golden Gate LiDAR project; the complete file for the County was initially assembled in 2011 and revised in 2013 (Version 6, dated December 18, 2013). Coordinates are provided in Table 1 and on the exploration logs in Appendix A. The locations are reported in feet using NAD83 California State Plane Zone II for the horizontal locations and NAVD88 for the elevations.

4. Laboratory Testing

4.1 Soil Testing

Laboratory tests were performed on selected soil samples from boreholes to obtain information about the environmental and geotechnical characteristics of subsurface soil. The laboratory testing program was developed based on the purpose of the project and review of information generated during subsurface investigations.

Environmental and geotechnical laboratory testing was performed by Curtis & Tompkins in Berkeley, California and Cooper Testing Laboratory in Palo Alto, California, respectively. Environmental testing results were used to assess the presence and distribution of naturally – occurring and manmade constituents in soils at the site. Geotechnical testing results were used to refine soils descriptions and material classifications. Laboratory test results are discussed below and summarized in Tables 2 and 3. The laboratory testing reports are provided in Appendix C. Geotechnical test results are also included on the boring logs in Appendix A.

4.1.1 Environmental Testing

Environmental laboratory testing of soil samples included the following tests.

- Total Organic Carbon, SM 5310C
- Metals, EPA 6010B
- Volatile Organic Compounds, EPA 8260
- Semivolatile Organic Compounds, EPA 8270
- Polychlorinated Biphenyls, EPA 8082
- Organochlorine Pesticides, EPA 8081A

According to the results of laboratory testing, there were some low detections of VOCs, SVOCs, and organochlorine pesticide constituents at the site, but none exceeded the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels (ESLs), rev. 3, February 2016. Metals concentrations were generally consistent across the site, with slightly elevated levels of arsenic, chromium, and nickel above the ESLs. However, these metals are common to the region and typical of background values.

As discussed in Section 10.2 of the *ESL User's Guide*, arsenic concentrations in site soils typically exceed risk-based screening levels by one or more orders of magnitude. In many situations, this is due to naturally occurring background concentrations. Duvergé (2011) conducted a study of regional background concentrations of arsenic in undifferentiated urbanized flatland soils and proposed an upper estimate for background arsenic (99th percentile) of 11 mg/kg in the San Francisco Bay Area. This value can be used, as appropriate, in consultation with the overseeing regulatory agency.

Similar to Arsenic, other metals such as chromium and nickel can also be present in regional soils at background levels exceeding the ESLs. SFRWQCB's *Draft Technical Reference Document, Characterization and Reuse of Soil from Multiple Sources for Maintenance of Levees Adjacent to Aquatic Environment*, dated August 1, 2006, provides recommendations for reuse of local soil for levee projects. Including in the recommendations are screening thresholds for various analytes which are generally based on ambient values statistically derived from locally-collected data. The recommend ambient concentrations for arsenic, chromium, and nickel are higher than those listed in the ESLs (Arsenic = 15.3 mg/kg, Chromium = 112 mg/kg, Nickel = 112 mg/kg), and are consistent with concentrations encountered at the site.

4.1.2 Geotechnical Testing

Geotechnical laboratory testing of soil samples included the following index tests.

- Sieve analysis, ASTM D 422
- Atterberg Limits, ASTM D 4318

Index testing of soil samples collected from the Former Nursery site indicate fines content (i.e. silt and clay content) ranges from 14% to 61%, but field classification of samples in some areas indicate soils with higher fines content may also be present. Gravel content ranged from 0% to 48.6% and sand content ranged from 31% to 63%. The maximum particle size of gravel was approximately 1-inch. Plasticity indices ranged from 7 to 26 and liquid limits ranged from 23 to 47, indicating a mixture of silty and clayey fines.

An evaluation of site soils for reuse as borrow will be presented in the forthcoming Geotechnical Report.

5. Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) was performed on all work products (deliverables) at the project and task level. QA/QC procedures were performed under the direction of the Project Manager. QA/QC was also performed on all subcontractor deliverables.

5.1 Hammer Energy Measurement

To ensure the consistency of data collected from SPTs, which are critical to liquefaction evaluation, the drilling subcontractor performed SPT energy measurements on SPT hammers to evaluate the energy that each hammer delivered. Hammer calibrations for the two drilling rigs equipped with automatic trip hammers utilized for this project were conducted in accordance with ASTM D 4633. The drill rigs and associated hammer efficiencies are as follows:

- Rig D-26 (Mobile B-53) = 76% per testing on October 29, 2014; used for MW#1 and MW#3.
- Rig D-12 (Mobile B-61) = 69% per testing on March 2, 2016; used for MW#2, SB#1, SB#2, and SB#3.

5.2 Boring Logs

Borings were logged in the field by engineers in general accordance with ASTM and California State guidelines. Boring logs for this project were created by carrying out the following QC steps:

- Entering field sampling details and soil descriptions on boring logs.
- The Project Manager and other geotechnical staff performing QC checks on field logs.
- Preparing draft gINT (Version 8) logs based on checked field logs.
- Engineering staff reviewing laboratory test results to gauge conformance with field boring logs.
- Refining boring log soil classifications and descriptions where appropriate based on laboratory test results.
- Geotechnical staff reviewing updated gINT boring logs

All gINT work was carried out by the project team's staff engineers and geologists. The gINT logs were taken through various levels of checks by the field loggers, the project team's engineers/geologists responsible for the gINT input, and the Project Manager.

5.3 Laboratory Testing and Test Results

While the laboratory testing was in progress, results were reviewed as they became available, maintained regular coordination with the laboratory representatives, addressed questions posed by laboratory representatives and provided additional instructions as necessary.

Laboratory index test results were reviewed by project team to gauge conformance with field boring logs. If laboratory results were in conflict with the field boring log information, the matter was typically resolved through a visual check and classification of a sample of the soil in question by the Project Manager and Field Logger.

5.4 Report

QA was performed on all deliverables and consisted of independent technical review (ITR), audits, documentation, and reporting. QC was also performed on all deliverables and included tasks, such as detail checking, computer program documentation, and nonconformance and corrective action documentation. QC was performed under the direction of the Project Manager.

6. Limitations

This geotechnical report, associated data collection and preparation have been performed in accordance with the standard of care commonly used as the state-of-practice in the engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this area performing the same services under similar circumstances during the same period.

Discussions of subsurface conditions summarized in this report are based on subsurface soil and groundwater conditions at limited exploration locations. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able identify all adverse conditions in the levee and/or its foundation.

No warranty, either expressed or implied, is made in the furnishing of this report. The project team makes no warranty that actual encountered site and subsurface conditions will exactly conform to the conditions described herein, nor that this report's interpretations and recommendations will be sufficient for all construction planning aspects of the work. The design engineer and/or contractor should perform a sufficient number of independent explorations and tests as they believe necessary to verify subsurface conditions rather than relying solely on the information presented in this report.

Data presented in this report are time-sensitive in that they apply only to locations and conditions existing at the time of the exploration and preparation of this report. Data should not be applied to any other projects in or near the area of this study nor should they be applied at a future time without appropriate verification.

This report is for the use and benefit of Marin County Flood Control and Water Conservation District. Use by any other party is at their own discretion and risk.

This report is one of multiple documents describing work completed. It will be supplemented with other reports presenting evaluations of this information.

7. References

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SFBRWQCB, 2016. *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs).* San Francisco Bay Regional Water Quality Control Board. Interim Final 2016. February 2016.

State of California, Department of Water Resources, Division of Flood Management. 2006. *Soil and Rock Logging, Classification, Description, and Presentation Manual*. December 6, and revised February 2008 (September 2009).

Tables

Table 1 - Subsurface Exploration Summary
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Boring ID	Description	Date Started	Date Completed	Latitude	Longitude	Existing Ground Elev. (feet)[1]	Boring Depth (feet)	Screen Interval Length (feet)
MW#1	8” auger boring with 2" well	8/3/2016	8/3/2016	38.002706	-122.610379	233.9	21.2	15
MW#2	8” auger boring with 2" well	8/4/2016	8/4/2016	38.002290	-122.610757	234.6	22.3	16
MW#3	8” auger boring reamed to 10” and 4" well	8/3/2016	8/4/2016	38.002185	-122.610332	232.9	21.5	15
SB#1	6” auger boring	8/4/2016	8/4/2016	38.001803	-122.609618	229.6	29	--
SB#2	6” auger boring	8/4/2016	8/4/2016	38.001257	-122.60978	235.6	31.5	--
SB#3	2” to 2.5” driven samplers	8/4/2016	8/4/2016	38.002569	-122.61063	234.9	3	--

Notes:

[1]Existing Ground Elevations (ft) obtained from MCFCWD LiDAR assembled in 2011 and revised in 2013 (6th edition, dated 12/18/2013)

Table 2. Summary of Analytical Soil Testing Results, Former Nursery Detention Basin

Marin County Flood Control and Water Conservation District

Analyte	San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (1)		Test Result (2)			
	Direct Exposure Human Health Risk Level - Res: Shallow Soil Exposure	Tier 1 ESL (3)	MW #1	MW #2	MW #3	SB #3
Volitile Organic Compounds (µg/kg)						
Toluene	970,000	2,900	0.9	ND	ND	ND
Semivolitile Organic Compounds (µg/kg)						
2-Methylnaphthalene	240,000	250	ND	ND	ND	12
Phenanthrene	--	11,000	13	11	14	28
bis(2-Ethylhexyl)phthalate	39,000	39,000	67	11	39	68
Organochlorine Pesticides (µg/kg)						
Heptachlor epoxide	67	0.42	7.3	ND	ND	ND
4,4'-DDE	1,900	1,900	58	ND	ND	ND
4,4'-DDD	2,700	2,700	6	ND	ND	ND
4,4'-DDT	1,900	1,900	110	ND	ND	ND
alpha-Chlordane	480 (4)	480 (4)	33	ND	ND	ND
gamma-Chlordane			33	ND	ND	ND
Metals (mg/kg)						
Antimony	31	31	0.21	0.23	0.20	0.13
Arsenic	0.07	0.07	8.1	7.8	7.6	5.8
Barium	15,000	3,000	210	200	440	170
Beryllium	150	42	0.55	0.55	0.59	0.55
Cadmium	39	39	0.130	0.090	0.057	0.080
Chromium	0.3 (5)	0.3 (5)	100	110	95	68
Cobalt	23	23	20	19	22	17
Copper	3,100	3,100	39	28	39	29
Lead	80	80	15	9.5	11	10
Mercury	13	13	ND	0.17	0.25	0.66
Molybdenum	390	390	0.35	0.21	0.79	0.44
Nickel	820	86	140	120	130	89
Selenium	390	390	0.20	0.19	0.19	0.14
Silver	390	390	0.050	0.050	0.040	0.063
Thallium	1	1	0.066	0.055	0.070	0.057
Vanadium	390	390	54	54	59	44
Zinc	23,000	23,000	85	72	80	62
Total Organic Carbon (%)						
Total Organic Carbon	--	--	1.00	0.86	0.42	0.43

(1) *Environmental Screening Levels, San Francisco Bay Regional Water Quality Contol Board,* February 2016 (Rev. 3)

(2) ND = Not Detected

(3) Tier 1 ESLs are used for protecting sites with unrestricted land and water use, shallow soil contamination, shallow groundwater, and permeable soil per *ESL Users Guide, SFRWQCB, February 22, 2016*

(4) sum Chlordane concentration

(5) ESL for Chromium VI

Table 3 - Summary of Geotechnical Soil Testing Results
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Boring ID	Depth (ft)	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	% Gravel	% Sand	% Fines
MW#1	1.5	Composite[1]				9.5	7.5	36.9	55.6
	7.5	S05A	30	19	11	19	7.5	31.2	61.3
MW#2	1.5	Composite[2]				19	18.4	47.4	34.2
	5.0	S04A	24	0	24	4.75	0	61.7	38.3
	12.5	S07A	32	20	12				
	20.0	S10A				25	34.7	48.3	17
MW#3	1.5	Composite[3]				25	29.3	51	19.7
	5.0	S04A	23	16	7	25	42.1	42.9	15
	12.5	S07A	32	19	13	9.5	0.4	42.4	57.2
	15.0	S08A	31	18	13	25	48.6	31.8	19.6
SB#1	5.0	S03A	29	19	10				
	10.0	S05A	31	20	11				
	12.5	S06A	25	18	7	2	0	53.3	46.7
	22.5	S10A	27	18	9	25	34.2	49.2	16.6
	27.5	S12A				25	36.2	49.8	14
SB#2	0.0	S01A	26	18	8	19	19.5	51.1	29.4
	7.5	S04A				19	12.6	62.7	24.7
	12.5	S06A	27	18	9				
	27.5	S12A	47	21	26				
SB#3	1.5	Composite[4]				19	27.5	39.6	32.9

Notes:

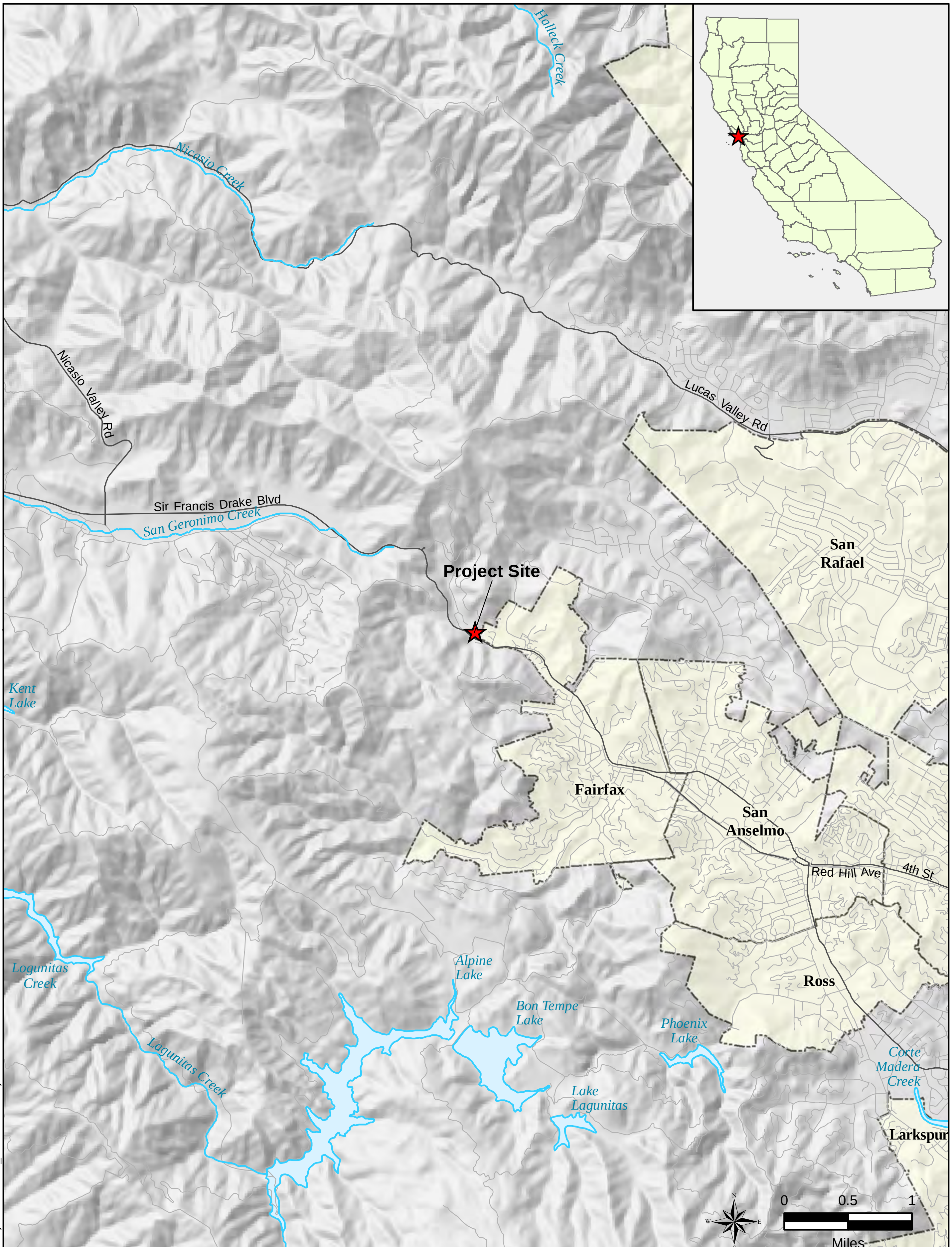
[1]Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A)

[2]Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A)

[3]Lab testing on combined sample (S01B, S01A, S02A, S03C, S03B, and S03A)

[4]Lab testing on combined sample (S01C, S01B, S01A, S02B, S02A, and S03A)

Figures



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Former Nursery Detention Basin
Fairfax, California

County of Marin Flood Control and Water Conservation District

GEI Consultants

Site Vicinity

FEBRUARY 2017

FIGURE 1

300 150 0 300

Feet

N W E S

Former Nursery Detention Basin Project
Fairfax, California

County of Marin Flood Control
and Water Conservation District

GEI Consultants

SITE PLAN

FEBRUARY 2017

FIGURE 2

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Appendix A

Boring Logs

BORING LOG LEGEND

SOIL DESCRIPTION

- CA - CHEMICAL ANALYSIS (CORROSIVITY)
- CD - CONSOLIDATED DRAINED TRIAXIAL
- CN - CONSOLIDATION
- CU - CONSOLIDATED UNDRAINED TRIAXIAL
- DS - DIRECT SHEAR
- PP - Q_p FROM POCKET PENETROMETER
- TV - S_u FROM TORVANE
- RV - R-VALUE

PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MEDIUM DENSE	10 - 30	FIRM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

SAMPLE TYPES

- Auger Cutting
- Grab Sample
- California Sample
- Modified California Sample
- 2.5" Modified California Sample
- Core Sample
- Split Spoon Sample
- Direct Push Sample
- Sonic Sample
- Undisturbed Sample
- Field Vane Shear
- Punch Core Sample

ADDITIONAL TESTS

- CA - CHEMICAL ANALYSIS (CORROSIVITY)
- CD - CONSOLIDATED DRAINED TRIAXIAL
- CN - CONSOLIDATION
- CU - CONSOLIDATED UNDRAINED TRIAXIAL
- DS - DIRECT SHEAR
- PP - POCKET PENETROMETER (TSF)
- (3.0) - (WITH SHEAR STRENGTH IN KSF)
- RV - R-VALUE
- SA - SIEVE ANALYSIS: % PASSING #200 SIEVE
- ▽ - WATER LEVEL (WITH DATE OF) MEASUREMENT
- (200) - (WITH % PASSING NO. 200 SIEVE
- SW - SWELL TEST
- TC - CYCLIC TRIAXIAL
- TV - TORVANE SHEAR
- UC - UNCONFINED COMPRESSION
- (1.5) - (WITH SHEAR STRENGTH IN KSF)
- UU - UNCONSOLIDATED UNDRAINED TRIAXIAL
- WA - WASH ANALYSIS
- (200%) - (WITH % PASSING NO. 200 SIEVE)

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants
GEI Consultants, Inc.
180 Grand Avenue Suite 1410
Oakland, CA 94612
(510) 350-2900

Boring Location

LATITUDE: 38.002706 **LONGITUDE:** -122.610379 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 233.9
LOCATION: Former Nursery Site

BORING

MW#1

Drilling Information

DATE START / END: 8/3/2016 - 8/3/2016 **TOTAL DEPTH (FT):** 21.2
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-53 (Gregg Rig No. D-26) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 8-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - NWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 76
GENERAL NOTES:

ABBREVIATIONS:

ID = Inside Diameter	bpf = Blows per Foot	U = Undisturbed Tube Sample	WOR = Weight of Rods	Q_P = Pocket Penetrometer Strength
OD = Outside Diameter	mpf = Minute per Foot	C = Rock Core	WOH = Weight of Hammer	S_v = Pocket Torvane Shear Strength
Pen. = Penetration Length	S = Split Spoon	V = Field Vane Shear	RQD = Rock Quality Designation	F_v = Field Vane Shear Strength
Rec. = Recovery Length	DP = Direct Push Sample	SC = Sonic Core	OVM = Organic Vapor Meter	NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01B, S01A	18/12	10 10 11 [21]/ {27}	Q_P=>4.5		Lean CLAY (CL); hard; light olive brown (2.5Y 5/3); dry to moist; >95% medium plasticity, high dry strength, no to slow dilatency, medium toughness fines; <5% fine sand; trace fine gravel.			56			Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A) Additional sampler (Samples S03B and S03A) driven from 0.0 to 1.5 feet for environmental sample approx. 1 foot east of boring
			S02B, S02A	18/12	6 9 10 [19]/ {24}			Clayey GRAVEL with Sand (GC); medium dense; olive brown (2.5Y 4/4); dry to moist; 40% fine, subangular gravel, max. size 1/2-in.; 30% fine to coarse sand; 30% low plasticity fines.						
230	5		S04A	18/7	2 3 5 [8]/ {10}			Sandy Lean CLAY (CL); medium stiff; very dark gray (7.5YR 3/1) mottled with orange; moist; 61% high dry strength, no dilatency, medium toughness fines; 31% fine to coarse sand; 8% fine gravel.						
			S05A	18/6	2 2 4 [6]/ {8}	Q_P=0.75					61	30	11	
225	10		S06A	18/7	4 5 7 [12]/ {15}	Q_P=0.75								
220			S07B, S07A	18/6	6 11 18 [29]/ {37}	Q_P=2.75 Q_P=4.25		Below 13 feet: very stiff to hard.						
	15		S08A	18/6	15 16 20 [36]/ {46}									
			S09A	9/7	40 50/4"			CLAYSTONE; light gray; intensely weathered to decomposed; very weak.						
215	20			2/0	50/2"									
210	25							End of Boring at 21.2 feet.						
205														

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.002290 **LONGITUDE:** -122.610757 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 234.6
LOCATION: Former Nursery Site

BORING

MW#2

Drilling Information

DATE START / END:	8/4/2016 - 8/4/2016	**TOTAL DEPTH (FT):**	22.3
CONTRACTOR:	Gregg Drilling & Testing **DRILLER:** E. Santellan	**LOGGED BY:**	T. Haynes
EQUIPMENT:	Mobile B-61 (Gregg Rig No. D-12)	**BORING METHOD:**	Hollow Stem Auger
AUGER ID/OD:	OD - 8-inch **CASING ID/OD:** N/A / N/A	**DRILL ROD TYPE/SIZE:**	Drill Rod Type - AWJ
HAMMER TYPE:	Automatic Hammer **HAMMER WEIGHT (lbs):** 140	**HAMMER DROP (inch):**	30
WATER LEVEL DEPTHS (ft):	Not Encountered	**HAMMER ENERGY MEASUREMENT (%):**	69
GENERAL NOTES:			

ABBREVIATIONS:

ID = Inside Diameter	bpf = Blows per Foot	U = Undisturbed Tube Sample	WOR = Weight of Rods	Q_P = Pocket Penetrometer Strength
OD = Outside Diameter	mpf = Minute per Foot	C = Rock Core	WOH = Weight of Hammer	S_v = Pocket Torvane Shear Strength
Pen. = Penetration Length	S = Split Spoon	V = Field Vane Shear	RQD = Rock Quality Designation	F_v = Field Vane Shear Strength
Rec. = Recovery Length	DP = Direct Push Sample	SC = Sonic Core	OVM = Organic Vapor Meter	NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01B, S01A	18/14	18 10 7 [17]/{20}			Clayey SAND with Gravel (SC); loose to medium dense; light olive brown (2.5Y 5/3); dry; 47% fine to coarse sand; 34% low plasticity fines; trace rootlets at surface; 18% fine, subangular gravel, max. size 3/4-in.						Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A) Additional sampler (Samples S03B and S03A) driven from 1.5 to 3.0 feet for environmental sample approx. 1 foot northwest of boring
			S02B, S02A	18/12	4 4 4 [8]/{9}						34			
230	5		S04A	18/6	2 2 2 [4]/{5}	Q_P=<0.5		Silty SAND (SM); loose; dark yellowish brown (10YR 3/6); moist; 62% fine sand; 38% slow dilatency, low to medium toughness fines.			38	24	NP	
			S05A	18/5	2 2 3 [5]/{6}									
225	10		S06A	18/10	1 2 2 [4]/{5}	Q_P=0.5		Lean CLAY (CL); soft; very dark grayish brown (2.5Y 3/2); moist; 95% medium to high dry strength, no dilatency, medium toughness fines; 5% fine sand; trace fine gravel/coarse sand.						
			S07A	18/10	2 4 7 [11]/{13}	Q_P=1.25		Below 13 feet: stiff.				32	12	
220	15		S08B, S08A	18/10	2 3 5 [8]/{9}			Sandy Lean CLAY (CL); dark grayish brown (2.5Y 4/2); moist; 60% low to medium plasticity, no to slow dilatency, medium toughness fines; 40% fine sand.						
			S09A	18/9	4 5 8 [13]/{15}	Q_P=4.5		Clayey SAND with Gravel (SC); medium dense; dark yellowish brown (10YR 3/4); moist; 48% fine to coarse sand; 35% fine to coarse, subangular gravel; 17% low to medium plasticity fines.						
215	20		S10A	18/11	5 8 9 [17]/{20}	Q_P=3					17			
								End of Boring at 22.3 feet.						
210	25													
205														

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.002185 **LONGITUDE:** -122.610332 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 232.9
LOCATION: Former Nursery Site

BORING

MW#3

PAGE 1 of 1

Drilling Information

DATE START / END: 8/3/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 21.5
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-53 (Gregg Rig No. D-26) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 8-inch, 10-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - NWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 76
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
		S01B, S01A	18/12	16 4 8 [12]/ {15}		Silty, Clayey SAND with Gravel (SC-SM); loose to medium dense; dark brown (10YR 3/3); dry to moist; 51% fine to coarse sand; 29% fine to coarse, subangular gravel; 20% fines.			20			Lab testing on combined sample (S01B, S01A, S02A, S03C, S03B, and S03A) Additional sampler (Sample S02A) driven from 0.0 to 1.5 feet for environmental sample approx. 1 foot southeast of boring
230		S03C, S03B, S03A	18/18	4 5 5 [10]/ {13}		Below 2.7 feet: moist.						
	5	S04A	18/8	7 6 4 [10]/ {13}		Below 5 feet: 43% sand; 42% gravel; 15% fines.			15	23	7	
225		S05A	18/10	1 1 1 [2]/ {3}	Q_P=<0.5	Lean CLAY (CL); very soft to soft; very dark gray (7.5YR 3/1) mottled with orange; moist; 90% low to medium plasticity, medium to high dry strength, no dilatency, low to medium toughness fines; 10% fine sand.						
	10	S06A	18/5	0 1 1 [2]/ {3}	Q_P=<0.5							
220		S07A	18/12	0 1 2 [3]/ {4}	Q_P=<0.5	Sandy Lean CLAY (CL); very soft to soft; very dark gray (7.5YR 3/1) mottled with orange; moist; 57% no dilatency, low to medium toughness fines; 42% fine to coarse sand; 1% fine gravel.			57	32	13	
	15	S08A	18/8	5 7 9 [16]/ {20}	Q_P=3.5	Clayey GRAVEL with Sand (GC); medium dense; dark brown (10YR 3/3) mottled with red and orange; moist to wet; 49% fine to coarse, subangular gravel, max. size 1-in.; 32% fine to coarse sand; 20% medium toughness fines.			20	31	13	
215		S09A	18/6	4 7 7 [14]/ {18}								
	20	S10A	18/11	4 6 10 [16]/ {20}	Q_P=2.5							
210						End of Boring at 21.5 feet. Reemed borehole with 10-inch auger for well installation.						
	25											
205												

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.001803 **LONGITUDE:** -122.609618 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 229.6
LOCATION: Former Nursery Site

BORING

SB#1

PAGE 1 of 1

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 29.0
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 6-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 69
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01A	18/11	11 7 5 [12]/{14}			Lean CLAY (CL); stiff; dark brown (7.5YR 3/2); dry to moist; 90% low plasticity, no dilatency, medium toughness fines; 10% fine, trace coarse sand; trace rootlets/plant fibers.						
			S02B, S02A	18/7	6 5 4 [9]/{10}			Lean CLAY (CL); stiff; dark yellowish brown (10YR 3/4) speckled with orange and red; moist; 95% no dilatency, medium toughness fines; 5% fine sand; trace organics.						
225	5		S03A	18/6	4 5 4 [9]/{10}	Q_P=2.5		Below 5 feet: stiff to very stiff.				29	10	
			S04A	18/4	3 4 6 [10]/{12}	Q_P=2		Lean CLAY (CL/CH); stiff to very stiff; dark olive brown (2.5Y 3/3); moist; >95% medium plasticity, no dilatency, medium to high toughness fines; <5% fine sand.						
220	10		S05A	18/8	3 3 3 [6]/{7}	Q_P=0.75		Lean CLAY (CL); medium stiff; very dark grayish brown (2.5Y 3/2) mottled with orange; moist; >95% no dilatency, medium toughness fines; <5% fine sand.				31	11	
			S06A	18/10	0 0 0 [0]/{0}			Silty, Clayey SAND (SC-SM); very loose; dark olive brown (2.5Y 3/3); moist; 53% fine sand; 47% slow dilatency, medium toughness fines.			47	25	7	
215	15		S07A	18/7	1 1 2 [3]/{3}	Q_P=<0.5		Lean CLAY (CL); soft; very dark grayish brown (2.5Y 3/2) mottled with orange; moist; 95% low plasticity, no dilatency, low to medium toughness fines; 5% fine sand.						
			S08A	18/9	1 4 5 [9]/{10}	Q_P=0.75		Lean CLAY (CL); medium stiff to stiff; dark olive brown (2.5Y 3/3); moist; 95% medium plasticity, no dilatency, medium toughness fines; 5% fine sand.						
210	20		S09A	18/9	4 6 10 [16]/{18}	Q_P=1.5								
			S10A	18/11	3 6 12 [18]/{21}			Clayey SAND with Gravel (SC); medium dense; olive brown (2.5Y 4/3); moist; 49% fine to coarse sand; 34% fine to coarse, subangular to angular gravel, max. size 1-in.; 17% fines.			17	27	9	
205	25		S11A	18/8	5 7 6 [13]/{15}									
			S12A	18/10	6 8 9 [17]/{20}			Below 27.5 feet: 50% sand, 36% gravel, 14% fines.			14			
200								End of Boring at 29 feet.						

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.001257 **LONGITUDE:** -122.609780 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 235.6
LOCATION: North Side of Sir Francis Drake Boulevard, 600 feet West of Shadow Creek Court

BORING

SB#2

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 31.5
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 6-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 69
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
235			S01A	18/8	19 17 18 [35]/ {40}	Q_P=>4.5	Clayey SAND with Gravel (SC); dense; olive brown (2.5Y 4/3); dry to moist; 51% fine to coarse sand; 29% no to slow dilatency, low to medium toughness fines; 13% fine gravel.			29	26	8	
			S02A	18/8	3 4 6 [10]/ {12}		Below 2.5 feet: medium dense						
230	5		S03A	18/8	3 6 4 [10]/ {12}	Q_P=>4.5	Lean CLAY with Sand (CL); hard; brown (10YR 4/3); moist; 85% low to medium plasticity, no dilatency, medium toughness fines; 15% fine to medium sand; trace rootlets.						
			S04A	18/9	4 7 9 [16]/ {18}		Clayey SAND (SC); medium dense; brown (10YR 4/3); moist; 63% fine to medium sand; 25% low to medium plasticity fines; 12% fine gravel; trace rootlets.			25			
225	10		S05A	18/9	6 11 13 [24]/ {28}		Lean CLAY (CL); very stiff; dark brown (10YR 3/3); moist; 90% medium plasticity, no dilatency, medium toughness fines; 10% fine sand. At 10.7 feet: 1" hard nodule.						
			S06A	18/8	3 4 7 [11]/ {13}	Q_P=2.5	Lean CLAY (CL); stiff to very stiff; very dark gray (2.5Y 3/1) mottled orange and red; moist; 90% no dilatency, medium toughness fines; 10% medium sand.				27	9	
220	15		S07A	18/8	4 5 7 [12]/ {14}	Q_P=2							
			S08A	18/9	6 9 12 [21]/ {24}	Q_P=3.5	Below 17.5 feet: increased plasticity, medium to high toughness fines.						
215	20		S09A	18/9	5 7 13 [20]/ {23}	Q_P=2.75							
			S10A	18/6	8 6 10 [16]/ {18}		Fat CLAY with Gravel (CH); very stiff; dark olive brown (2.5Y 5/3); moist; 80% high plasticity, no dilatency, high toughness fines; 20% fine gravel.						
210	25		S11A	18/6	7 9 12 [21]/ {24}	Q_P=3.5	Lean CLAY (CL); very stiff; dark olive gray (5Y 3/2); moist; 95% medium to high plasticity, no dilatency, medium to high toughness fines; 5% fine sand.						
			S12A	18/9	8 17 20 [37]/ {43}	Q_P=>4.5	Lean CLAY (CL); hard; very dark gray (5Y 3/1) mottled with light gray; moist; 95% no dilatency, medium to high toughness fines; 5% fine sand; shows rock structure.				47	26	

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location
LATITUDE: 38.001257 **LONGITUDE:** -122.609780 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 235.6
LOCATION: North Side of Sir Francis Drake Boulevard, 600 feet West of Shadow Creek Court

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
205		X	S13A	18/8	10 17 21 [38]/ {44}	Q_P=>4.5		Lean CLAY (CL) as above.						
								End of Boring at 31.5 feet.						
200	35													
195	40													
190	45													
185	50													
180	55													
175	60													
170	65													

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.002569 **LONGITUDE:** -122.610630 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 234.9
LOCATION: Former Nursery Site

BORING
SB#3
PAGE 1 of 1

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 3.0
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 6-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 69
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01C, S01B, S01A	18/18	32 21 14 [35]/ {40}			Clayey SAND with Gravel (SC); medium dense to dense; dark yellowish brown (10YR 3/4); dry to moist; 40% fine to coarse sand; 33% low to medium fines; 28% fine, subrounded to subangular gravel, max. size 3/4-in.			33			Lab testing on combined sample (S01C, S01B, S01A, S02B, S02A, and S03A)
			S02B, S02A	18/12	8 9 11 [20]/ {23}									
								End of Boring at 3 feet.						Additional sampler (Sample S03A) driven from 1.5 to 3.0 feet for environmental sample approx. 1 foot northeast of boring
230	5													
225	10													
220	15													
215	20													
210	25													

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

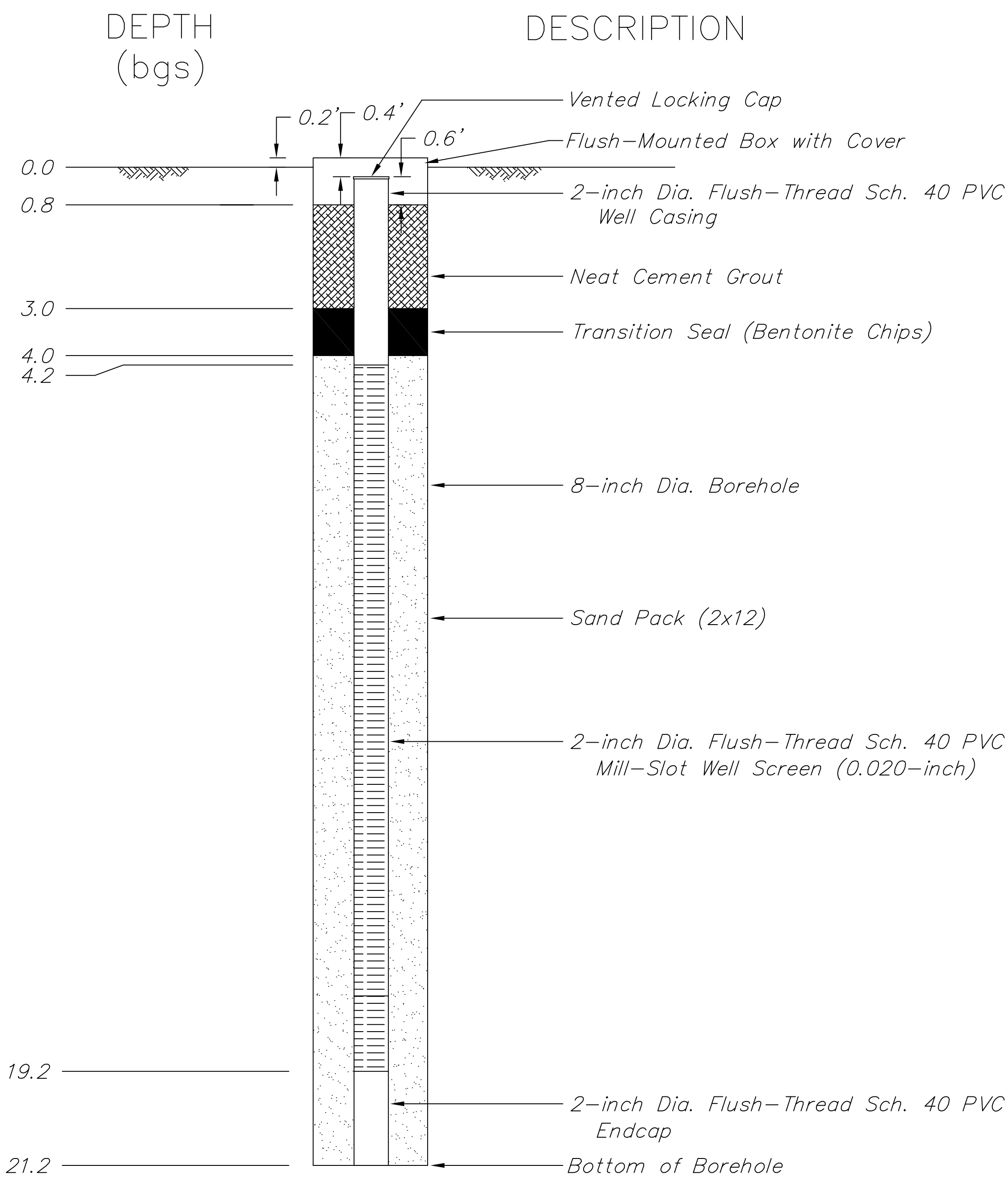
CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Appendix B

Monitoring Well As-Builts

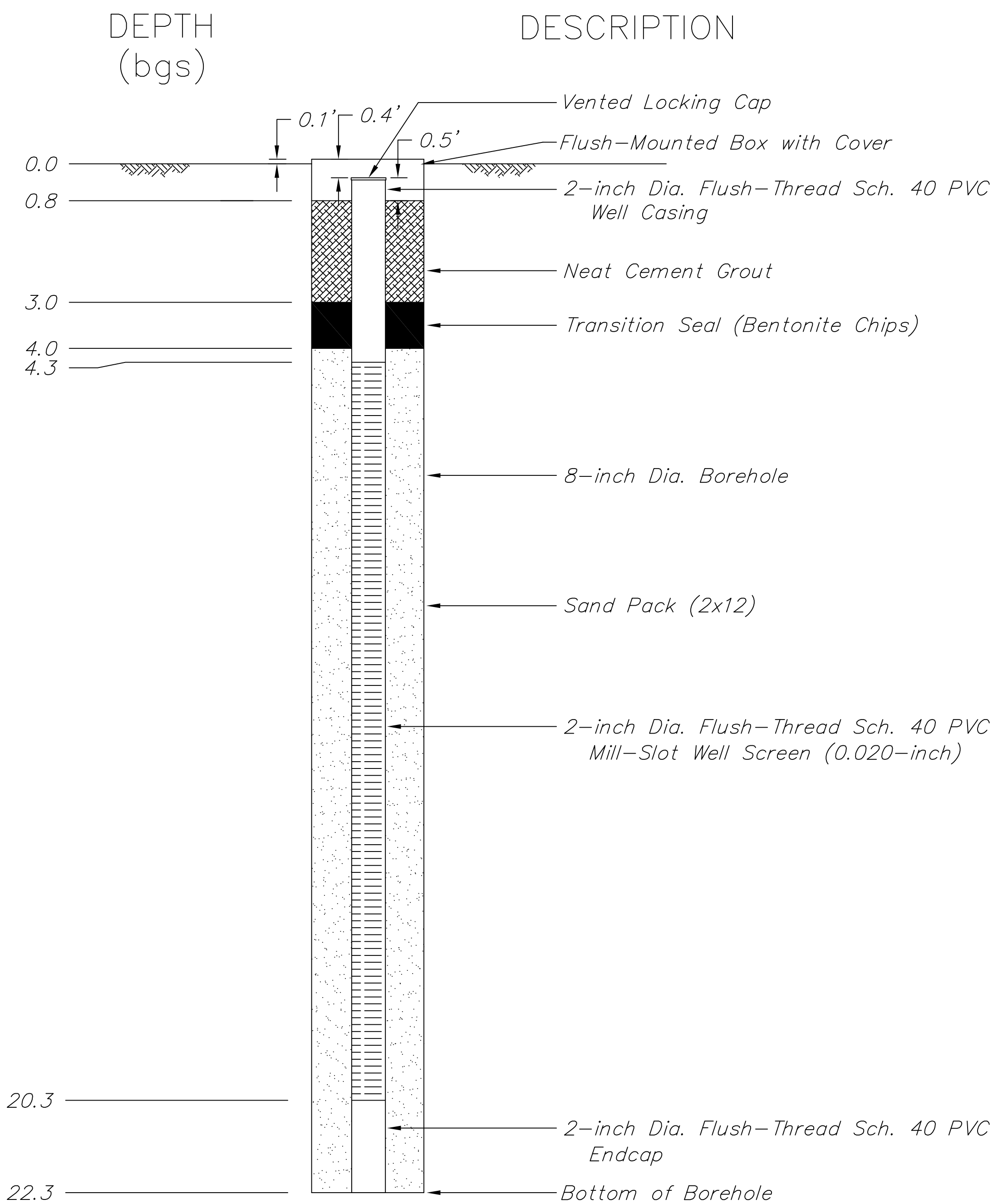
AS-BUILT CONSTRUCTION DETAILS
FOR MW-1



(HORIZONTAL: NOT TO SCALE)

Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-1 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-1

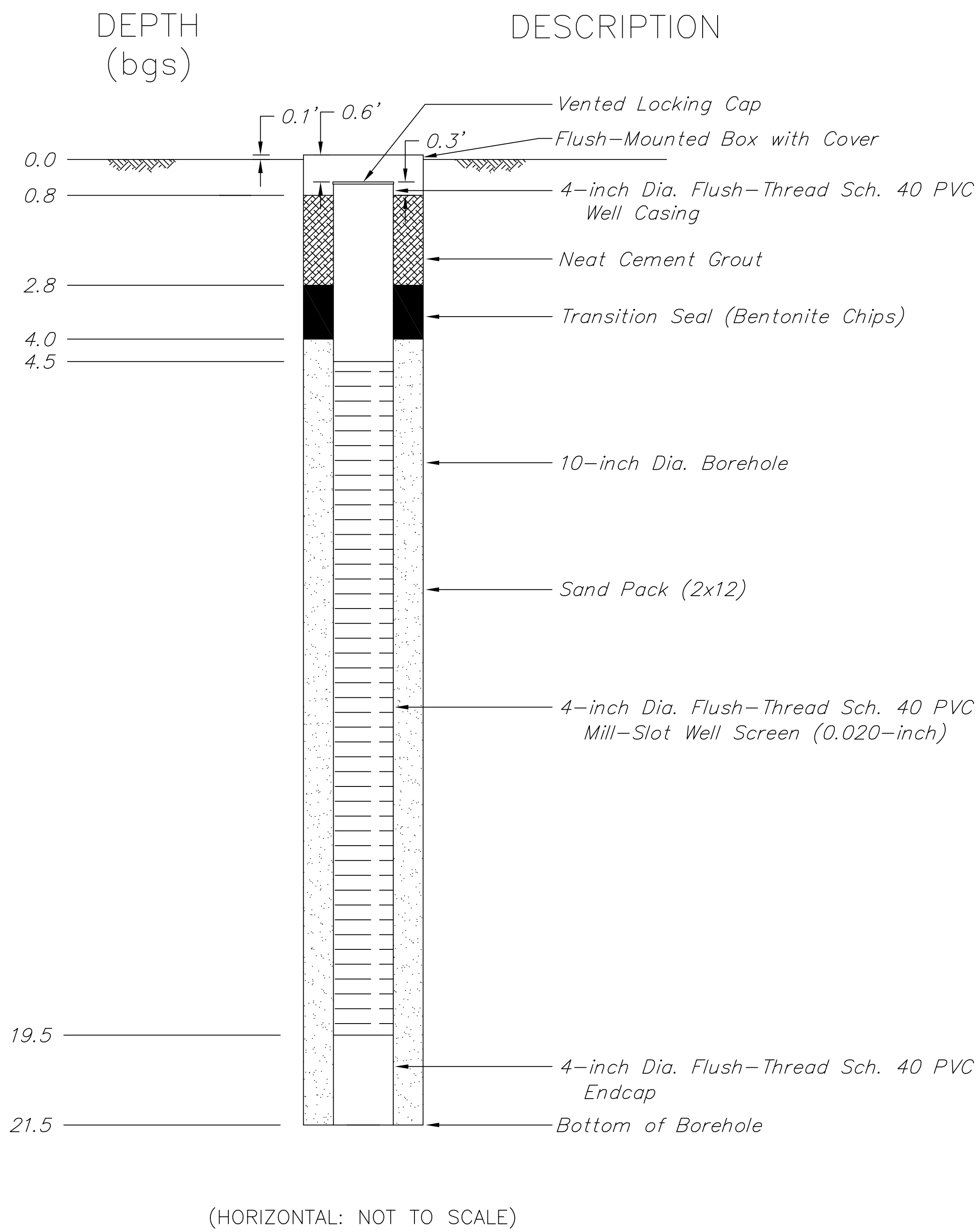
AS-BUILT CONSTRUCTION DETAILS FOR MW-2



(HORIZONTAL: NOT TO SCALE)

Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-2 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-2

AS-BUILT CONSTRUCTION DETAILS
FOR MW-3

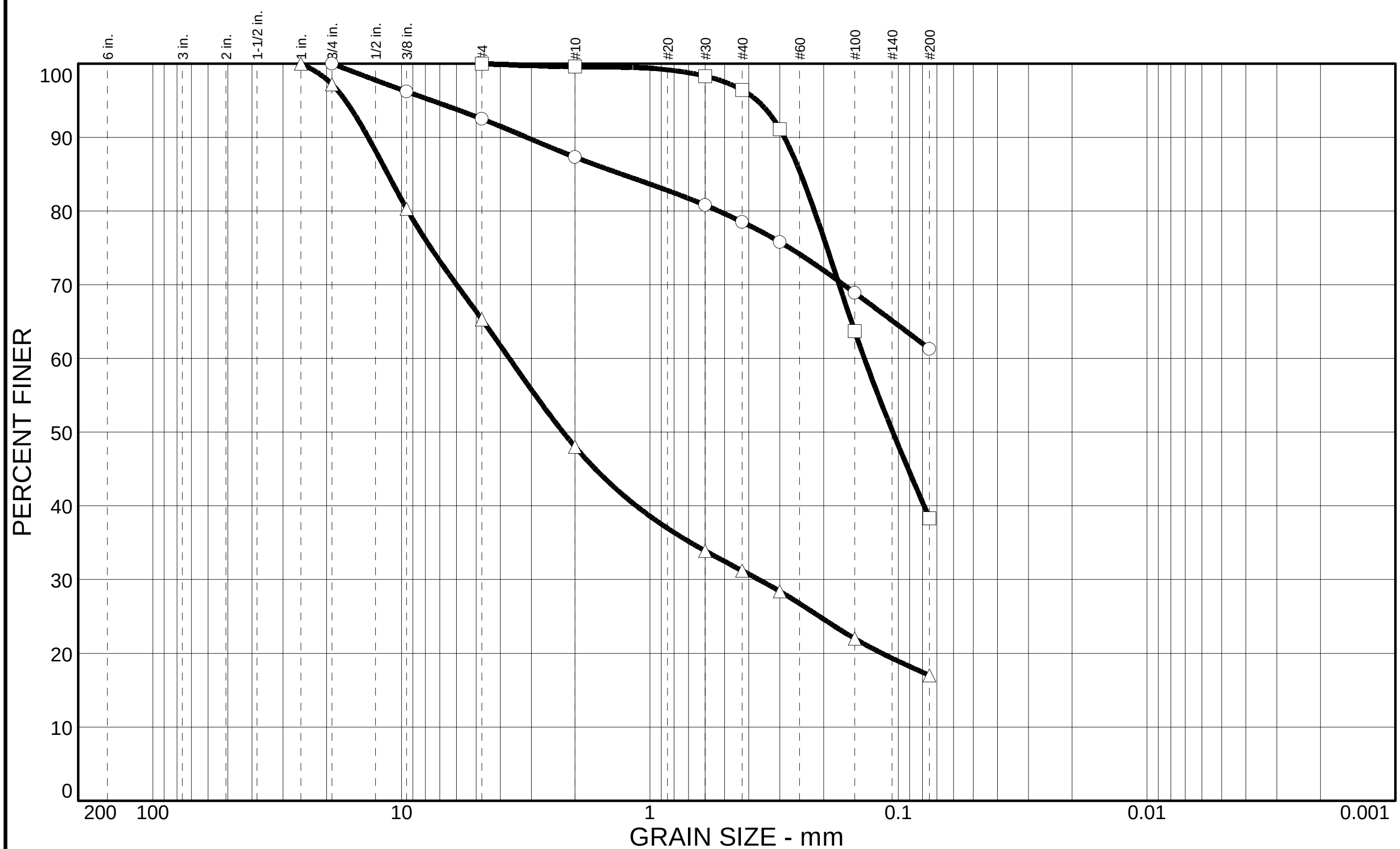


Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-3 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-3

Appendix C

Laboratory Test Results

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	31.2	61.3		CL		19	30
□			61.7	38.3		SM		26	24
△		34.7	48.3	17.0					

SIEVE inches size	PERCENT FINER ○	□	△
1"			100.0
3/4"	100.0		97.2
3/8"	96.2		80.3
GRAIN SIZE			
D_{60}		0.137	3.68
D_{30}			0.364
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	92.5	100.0	65.3
#10	87.3	99.6	48.0
#30	80.8	98.3	33.9
#40	78.5	96.4	31.2
#50	75.8	91.1	28.4
#100	68.9	63.7	22.0
#200	61.3	38.3	17.0

SOIL DESCRIPTION

○ Brown Sandy Lean CLAY

□ Brown Silty SAND

△ Brown Clayey SAND w/ Gravel

REMARKS:

○

□

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: MW# 1 Elev./Depth: 7.5'

□ Source: MW# 2 Elev./Depth: 5.0'

△ Source: MW# 2 Elev./Depth: 20'

COOPER TESTING LABORATORY

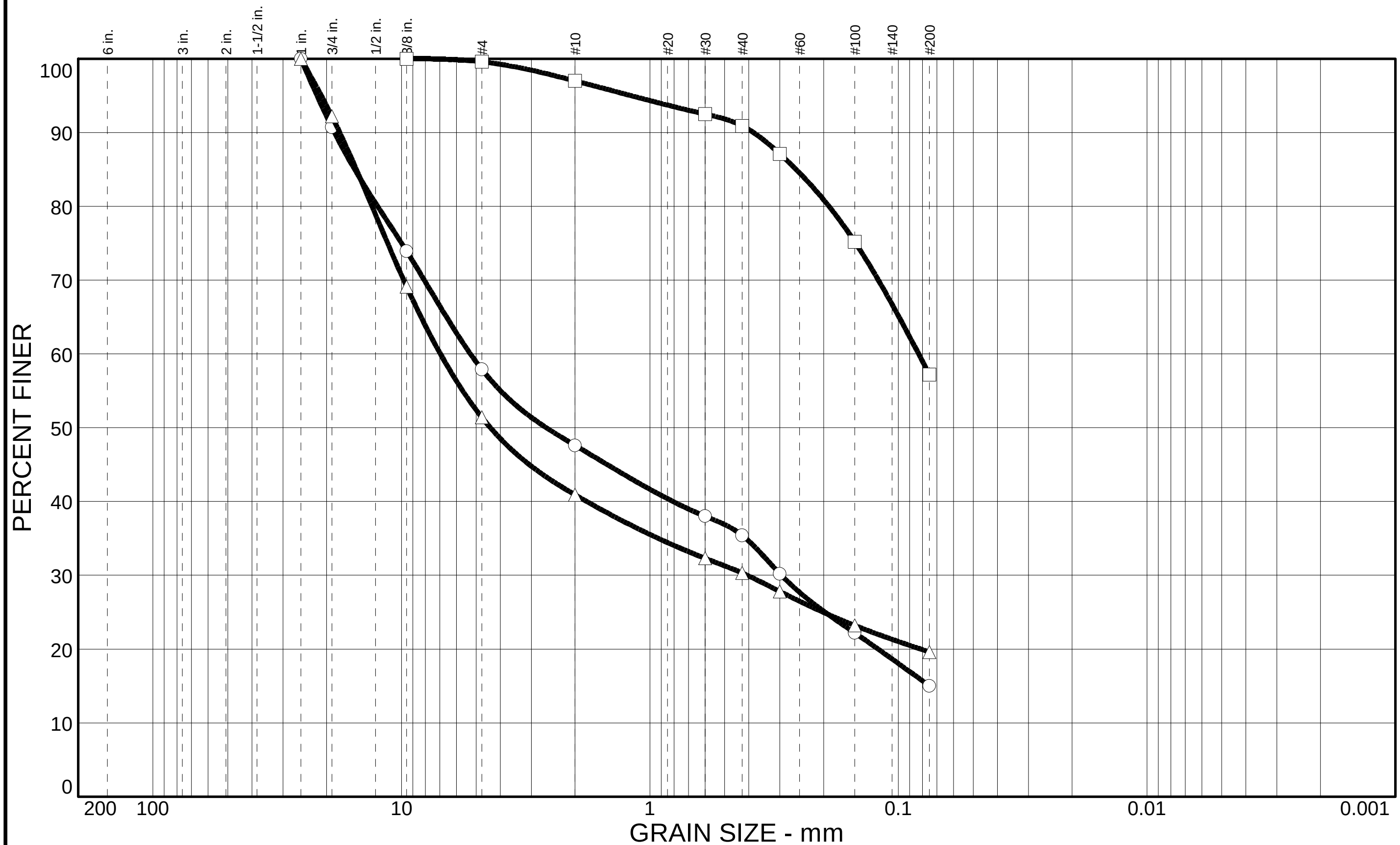
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		42.1	42.9	15.0		SC-SM		16	23
□		0.4	42.4	57.2		CL		19	32
△		48.6	31.8	19.6		GC		18	31

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0		100.0
3/4"	90.7		92.2
3/8"	73.9	100.0	69.1
	GRAIN SIZE		
D_{60}	5.28	0.0829	6.97
D_{30}	0.296		0.406
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	57.9	99.6	51.4
#10	47.6	97.0	40.9
#30	38.0	92.5	32.3
#40	35.4	90.9	30.3
#50	30.2	87.1	27.8
#100	22.2	75.2	23.2
#200	15.0	57.2	19.6

SOIL DESCRIPTION

○ Brown Silty, Clayey SAND w/ Gravel

□ Brown Sandy Lean CLAY

△ Brown Lean Clayey GRAVEL w/ Sand

REMARKS:

○ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

□

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: MW# 3 Elev./Depth: 5.0'

□ Source: MW# 3 Elev./Depth: 12.5'

△ Source: MW# 3 Elev./Depth: 15.0'

COOPER TESTING LABORATORY

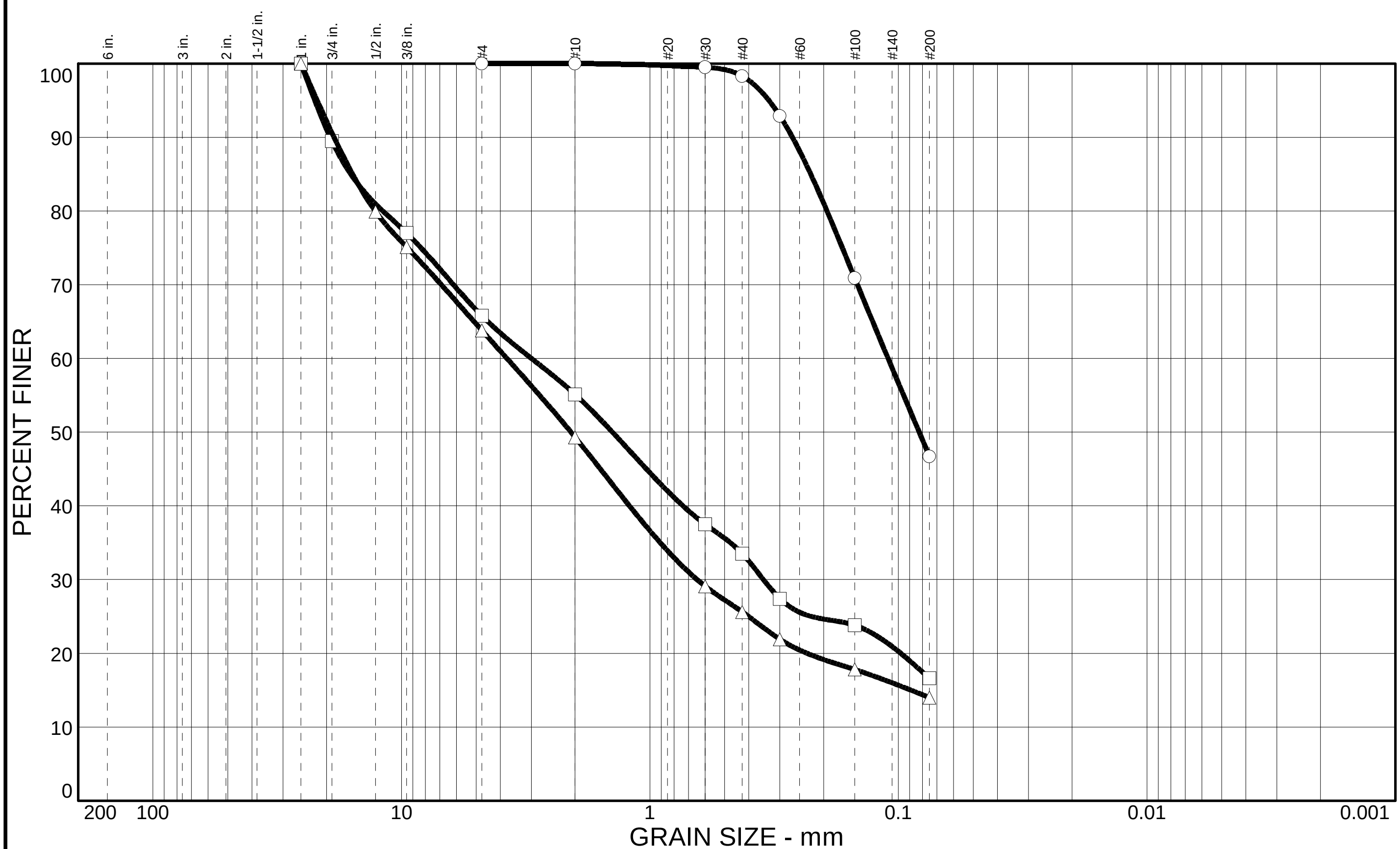
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			53.3	46.7		SC-SM		18	25
□		34.2	49.2	16.6		SC		18	27
△		36.2	49.8	14.0					

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	100.0
3/4"		89.5	
1/2"			79.9
3/8"		77.0	75.1
GRAIN SIZE			
D_{60}	0.110	3.00	3.77
D_{30}		0.350	0.647
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	65.8	63.8
#10	100.0	55.1	49.3
#30	99.5	37.5	29.1
#40	98.3	33.5	25.6
#50	92.9	27.4	21.9
#100	70.9	23.8	17.8
#200	46.7	16.6	14.0

SOIL DESCRIPTION

○ Brown Silty, Clayey SAND

□ Brown Lean Clayey SAND w/ Gravel

△ Brown Clayey SAND w/ Gravel

REMARKS:

○

□ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: SB# 1 Elev./Depth: 12.5'

□ Source: SB# 1 Elev./Depth: 22.5'

△ Source: SB# 1 Elev./Depth: 27.5'

COOPER TESTING LABORATORY

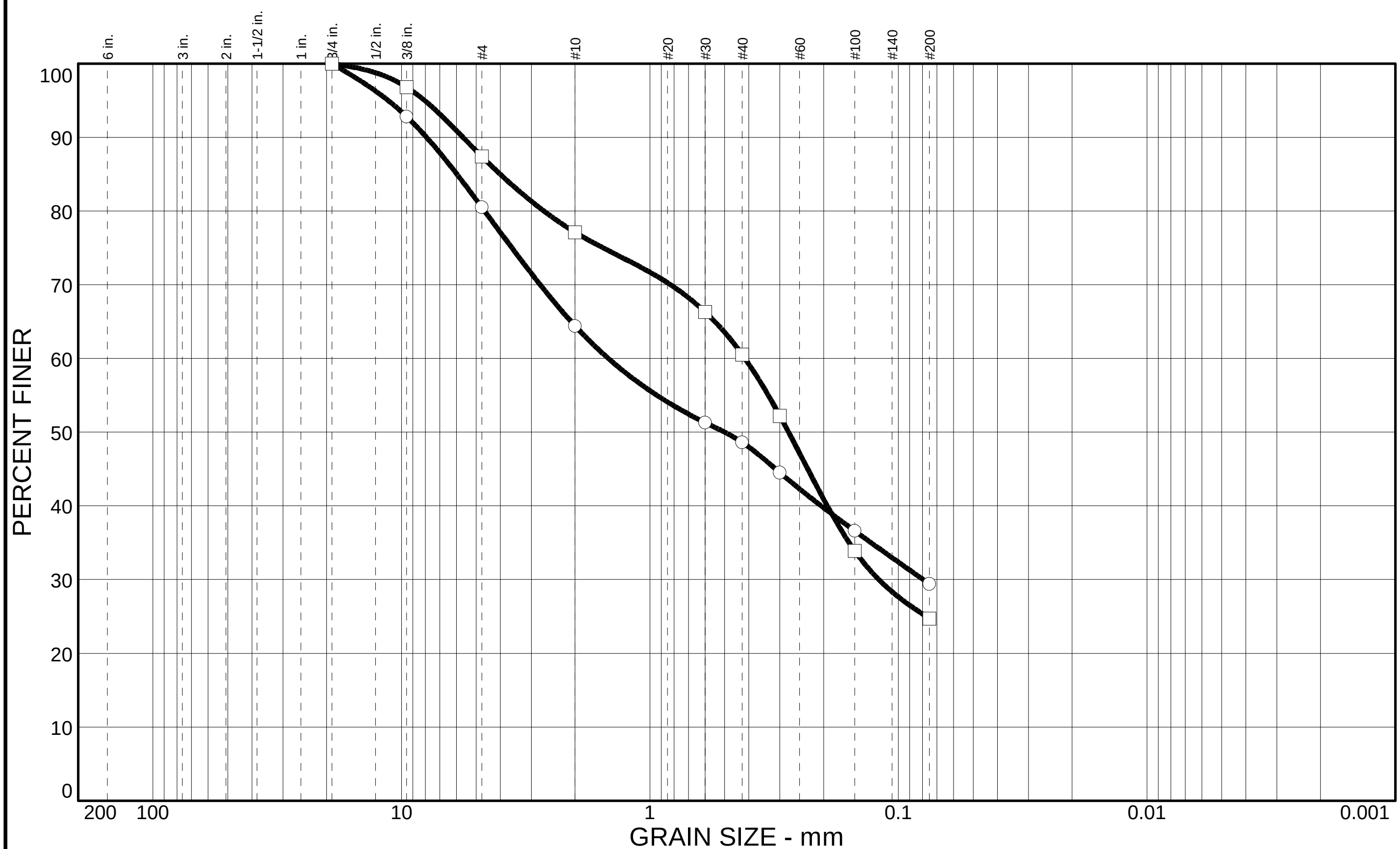
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		19.5	51.1	29.4		SC		18	26
□		12.6	62.7	24.7					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	92.8	96.8	
	GRAIN SIZE		
D_{60}	1.47	0.415	
D_{30}	0.0795	0.120	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	80.5	87.4	
#10	64.4	77.1	
#30	51.3	66.3	
#40	48.6	60.5	
#50	44.5	52.2	
#100	36.6	33.9	
#200	29.4	24.7	

SOIL DESCRIPTION

○ Olive Brown Lean Clayey SAND w/ Gravel

□ Olive Brown Silty SAND

REMARKS:

○

□

○ Source: SB# 2 Elev./Depth: 0'

□ Source: SB# 2 Elev./Depth: 7.5'

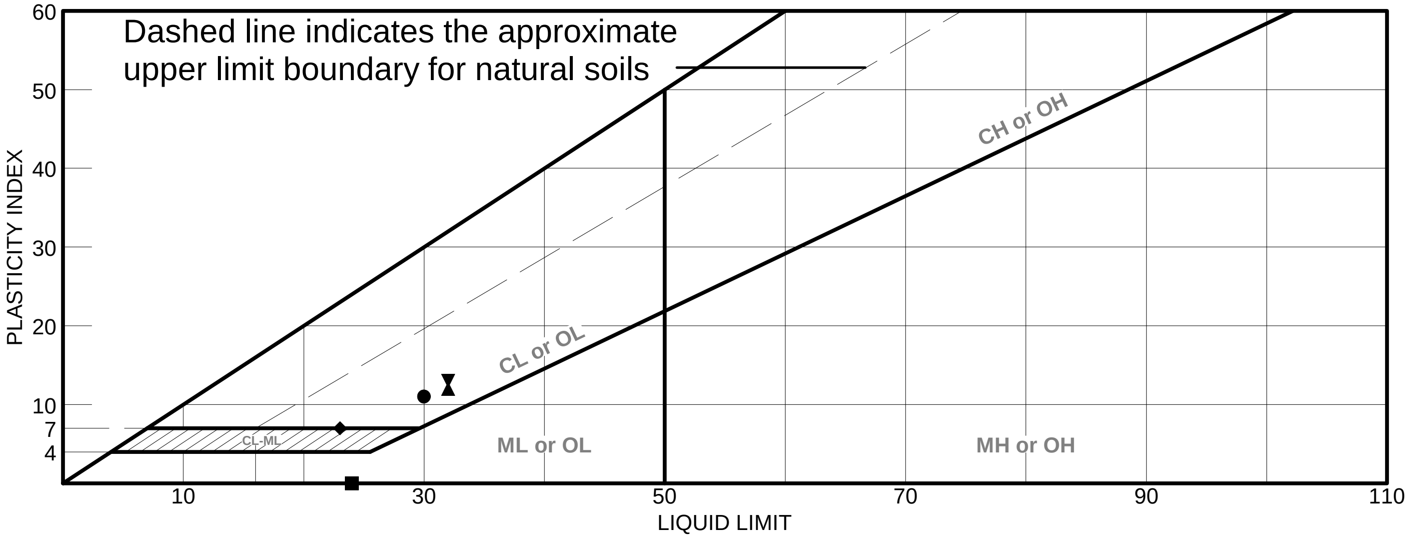
COOPER TESTING LABORATORY

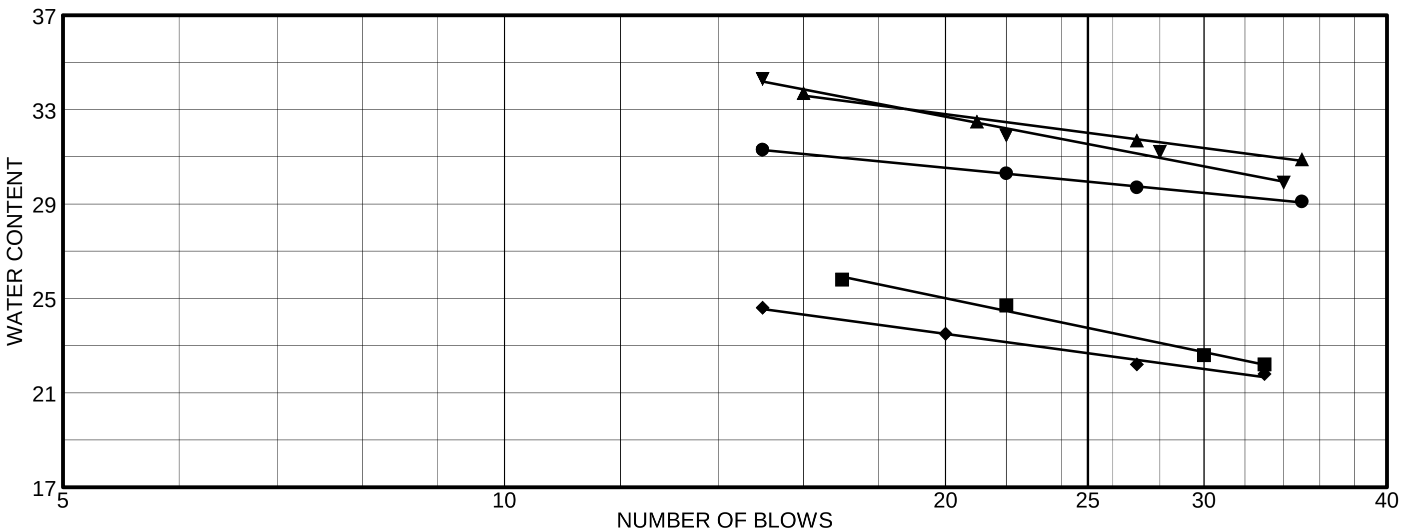
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066 Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Sandy Lean CLAY	30	19	11	78.5	61.3	CL
■	Brown Silty SAND	24	26	NP	96.4	38.3	SM
▲	Brown Sandy Lean CLAY	32	20	12			
◆	Brown Silty, Clayey SAND w/ Gravel	23	16	7	35.4	15.0	SC-SM
▼	Brown Sandy Lean CLAY	32	19	13	90.9	57.2	CL

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** MW# 1 **Elev./Depth:** 7.5'
■ **Source:** MW# 2 **Elev./Depth:** 5.0'
▲ **Source:** MW# 2 **Elev./Depth:** 12.5'
◆ **Source:** MW# 3 **Elev./Depth:** 5.0'
▼ **Source:** MW# 3 **Elev./Depth:** 12.5'

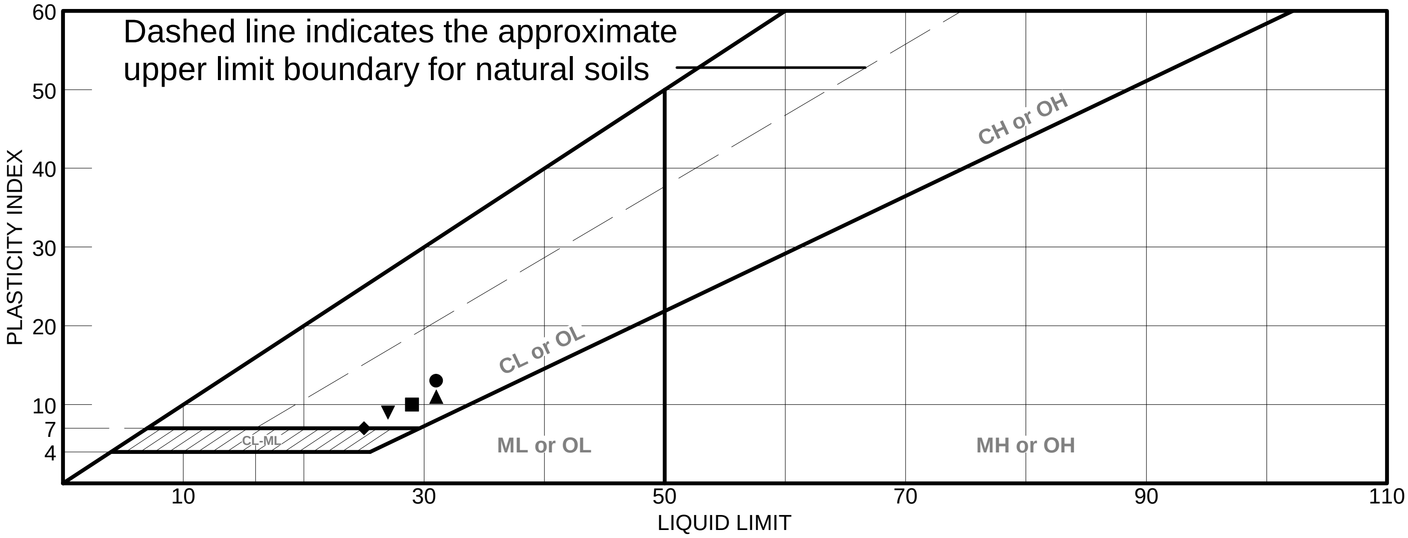
Remarks:
●
■ Could not roll out. Sample slides in bowl. Non-plastic.
▲
◆
▼

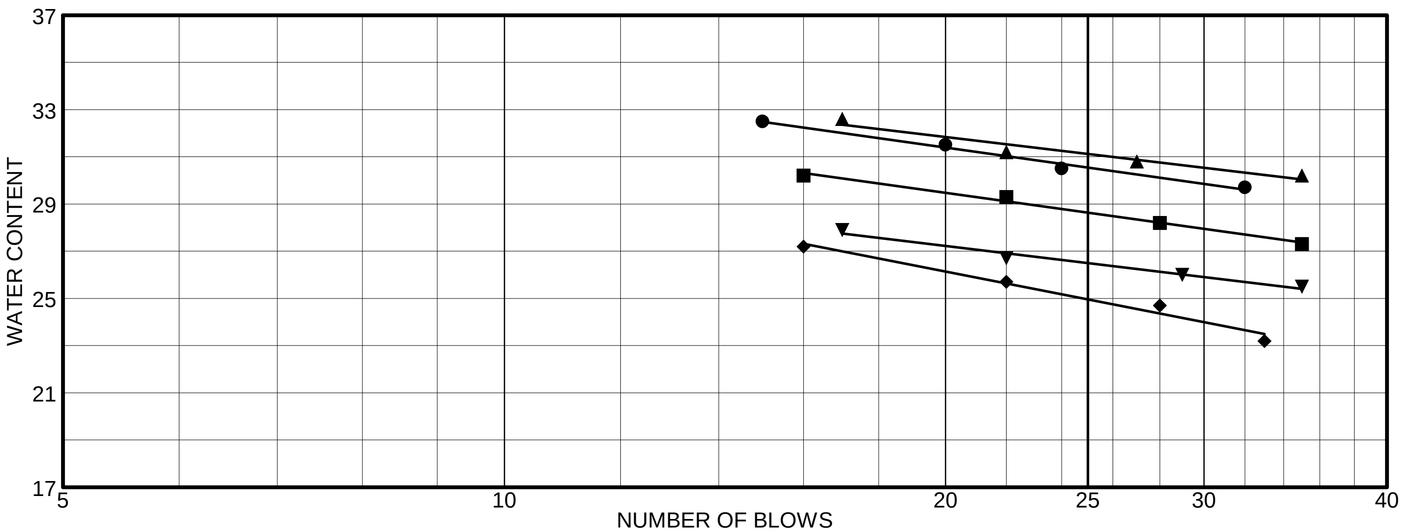
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Lean Clayey GRAVEL w/ Sand	31	18	13	30.3	19.6	GC
■	Brown Lean Clayey SAND	29	19	10			
▲	Brown Sandy Lean CLAY	31	20	11			
◆	Brown Silty, Clayey SAND	25	18	7	98.3	46.7	SC-SM
▼	Brown Lean Clayey SAND w/ Gravel	27	18	9	33.5	16.6	SC

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** MW# 3 **Elev./Depth:** 15.0'
■ **Source:** SB# 1 **Elev./Depth:** 5.0'
▲ **Source:** SB# 1 **Elev./Depth:** 10'
◆ **Source:** SB# 1 **Elev./Depth:** 12.5'
▼ **Source:** SB# 1 **Elev./Depth:** 22.5'

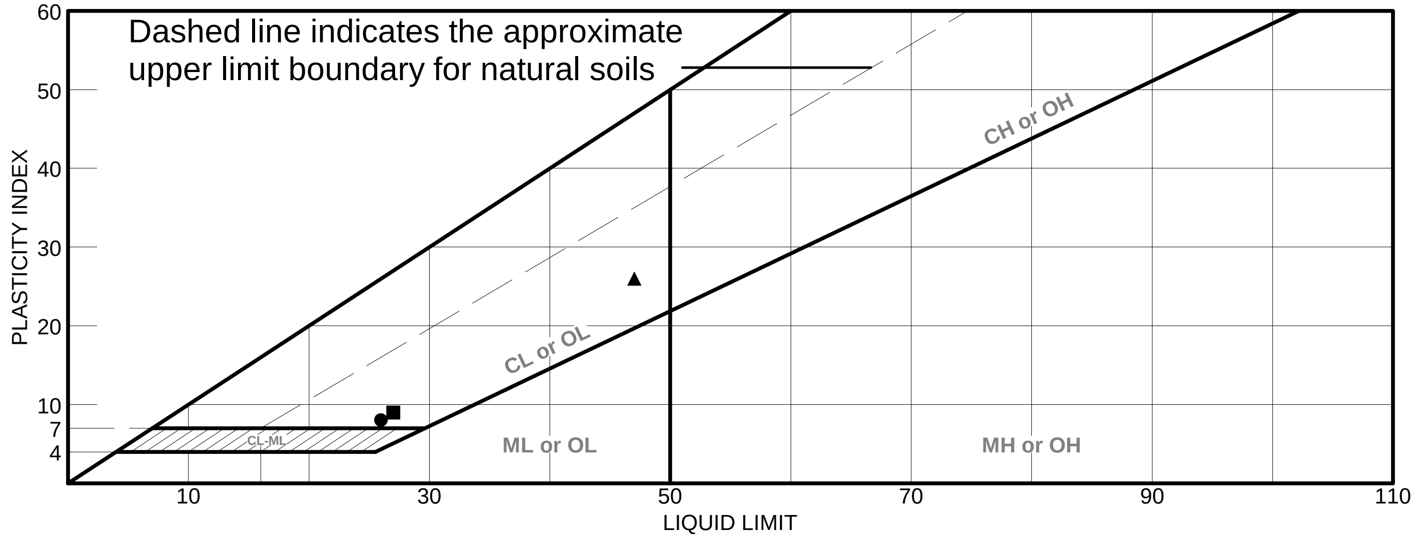
Remarks:
●
■
▲
◆
▼

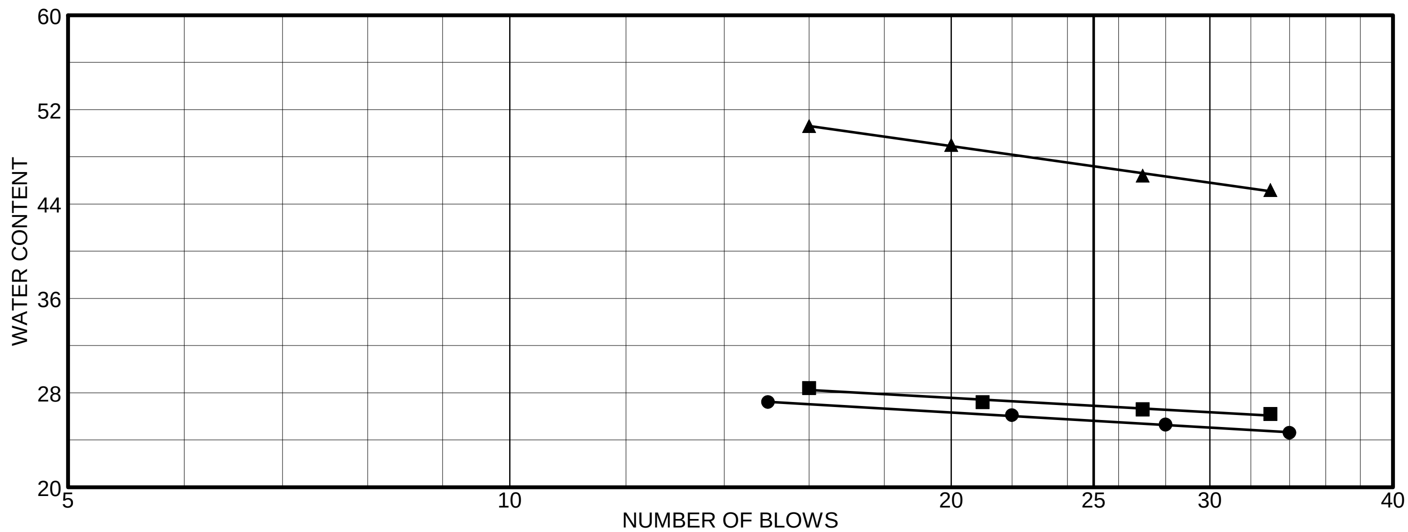
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive Brown Lean Clayey SAND w/ Gravel	26	18	8	48.6	29.4	SC
■	Dark Brown Sandy Lean CLAY	27	18	9			
▲	Dark Brown Sandy Lean CLAY	47	21	26			

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** SB# 2 **Elev./Depth:** 0'

■ **Source:** SB# 2 **Elev./Depth:** 12.5'

▲ **Source:** SB# 2 **Elev./Depth:** 27.5'

Remarks:

●

■

▲

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 279328
ANALYTICAL REPORT

GEI Consultants, Inc.	Project : 1610277
180 Grand Avenue	Location : Former Nursery Detention Basin
Oakland, CA 94612	Level : II

Sample ID	Lab ID
MW #1	279328-001
MW #3	279328-002

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Mikelle Chong Date: 08/19/2016

Mikelle Chong
Project Manager
mikelle.chong@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279328**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/03/16**
Samples Received:	**08/03/16**

This data package contains sample and QC results for two six-point soil composites, requested for the above referenced project on 08/03/16. The samples were received cold and intact.

Volatile Organics by GC/MS (EPA 8260B):
No analytical problems were encountered.

Semivolatile Organics by GC/MS (EPA 8270C):
Bis(2-ethylhexyl)phthalate was detected between the MDL and the RL in the method blank for batch 237734; this analyte was not detected in samples at or above the RL. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC846055,QC846056 (batch 237742) were not reported because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

Metals (EPA 6020 and EPA 7471A):
Chromium was detected above the RL in the method blank for batch 237809; this analyte was detected in samples at a level at least 10 times that of the blank. Arsenic, vanadium, and zinc were detected between the MDL and the RL in the method blank for batch 237809; these analytes were detected in samples at a level at least 10 times that of the blank. Mercury was detected between the MDL and the RL in the method blank for batch 238064; this analyte was either not detected in samples at or above the RL, or detected at a level at least 10 times that of the blank. No other analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

Total Organic Carbon (TOC) (WALKLEY-BLACK):
No analytical problems were encountered.

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279328**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/03/16**
Samples Received:	**08/03/16**

Particle Size (ASTM):
Cooper Testing Labs in Palo Alto, CA performed the analysis (not NELAP certified). Please see the Cooper Testing Labs case narrative.

CHAIN OF CUSTODY

Page ____ of ____

Chain of Custody # ________

Curtis & Tompkins Laboratories
ENVIRONMENTAL ANALYTICAL TESTING LABORATORY
In Business Since 1878

2323 Fifth Street
Berkeley, CA 94710

Phone (510) 486-0900
Fax (510) 486-0532

C&T LOGIN # 279328

Project No: 1610277

Project Name: Former Nursery Detention Basin

Project P. O. No:

EDD Format: Report Level ☐ II ☐ III ☐ IV

Turnaround Time: ☐ RUSH ________ ☒ Standard

Sampler:

Report To: Graham Bradner

Company: GEI

Telephone: ~~xx~~ (916) 631-4577

Email: gbradner@geiconsultants.com

Lab No.	Sample ID.	SAMPLING: Date Collected	SAMPLING: Time Collected	MATRIX: Water	MATRIX: Solid	MATRIX	MATRIX	# of Containers	CHEMICAL PRESERVATIVE: HCl	H2SO4	HNO3	NaOH	None
	MW#1	8/3/16	1100		X			6					X
	MW#3	↓	1400		X			6					X

ANALYTICAL REQUEST

Sample ID.	TOC	Metals 6010B or 6020	VOCs 8260	SVOCs 8270	PCB Aroclors 8082	8081A	Sieve w/ 200 wash	~~TPH + Gas 8015~~ MG 08/04	TEHM 8015 + Silica Gel	~~[illegible]~~	COMP	Moisture					
MW#1	1	1	1	1	1	1	1	~~1~~	1		1	1					
MW#3	1	1	1	1	1	1	1	~~1~~	1		1	1					

Notes:
removed TPH analysis per Tim 08/04

SAMPLE RECEIPT
☐ Intact
☐ Cold
☐ On Ice
☐ Ambient

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Tim Haynes	8/3/16	1835	dnguyen	8/3/16	18:35

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 279328 Date Received 8/3/16 Number of coolers 1
Client GEI Project 1610277

Date Opened 8/3 By (print) CB (sign)
Date Logged in 8/4 By (print) SL (sign)
Date Labelled ↓ By (print) ↓ (sign) ↓

1. Did cooler come with a shipping slip (airbill, etc) YES **NO**
   Shipping info
2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many Name Date
2B. Were custody seals intact upon arrival? YES NO **N/A**
3. Were custody papers dry and intact when received? **YES** NO
4. Were custody papers filled out properly (ink, signed, etc)? **YES** NO
5. Is the project identifiable from custody papers? (If so fill out top of form) **YES** NO
6. Indicate the packing in cooler: (if other, describe)

   ☐ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels
7. Temperature documentation: * Notify PM if temperature exceeds 6°C

   Type of ice used: ☒ Wet ☐ Blue/Gel ☐ None Temp(°C) 3.3

   ☐ Temperature blank(s) included? ☐ Thermometer# ☒ IR Gun# B

   ☐ Samples received on ice directly from the field. Cooling process had begun
8. Were Method 5035 sampling containers present? YES **NO**
   If YES, what time were they transferred to freezer?
9. Did all bottles arrive unbroken/unopened? **YES** NO
10. Are there any missing / extra samples? YES **NO**
11. Are samples in the appropriate containers for indicated tests? **YES** NO
12. Are sample labels present, in good condition and complete? **YES** NO
13. Do the sample labels agree with custody papers? **YES** NO
14. Was sufficient amount of sample sent for tests requested? **YES** NO
15. Are the samples appropriately preserved? YES NO **N/A**
16. Did you check preservatives for all bottles for each sample? YES NO **N/A**
17. Did you document your preservative check? (pH strip lot#) YES NO **N/A**
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO **N/A**
19. Did you change the hold time in LIMS for preserved terracores? YES NO **N/A**
20. Are bubbles > 6mm absent in VOA samples? YES NO **N/A**
21. Was the client contacted concerning this sample delivery? YES **NO**
   If YES, Who was called? By Date:

COMMENTS

Detections Summary for 279328

Results for any subcontracted analyses are not included in this summary.

Client : GEI Consultants, Inc.
Project : 1610277
Location : Former Nursery Detention Basin

Client Sample ID : MW #1 Laboratory Sample ID : 279328-001

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Toluene	0.9	J	5.4	0.8	ug/Kg	Dry	0.9921	EPA 8260B	EPA 5030B
Phenanthrene	13	J	73	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	67	J	360	9.5	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Heptachlor epoxide	7.3		1.9	0.27	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDE	58		3.6	0.48	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDD	6.0	C	3.6	0.52	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDT	110		3.6	0.48	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
alpha-Chlordane	33		1.9	0.28	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
gamma-Chlordane	33		1.9	0.40	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
Antimony	0.21	J	2.2	0.086	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	8.1		0.27	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	210		0.27	0.059	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.13	J	0.27	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	100		0.27	0.084	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	20		0.27	0.053	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	39		0.35	0.12	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	15		0.27	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Molybdenum	0.35		0.27	0.087	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	140		0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.20	J	2.2	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.050	J	0.27	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.066	J	0.27	0.058	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	54		0.35	0.12	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	85		1.1	0.28	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	1.0		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : MW #3 Laboratory Sample ID : 279328-002

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Phenanthrene	14	J	70	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	39	J	350	9.2	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.20	J	2.1	0.085	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	7.6		0.26	0.079	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	440		29	7.6	mg/Kg	Dry	2500	EPA 6020	EPA 3050B
Beryllium	0.59		0.26	0.054	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.057	J	0.26	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	95		0.26	0.083	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	22		0.26	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	39		0.34	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	11		0.26	0.076	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.25		0.017	0.0030	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.79		0.26	0.086	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	130		0.26	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.19	J	2.1	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.040	J	0.26	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.070	J	0.26	0.057	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	59		0.34	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	80		1.1	0.28	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.42		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

C = Presence confirmed, but RPD between columns exceeds 40%

J = Estimated value

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #1	Diln Fac:	0.9921
Lab ID:	279328-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 8%

Analyte	Result	RL	MDL
Freon 12	ND	11	0.4
Chloromethane	ND	11	1.1
Vinyl Chloride	ND	11	1.0
Bromomethane	ND	11	1.3
Chloroethane	ND	11	0.5
Trichlorofluoromethane	ND	5.4	0.8
Acetone	ND	22	3.6
Freon 113	ND	5.4	0.5
1,1-Dichloroethene	ND	5.4	1.0
Methylene Chloride	ND	22	1.2
Carbon Disulfide	ND	5.4	0.9
MTBE	ND	5.4	1.1
trans-1,2-Dichloroethene	ND	5.4	0.9
Vinyl Acetate	ND	54	0.8
1,1-Dichloroethane	ND	5.4	1.2
2-Butanone	ND	11	1.4
cis-1,2-Dichloroethene	ND	5.4	0.9
2,2-Dichloropropane	ND	5.4	1.2
Chloroform	ND	5.4	1.4
Bromochloromethane	ND	5.4	1.0
1,1,1-Trichloroethane	ND	5.4	0.9
1,1-Dichloropropene	ND	5.4	0.7
Carbon Tetrachloride	ND	5.4	0.5
1,2-Dichloroethane	ND	5.4	1.0
Benzene	ND	5.4	1.0
Trichloroethene	ND	5.4	0.9
1,2-Dichloropropane	ND	5.4	0.8
Bromodichloromethane	ND	5.4	0.9
Dibromomethane	ND	5.4	0.8
4-Methyl-2-Pentanone	ND	11	1.1
cis-1,3-Dichloropropene	ND	5.4	0.7
Toluene	0.9 J	5.4	0.8
trans-1,3-Dichloropropene	ND	5.4	0.7
1,1,2-Trichloroethane	ND	5.4	0.7
2-Hexanone	ND	11	0.9
1,3-Dichloropropane	ND	5.4	0.9
Tetrachloroethene	ND	5.4	0.6
Dibromochloromethane	ND	5.4	0.6
1,2-Dibromoethane	ND	5.4	0.7
Chlorobenzene	ND	5.4	0.7
1,1,1,2-Tetrachloroethane	ND	5.4	0.7
Ethylbenzene	ND	5.4	0.7
m,p-Xylenes	ND	5.4	1.3
o-Xylene	ND	5.4	0.7
Styrene	ND	5.4	0.6
Bromoform	ND	5.4	0.4
Isopropylbenzene	ND	5.4	0.5
1,1,2,2-Tetrachloroethane	ND	5.4	0.4
1,2,3-Trichloropropane	ND	5.4	0.6
Propylbenzene	ND	5.4	0.5

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #1	Diln Fac:	0.9921
Lab ID:	279328-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
Bromobenzene	ND	5.4	0.6
1,3,5-Trimethylbenzene	ND	5.4	0.6
2-Chlorotoluene	ND	5.4	0.7
4-Chlorotoluene	ND	5.4	0.7
tert-Butylbenzene	ND	5.4	0.4
1,2,4-Trimethylbenzene	ND	5.4	0.6
sec-Butylbenzene	ND	5.4	0.5
para-Isopropyl Toluene	ND	5.4	0.5
1,3-Dichlorobenzene	ND	5.4	0.5
1,4-Dichlorobenzene	ND	5.4	0.6
n-Butylbenzene	ND	5.4	0.4
1,2-Dichlorobenzene	ND	5.4	0.6
1,2-Dibromo-3-Chloropropane	ND	5.4	1.0
1,2,4-Trichlorobenzene	ND	5.4	0.5
Hexachlorobutadiene	ND	5.4	0.3
Naphthalene	ND	5.4	1.1
1,2,3-Trichlorobenzene	ND	5.4	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	97	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	109	78-123

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #3	Diln Fac:	0.9671
Lab ID:	279328-002	Batch#:	237987
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/12/16

Moisture: 5%

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.1
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.1	0.7
Acetone	ND	20	3.4
Freon 113	ND	5.1	0.4
1,1-Dichloroethene	ND	5.1	1.0
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.1	0.9
MTBE	ND	5.1	1.0
trans-1,2-Dichloroethene	ND	5.1	0.9
Vinyl Acetate	ND	51	0.7
1,1-Dichloroethane	ND	5.1	1.2
2-Butanone	ND	10	1.4
cis-1,2-Dichloroethene	ND	5.1	0.9
2,2-Dichloropropane	ND	5.1	1.1
Chloroform	ND	5.1	1.3
Bromochloromethane	ND	5.1	1.0
1,1,1-Trichloroethane	ND	5.1	0.8
1,1-Dichloropropene	ND	5.1	0.6
Carbon Tetrachloride	ND	5.1	0.5
1,2-Dichloroethane	ND	5.1	0.9
Benzene	ND	5.1	0.9
Trichloroethene	ND	5.1	0.9
1,2-Dichloropropane	ND	5.1	0.8
Bromodichloromethane	ND	5.1	0.9
Dibromomethane	ND	5.1	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.1	0.6
Toluene	ND	5.1	0.7
trans-1,3-Dichloropropene	ND	5.1	0.7
1,1,2-Trichloroethane	ND	5.1	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.1	0.9
Tetrachloroethene	ND	5.1	0.5
Dibromochloromethane	ND	5.1	0.5
1,2-Dibromoethane	ND	5.1	0.7
Chlorobenzene	ND	5.1	0.7
1,1,1,2-Tetrachloroethane	ND	5.1	0.6
Ethylbenzene	ND	5.1	0.7
m,p-Xylenes	ND	5.1	1.3
o-Xylene	ND	5.1	0.6
Styrene	ND	5.1	0.6
Bromoform	ND	5.1	0.4
Isopropylbenzene	ND	5.1	0.5
1,1,2,2-Tetrachloroethane	ND	5.1	0.4
1,2,3-Trichloropropane	ND	5.1	0.6
Propylbenzene	ND	5.1	0.5
Bromobenzene	ND	5.1	0.5

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #3	Diln Fac:	0.9671
Lab ID:	279328-002	Batch#:	237987
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/12/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.1	0.6
2-Chlorotoluene	ND	5.1	0.7
4-Chlorotoluene	ND	5.1	0.7
tert-Butylbenzene	ND	5.1	0.4
1,2,4-Trimethylbenzene	ND	5.1	0.6
sec-Butylbenzene	ND	5.1	0.4
para-Isopropyl Toluene	ND	5.1	0.4
1,3-Dichlorobenzene	ND	5.1	0.4
1,4-Dichlorobenzene	ND	5.1	0.5
n-Butylbenzene	ND	5.1	0.4
1,2-Dichlorobenzene	ND	5.1	0.5
1,2-Dibromo-3-Chloropropane	ND	5.1	1.0
1,2,4-Trichlorobenzene	ND	5.1	0.4
Hexachlorobutadiene	ND	5.1	0.3
Naphthalene	ND	5.1	1.0
1,2,3-Trichlorobenzene	ND	5.1	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	93	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	105	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	237945
Units:	ug/Kg	Analyzed:	08/11/16
Diln Fac:	1.000		

Type: BS   Lab ID: QC846870

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	27.21	109	70-134
Benzene	25.00	24.33	97	80-123
Trichloroethene	25.00	25.74	103	80-128
Toluene	25.00	23.96	96	80-120
Chlorobenzene	25.00	24.26	97	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	107	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	98	80-120
Bromofluorobenzene	102	78-123

Type: BSD   Lab ID: QC846871

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	25.00	22.86	91	70-134	17	22
Benzene	25.00	22.09	88	80-123	10	21
Trichloroethene	25.00	22.71	91	80-128	13	23
Toluene	25.00	20.88	84	80-120	14	20
Chlorobenzene	25.00	21.82	87	80-123	11	20

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	100	78-123

RPD= Relative Percent Difference

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	114	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	107	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Batch#:	237945
MSS Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Analyzed:	08/11/16
Basis:	dry		

Type: MS   Moisture: 8%
Lab ID: QC846987   Diln Fac: 0.9843

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<1.015	53.49	58.61	110	56-133
Benzene	<0.9749	53.49	51.33	96	57-120
Trichloroethene	<0.9024	53.49	51.54	96	49-145
Toluene	<0.7686	53.49	55.51	104	51-120
Chlorobenzene	<0.7413	53.49	51.41	96	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	90	80-138
Toluene-d8	107	80-120
Bromofluorobenzene	101	78-123

Type: MSD   Moisture: 8%
Lab ID: QC846988   Diln Fac: 0.9960

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	54.13	55.40	102	56-133	7	46
Benzene	54.13	48.64	90	57-120	7	44
Trichloroethene	54.13	47.74	88	49-145	9	46
Toluene	54.13	46.50	86	51-120	19	47
Chlorobenzene	54.13	44.70	83	47-120	15	50

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC847044	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	26.55	106	70-134
Benzene	25.00	23.97	96	80-123
Trichloroethene	25.00	25.63	103	80-128
Toluene	25.00	23.99	96	80-120
Chlorobenzene	25.00	25.21	101	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	103	78-134
1,2-Dichloroethane-d4	102	80-138
Toluene-d8	97	80-120
Bromofluorobenzene	100	78-123

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC847046	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC847046	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	106	80-138
Toluene-d8	110	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

32.0

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	ZZZZZZZZZZ	Batch#:	237987
MSS Lab ID:	279653-014	Sampled:	08/11/16
Matrix:	Soil	Received:	08/11/16
Units:	ug/Kg	Analyzed:	08/12/16
Basis:	as received		

Type: MS Diln Fac: 0.9653
Lab ID: QC847171

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<0.8465	48.26	51.56	107	56-133
Benzene	<0.8129	48.26	47.55	99	57-120
Trichloroethene	<0.7524	48.26	51.60	107	49-145
Toluene	<0.6408	48.26	45.51	94	51-120
Chlorobenzene	<0.6181	48.26	45.46	94	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	109	78-134
1,2-Dichloroethane-d4	121	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	98	78-123

Type: MSD Diln Fac: 0.9242
Lab ID: QC847172

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	46.21	54.97	119	56-133	11	46
Benzene	46.21	48.39	105	57-120	6	44
Trichloroethene	46.21	50.82	110	49-145	3	46
Toluene	46.21	45.10	98	51-120	3	47
Chlorobenzene	46.21	45.80	99	47-120	5	50

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	115	80-138
Toluene-d8	93	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #1	Batch#:	237734
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	14
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	730	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	550
bis(2-Chloroethoxy)methane	ND	360	13
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	11
Naphthalene	ND	73	9.6
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	66
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	ND	73	11
Hexachlorocyclopentadiene	ND	730	66
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.6
2-Chloronaphthalene	ND	360	60
2-Nitroaniline	ND	730	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	73	9.3
2,6-Dinitrotoluene	ND	360	9.6
3-Nitroaniline	ND	730	36
Acenaphthene	ND	73	13
2,4-Dinitrophenol	ND	730	170
4-Nitrophenol	ND	730	75
Dibenzofuran	ND	360	9.6
2,4-Dinitrotoluene	ND	360	11
Diethylphthalate	ND	360	9.3
Fluorene	ND	73	9.7
4-Chlorophenyl-phenylether	ND	360	11
4-Nitroaniline	ND	730	36
4,6-Dinitro-2-methylphenol	ND	730	46
N-Nitrosodiphenylamine	ND	360	61
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	64
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #1	Batch#:	237734
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	730	160
Phenanthrene	13 J	73	10
Anthracene	ND	73	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	73	9.4
Pyrene	ND	73	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	730	47
Benzo(a)anthracene	ND	73	9.4
Chrysene	ND	73	13
bis(2-Ethylhexyl)phthalate	67 J	360	9.5
Di-n-octylphthalate	ND	360	9.2
Benzo(b)fluoranthene	ND	73	13
Benzo(k)fluoranthene	ND	73	9.5
Benzo(a)pyrene	ND	73	9.5
Indeno(1,2,3-cd)pyrene	ND	73	13
Dibenz(a,h)anthracene	ND	73	13
Benzo(g,h,i)perylene	ND	73	9.4

Surrogate	%REC	Limits
2-Fluorophenol	99	25-120
Phenol-d5	99	36-120
2,4,6-Tribromophenol	66	27-120
Nitrobenzene-d5	62	44-120
2-Fluorobiphenyl	70	47-120
Terphenyl-d14	81	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #3	Batch#:	237734
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Moisture: 5%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	350	35
Phenol	ND	350	18
bis(2-Chloroethyl)ether	ND	350	13
2-Chlorophenol	ND	350	17
1,3-Dichlorobenzene	ND	350	13
1,4-Dichlorobenzene	ND	350	11
Benzyl alcohol	ND	350	16
1,2-Dichlorobenzene	ND	350	10
2-Methylphenol	ND	350	16
bis(2-Chloroisopropyl) ether	ND	350	19
4-Methylphenol	ND	350	18
N-Nitroso-di-n-propylamine	ND	350	35
Hexachloroethane	ND	350	13
Nitrobenzene	ND	350	13
Isophorone	ND	350	11
2-Nitrophenol	ND	700	11
2,4-Dimethylphenol	ND	350	15
Benzoic acid	ND	1,800	530
bis(2-Chloroethoxy)methane	ND	350	12
2,4-Dichlorophenol	ND	350	13
1,2,4-Trichlorobenzene	ND	350	10
Naphthalene	ND	70	9.3
4-Chloroaniline	ND	350	17
Hexachlorobutadiene	ND	350	64
4-Chloro-3-methylphenol	ND	350	16
2-Methylnaphthalene	ND	70	10
Hexachlorocyclopentadiene	ND	700	64
2,4,6-Trichlorophenol	ND	350	15
2,4,5-Trichlorophenol	ND	350	9.3
2-Chloronaphthalene	ND	350	58
2-Nitroaniline	ND	700	35
Dimethylphthalate	ND	350	9.9
Acenaphthylene	ND	70	9.0
2,6-Dinitrotoluene	ND	350	9.3
3-Nitroaniline	ND	700	35
Acenaphthene	ND	70	13
2,4-Dinitrophenol	ND	700	170
4-Nitrophenol	ND	700	72
Dibenzofuran	ND	350	9.2
2,4-Dinitrotoluene	ND	350	10
Diethylphthalate	ND	350	9.0
Fluorene	ND	70	9.4
4-Chlorophenyl-phenylether	ND	350	10
4-Nitroaniline	ND	700	35
4,6-Dinitro-2-methylphenol	ND	700	44
N-Nitrosodiphenylamine	ND	350	59
Azobenzene	ND	350	13
4-Bromophenyl-phenylether	ND	350	62
Hexachlorobenzene	ND	350	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #3	Batch#:	237734
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	700	160
Phenanthrene	14 J	70	10
Anthracene	ND	70	13
Di-n-butylphthalate	ND	350	13
Fluoranthene	ND	70	9.1
Pyrene	ND	70	9.9
Butylbenzylphthalate	ND	350	13
3,3'-Dichlorobenzidine	ND	700	45
Benzo(a)anthracene	ND	70	9.1
Chrysene	ND	70	13
bis(2-Ethylhexyl)phthalate	39 J	350	9.2
Di-n-octylphthalate	ND	350	8.9
Benzo(b)fluoranthene	ND	70	13
Benzo(k)fluoranthene	ND	70	9.1
Benzo(a)pyrene	ND	70	9.1
Indeno(1,2,3-cd)pyrene	ND	70	13
Dibenz(a,h)anthracene	ND	70	13
Benzo(g,h,i)perylene	ND	70	9.1

Surrogate	%REC	Limits
2-Fluorophenol	100	25-120
Phenol-d5	101	36-120
2,4,6-Tribromophenol	70	27-120
Nitrobenzene-d5	62	44-120
2-Fluorobiphenyl	69	47-120
Terphenyl-d14	83	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846023	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	330	33
Phenol	ND	330	17
bis(2-Chloroethyl)ether	ND	330	12
2-Chlorophenol	ND	330	16
1,3-Dichlorobenzene	ND	330	12
1,4-Dichlorobenzene	ND	330	10
Benzyl alcohol	ND	330	15
1,2-Dichlorobenzene	ND	330	9.4
2-Methylphenol	ND	330	15
bis(2-Chloroisopropyl) ether	ND	330	18
4-Methylphenol	ND	330	17
N-Nitroso-di-n-propylamine	ND	330	33
Hexachloroethane	ND	330	12
Nitrobenzene	ND	330	12
Isophorone	ND	330	11
2-Nitrophenol	ND	660	10
2,4-Dimethylphenol	ND	330	14
Benzoic acid	ND	1,700	500
bis(2-Chloroethoxy)methane	ND	330	11
2,4-Dichlorophenol	ND	330	13
1,2,4-Trichlorobenzene	ND	330	9.6
Naphthalene	ND	66	8.7
4-Chloroaniline	ND	330	16
Hexachlorobutadiene	ND	330	60
4-Chloro-3-methylphenol	ND	330	15
2-Methylnaphthalene	ND	66	9.8
Hexachlorocyclopentadiene	ND	660	60
2,4,6-Trichlorophenol	ND	330	14
2,4,5-Trichlorophenol	ND	330	8.7
2-Chloronaphthalene	ND	330	55
2-Nitroaniline	ND	660	33
Dimethylphthalate	ND	330	9.3
Acenaphthylene	ND	66	8.5
2,6-Dinitrotoluene	ND	330	8.8
3-Nitroaniline	ND	660	33
Acenaphthene	ND	66	12
2,4-Dinitrophenol	ND	660	160
4-Nitrophenol	ND	660	68
Dibenzofuran	ND	330	8.7
2,4-Dinitrotoluene	ND	330	9.6
Diethylphthalate	ND	330	8.5
Fluorene	ND	66	8.9
4-Chlorophenyl-phenylether	ND	330	9.7
4-Nitroaniline	ND	660	33
4,6-Dinitro-2-methylphenol	ND	660	42
N-Nitrosodiphenylamine	ND	330	56
Azobenzene	ND	330	12
4-Bromophenyl-phenylether	ND	330	58
Hexachlorobenzene	ND	330	12
Pentachlorophenol	ND	660	150
Phenanthrene	ND	66	9.6
Anthracene	ND	66	12

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

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Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846023	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Result	RL	MDL
Di-n-butylphthalate	ND	330	12
Fluoranthene	ND	66	8.6
Pyrene	ND	66	9.3
Butylbenzylphthalate	ND	330	12
3,3'-Dichlorobenzidine	ND	660	43
Benzo(a)anthracene	ND	66	8.6
Chrysene	ND	66	12
bis(2-Ethylhexyl)phthalate	13 J	330	8.7
Di-n-octylphthalate	ND	330	8.4
Benzo(b)fluoranthene	ND	66	12
Benzo(k)fluoranthene	ND	66	8.6
Benzo(a)pyrene	ND	66	8.6
Indeno(1,2,3-cd)pyrene	ND	66	12
Dibenz(a,h)anthracene	ND	66	12
Benzo(g,h,i)perylene	ND	66	8.6

Surrogate	%REC	Limits
2-Fluorophenol	111	25-120
Phenol-d5	106	36-120
2,4,6-Tribromophenol	71	27-120
Nitrobenzene-d5	72	44-120
2-Fluorobiphenyl	81	47-120
Terphenyl-d14	85	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846024	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Spiked	Result	%REC	Limits
Phenol	2,694	1,490	55	42-120
2-Chlorophenol	2,694	1,801	67	45-120
1,4-Dichlorobenzene	2,694	1,754	65	48-120
N-Nitroso-di-n-propylamine	2,694	1,607	60	27-123
1,2,4-Trichlorobenzene	2,694	2,149	80	50-120
4-Chloro-3-methylphenol	2,694	2,563	95	59-120
Acenaphthene	1,010	740.4	73	53-120
4-Nitrophenol	2,694	2,119	79	47-120
2,4-Dinitrotoluene	2,694	2,276	85	55-120
Pentachlorophenol	2,694	1,388	52	32-120
Pyrene	1,010	826.8	82	52-120

Surrogate	%REC	Limits
2-Fluorophenol	74	25-120
Phenol-d5	59	36-120
2,4,6-Tribromophenol	86	27-120
Nitrobenzene-d5	75	44-120
2-Fluorobiphenyl	75	47-120
Terphenyl-d14	88	49-120

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #1	Batch#:	237742
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.9	0.27
beta-BHC	ND	1.9	0.44
gamma-BHC	ND	1.9	0.43
delta-BHC	ND	1.9	0.22
Heptachlor	ND	1.9	0.41
Aldrin	ND	1.9	0.46
Heptachlor epoxide	7.3	1.9	0.27
Endosulfan I	ND	1.9	0.35
Dieldrin	ND	1.9	0.51
4,4'-DDE	58	3.6	0.48
Endrin	ND	3.6	0.64
Endosulfan II	ND	3.6	0.53
Endosulfan sulfate	ND	3.6	0.53
4,4'-DDD	6.0 C	3.6	0.52
Endrin aldehyde	ND	3.6	0.43
4,4'-DDT	110	3.6	0.48
alpha-Chlordane	33	1.9	0.28
gamma-Chlordane	33	1.9	0.40
Methoxychlor	ND	19	2.9
Toxaphene	ND	66	16

Surrogate	%REC	Limits
TCMX	84	44-125
Decachlorobiphenyl	77	39-121

C= Presence confirmed, but RPD between columns exceeds 40%
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #3	Batch#:	237742
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 5%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.8	0.26
beta-BHC	ND	1.8	0.42
gamma-BHC	ND	1.8	0.42
delta-BHC	ND	1.8	0.22
Heptachlor	ND	1.8	0.39
Aldrin	ND	1.8	0.45
Heptachlor epoxide	ND	1.8	0.26
Endosulfan I	ND	1.8	0.34
Dieldrin	ND	1.8	0.50
4,4'-DDE	ND	3.5	0.47
Endrin	ND	3.5	0.62
Endosulfan II	ND	3.5	0.52
Endosulfan sulfate	ND	3.5	0.51
4,4'-DDD	ND	3.5	0.50
Endrin aldehyde	ND	3.5	0.42
4,4'-DDT	ND	3.5	0.46
alpha-Chlordane	ND	1.8	0.27
gamma-Chlordane	ND	1.8	0.38
Methoxychlor	ND	18	2.8
Toxaphene	ND	64	15

Surrogate	%REC	Limits
TCMX	96	44-125
Decachlorobiphenyl	97	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846053	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
alpha-BHC	ND	0.86	0.12
beta-BHC	ND	0.86	0.20
gamma-BHC	ND	0.86	0.20
delta-BHC	ND	0.86	0.10
Heptachlor	ND	0.86	0.19
Aldrin	ND	0.86	0.21
Heptachlor epoxide	ND	0.86	0.12
Endosulfan I	ND	0.86	0.16
Dieldrin	ND	0.86	0.23
4,4'-DDE	ND	1.7	0.22
Endrin	ND	1.7	0.29
Endosulfan II	ND	1.7	0.24
Endosulfan sulfate	ND	1.7	0.24
4,4'-DDD	ND	1.7	0.24
Endrin aldehyde	ND	1.7	0.20
4,4'-DDT	ND	1.7	0.22
alpha-Chlordane	ND	0.86	0.13
gamma-Chlordane	ND	0.86	0.18
Methoxychlor	ND	8.6	1.3
Toxaphene	ND	30	7.3

Surrogate	%REC	Limits
TCMX	86	44-125
Decachlorobiphenyl	76	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846054	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.18	14.17	107	44-121
Heptachlor	13.18	14.18	108	45-129
Aldrin	13.18	14.15	107	45-120
Dieldrin	13.18	13.40 #	102	49-131
Endrin	13.18	12.12	92	43-135
4,4'-DDT	13.18	10.06	76	37-141

Surrogate	%REC	Limits
TCMX	108	44-125
Decachlorobiphenyl	87	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Prepared:	08/08/16
Diln Fac:	1.000	Analyzed:	08/09/16
Batch#:	237812		

Field ID: MW #1 Lab ID: 279328-001
Type: SAMPLE Moisture: 8%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.6
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.9
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	81	25-135

Field ID: MW #3 Lab ID: 279328-002
Type: SAMPLE Moisture: 5%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.1
Aroclor-1221	ND	25	8.4
Aroclor-1232	ND	13	4.1
Aroclor-1242	ND	13	3.8
Aroclor-1248	ND	13	4.0
Aroclor-1254	ND	13	3.2
Aroclor-1260	ND	13	2.0

Surrogate	%REC	Limits
Decachlorobiphenyl	82	25-135

Type: BLANK Lab ID: QC846342

Analyte	Result	RL	MDL
Aroclor-1016	ND	4.8	1.2
Aroclor-1221	ND	9.6	3.2
Aroclor-1232	ND	4.8	1.5
Aroclor-1242	ND	4.8	1.4
Aroclor-1248	ND	4.8	1.5
Aroclor-1254	ND	4.8	1.2
Aroclor-1260	ND	4.8	0.77

Surrogate	%REC	Limits
Decachlorobiphenyl	107	25-135

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846343	Batch#:	237812
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	165.6	174.4	105	64-140
Aroclor-1260	165.6	155.8	94	65-146

Surrogate	%REC	Limits
Decachlorobiphenyl	92	25-135

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Field ID:	ZZZZZZZZZZ	Batch#:	237812
MSS Lab ID:	279347-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/09/16
Diln Fac:	1.000		

Type: MS   Lab ID: QC846344

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.952	166.2	214.0	129	60-161
Aroclor-1260	38.23	166.2	248.9	127	42-166

Surrogate	%REC	Limits
Decachlorobiphenyl	91	25-135

Type: MSD   Lab ID: QC846345

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	166.6	219.9	132	60-161	2	43
Aroclor-1260	166.6	269.4	139	42-166	8	51

Surrogate	%REC	Limits
Decachlorobiphenyl	90	25-135

RPD= Relative Percent Difference

California Title 22 Metals

Lab #:	279328	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	MW #1	Basis:	dry
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg		

Moisture: 8%

Analyte	Result		RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.21	J	2.2	0.086	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Arsenic	8.1		0.27	0.080	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Barium	210		0.27	0.059	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Beryllium	0.55		0.27	0.055	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cadmium	0.13	J	0.27	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Chromium	100		0.27	0.084	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cobalt	20		0.27	0.053	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Copper	39		0.35	0.12	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Lead	15		0.27	0.077	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Mercury	ND		0.018	0.0033	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.35		0.27	0.087	25.00	237809	08/08/16	08/11/16	EPA 3050B	EPA 6020
Nickel	140		0.27	0.082	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Selenium	0.20	J	2.2	0.081	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Silver	0.050	J	0.27	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Thallium	0.066	J	0.27	0.058	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Vanadium	54		0.35	0.12	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Zinc	85		1.1	0.28	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279328	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	MW #3	Basis:	dry
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg		

Moisture: 5%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.20 J	2.1	0.085	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Arsenic	7.6	0.26	0.079	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Barium	440	29	7.6	2,500	237809	08/08/16	08/12/16	EPA 3050B	EPA 6020
Beryllium	0.59	0.26	0.054	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cadmium	0.057 J	0.26	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Chromium	95	0.26	0.083	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cobalt	22	0.26	0.052	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Copper	39	0.34	0.11	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Lead	11	0.26	0.076	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Mercury	0.25	0.017	0.0030	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.79	0.26	0.086	25.00	237809	08/08/16	08/11/16	EPA 3050B	EPA 6020
Nickel	130	0.26	0.081	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Selenium	0.19 J	2.1	0.080	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Silver	0.040 J	0.26	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Thallium	0.070 J	0.26	0.057	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Vanadium	59	0.34	0.11	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Zinc	80	1.1	0.28	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Type:	BLANK	Diln Fac:	25.00
Lab ID:	QC846328	Batch#:	237809
Matrix:	Soil	Prepared:	08/08/16
Units:	mg/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
Antimony	ND	2.0	0.077
Arsenic	0.21 J	0.25	0.071
Barium	ND	0.25	0.052
Beryllium	ND	0.25	0.049
Cadmium	ND	0.25	0.029
Chromium	0.47 b	0.25	0.075
Cobalt	ND	0.25	0.047
Copper	ND	0.31	0.10
Lead	ND	0.25	0.069
Molybdenum	ND	0.25	0.077
Nickel	ND	0.25	0.073
Selenium	ND	2.0	0.072
Silver	ND	0.25	0.029
Thallium	ND	0.25	0.052
Vanadium	0.22 J	0.31	0.10
Zinc	0.47 J	1.0	0.25

J= Estimated value
b= See narrative
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Matrix:	Soil	Batch#:	237809
Units:	mg/Kg	Prepared:	08/08/16
Diln Fac:	25.00	Analyzed:	08/08/16

Type: BS Lab ID: QC846329

Analyte	Spiked	Result	%REC	Limits
Antimony	24.51	22.13	90	80-120
Arsenic	24.51	25.21	103	80-121
Barium	24.51	24.91	102	80-121
Beryllium	12.25	11.66	95	80-120
Cadmium	24.51	23.70	97	80-120
Chromium	24.51	25.38	104	80-131
Cobalt	24.51	25.45	104	80-132
Copper	24.51	23.11	94	80-137
Lead	24.51	24.62	100	80-125
Molybdenum	24.51	23.39	95	80-120
Nickel	24.51	25.00	102	77-141
Selenium	24.51	24.14	99	80-129
Silver	2.451	2.348	96	80-122
Thallium	24.51	24.19	99	80-120
Vanadium	24.51	24.40	100	80-128
Zinc	24.51	25.11	102	80-133

Type: BSD Lab ID: QC846330

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.27	22.79	94	80-120	4	20
Arsenic	24.27	26.12	108	80-121	5	21
Barium	24.27	25.73	106	80-121	4	20
Beryllium	12.14	11.93	98	80-120	3	20
Cadmium	24.27	24.82	102	80-120	6	20
Chromium	24.27	26.84	111	80-131	7	25
Cobalt	24.27	26.71	110	80-132	6	24
Copper	24.27	24.66	102	80-137	7	27
Lead	24.27	25.17	104	80-125	3	20
Molybdenum	24.27	22.62	93	80-120	2	20
Nickel	24.27	25.72	106	77-141	4	29
Selenium	24.27	25.69	106	80-129	7	22
Silver	2.427	2.499	103	80-122	7	20
Thallium	24.27	24.62	101	80-120	3	20
Vanadium	24.27	25.74	106	80-128	6	24
Zinc	24.27	25.78	106	80-133	4	23

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Field ID:	ZZZZZZZZZZ	Batch#:	237809
MSS Lab ID:	279117-003	Sampled:	07/26/16
Matrix:	Soil	Received:	07/28/16
Units:	mg/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/08/16
Diln Fac:	25.00		

Type: MS   Lab ID: QC846331

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	0.1860	26.32	13.88	52	21-120
Arsenic	10.05	26.32	38.51	108	75-122
Barium	27.36	26.32	50.12	86	54-148
Beryllium	0.06667	13.16	12.77	97	80-120
Cadmium	<0.02565	26.32	26.46	101	80-120
Chromium	20.47	26.32	48.57	107	60-158
Cobalt	5.534	26.32	32.25	102	73-142
Copper	1.791	26.32	28.74	102	59-150
Lead	1.692	26.32	27.68	99	68-137
Molybdenum	0.4329	26.32	23.96	89	71-120
Nickel	23.53	26.32	49.80	100	57-161
Selenium	<0.06483	26.32	26.32	100	75-128
Silver	<0.02583	2.632	2.749	104	77-120
Thallium	<0.04630	26.32	25.93	99	76-120
Vanadium	18.18	26.32	44.03	98	65-150
Zinc	18.17	26.32	45.38	103	44-158

Type: MSD   Lab ID: QC846332

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.04	12.66	52	21-120	0	29
Arsenic	24.04	34.99	104	75-122	3	24
Barium	24.04	43.11	66	54-148	11	28
Beryllium	12.02	12.09	100	80-120	4	20
Cadmium	24.04	24.45	102	80-120	1	20
Chromium	24.04	45.97	106	60-158	0	36
Cobalt	24.04	30.18	103	73-142	1	34
Copper	24.04	30.44	119	59-150	14	52
Lead	24.04	25.97	101	68-137	2	32
Molybdenum	24.04	21.68	88	71-120	1	20
Nickel	24.04	48.65	105	57-161	2	47
Selenium	24.04	24.07	100	75-128	0	20
Silver	2.404	2.526	105	77-120	1	20
Thallium	24.04	23.74	99	76-120	0	20
Vanadium	24.04	42.55	101	65-150	2	28
Zinc	24.04	45.67	114	44-158	6	33

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	238064
Lab ID:	QC847358	Prepared:	08/15/16
Matrix:	Soil	Analyzed:	08/15/16
Units:	mg/Kg		

Result	RL	MDL
0.0058 J	0.016	0.0029

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	238064
Matrix:	Soil	Prepared:	08/15/16
Units:	mg/Kg	Analyzed:	08/16/16
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC847359	0.2083	0.1913	92	80-120		
BSD	QC847360	0.2049	0.1943	95	80-120	3	20

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	238064
MSS Lab ID:	279344-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg	Prepared:	08/15/16
Basis:	as received	Analyzed:	08/15/16

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC847361	0.2728	0.2016	0.4747	100	69-142		
MSD	QC847362		0.1953	0.4610	96	69-142	2	36

RPD= Relative Percent Difference

Total Organic Carbon (TOC)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Batch#:	237846
Matrix:	Soil	Sampled:	08/03/16
Units:	%	Received:	08/03/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL	Moisture
MW #1	SAMPLE	279328-001	1.0	0.05	8%
MW #3	SAMPLE	279328-002	0.42	0.05	5%
	BLANK	QC846469	ND	0.01	

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

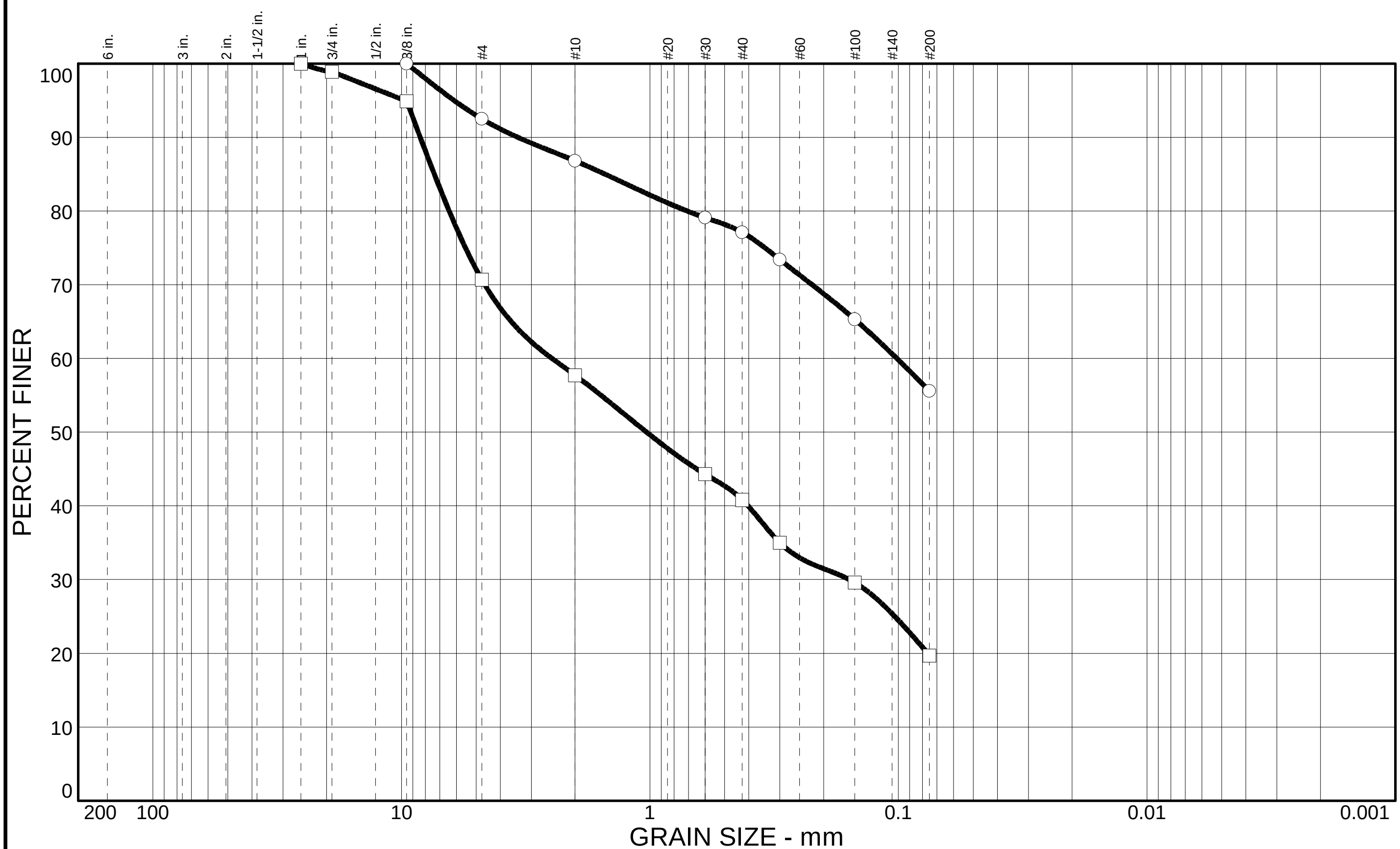
Total Organic Carbon (TOC)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Diln Fac:	1.000
Field ID:	MW #1	Batch#:	237846
MSS Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	%	Analyzed:	08/08/16
Basis:	dry		

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	Moisture	RPD	Lim
LCS	QC846470		0.1300	0.1240	95	80-120			
MS	QC846471	1.020	0.7030	1.655	90	66-120	8%		
MSD	QC846472		0.6996	1.579	80	66-120	8%	5	20

RPD= Relative Percent Difference

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	36.9	55.6					
□		29.3	51.0	19.7					

SIEVE inches size	PERCENT FINER ○	□	
1"		100.0	
3/4"		98.9	
3/8	100.0	94.9	
	GRAIN SIZE		
D_{60}	0.102	2.48	
D_{30}		0.158	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	92.5	70.7	
#10	86.8	57.7	
#30	79.1	44.3	
#40	77.1	40.8	
#50	73.4	35.0	
#100	65.3	29.6	
#200	55.6	19.7	

SOIL DESCRIPTION

○ Olive Brown Sandy CLAY

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #1

□ Source: MW #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins, Ltd.

Project: Nursery Detention Basin - 279328

Project No.: 202-066

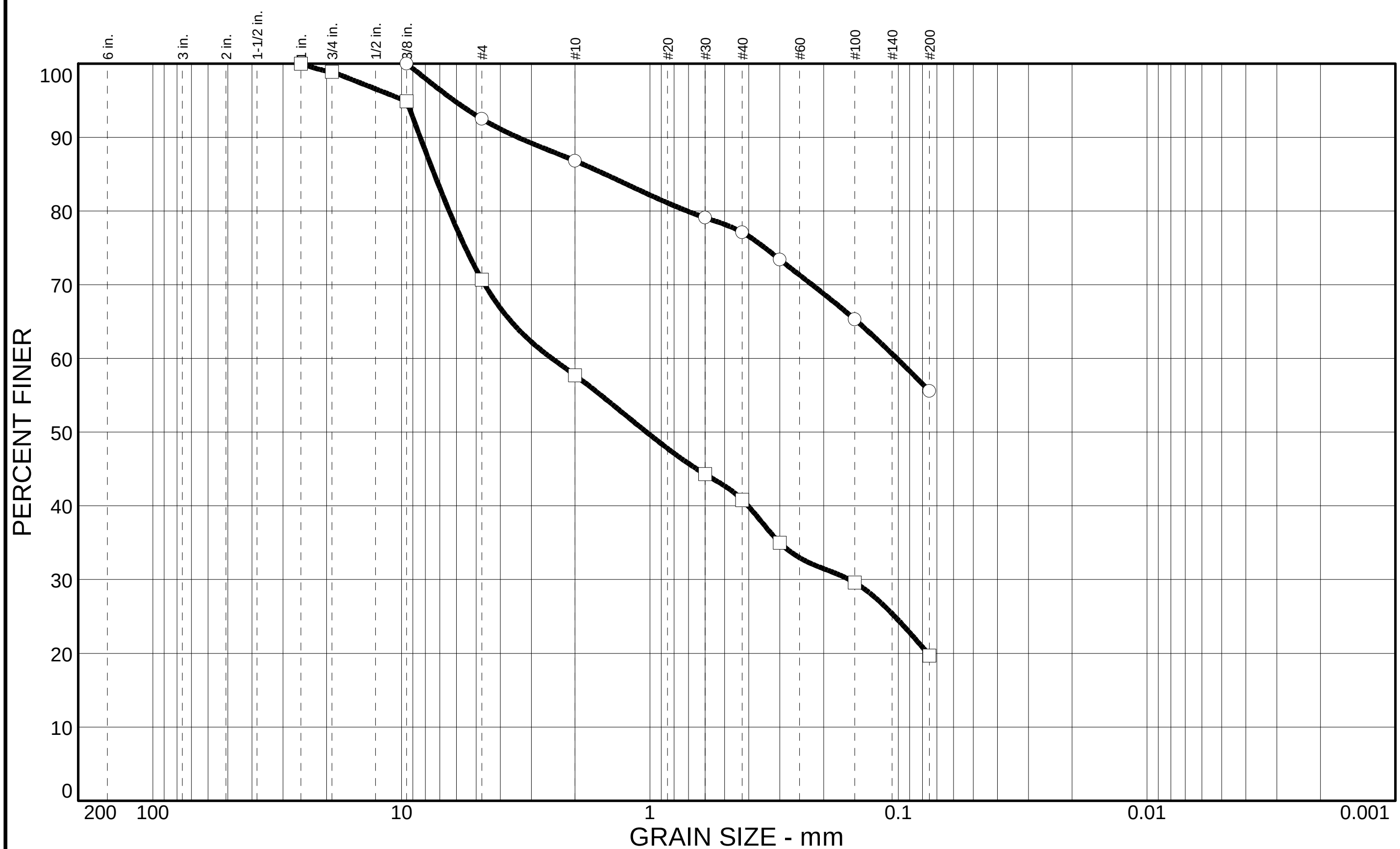
Figure

Laboratory Job Number 279328

Subcontracted Products

Cooper Testing Labs

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	36.9	55.6					
□		29.3	51.0	19.7					

SIEVE inches size	PERCENT FINER ○	□	
1"		100.0	
3/4"		98.9	
3/8	100.0	94.9	
	GRAIN SIZE		
D_{60}	0.102	2.48	
D_{30}		0.158	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	92.5	70.7	
#10	86.8	57.7	
#30	79.1	44.3	
#40	77.1	40.8	
#50	73.4	35.0	
#100	65.3	29.6	
#200	55.6	19.7	

SOIL DESCRIPTION

○ Olive Brown Sandy CLAY

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #1

□ Source: MW #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins, Ltd.

Project: Nursery Detention Basin - 279328

Project No.: 202-066

Figure


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 279335
ANALYTICAL REPORT

GEI Consultants, Inc.	Project : 1610277
180 Grand Avenue	Location : Former Nursery Detention Basin
Oakland, CA 94612	Level : II

Sample ID	Lab ID
MW #2	279335-001
SB #3	279335-002

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: ______________________ Date: 08/30/2016

Dina Ali
Project Manager
dina.ali@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279335**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/04/16**
Samples Received:	**08/04/16**

This data package contains sample and QC results for two six-point soil composites, requested for the above referenced project on 08/04/16. The samples were received on ice and intact.

Volatile Organics by GC/MS (EPA 8260B):
No analytical problems were encountered.

Semivolatile Organics by GC/MS (EPA 8270C):
Matrix spikes QC846264,QC846265 (batch 237795) were not reported because the parent sample required a dilution that would have diluted out the spikes. 1,2,4-trichlorobenzene was detected between the MDL and the RL in the method blank for batch 237795; this analyte was not detected in samples at or above the RL. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC846055,QC846056 (batch 237742) were not reported because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

Metals (EPA 6020 and EPA 7471A):
Mercury was detected between the MDL and the RL in the method blank for batch 238064; this analyte was detected in samples at a level at least 10 times that of the blank. Chromium was detected above the RL in the method blank for batch 237809; this analyte was detected in samples at a level at least 10 times that of the blank. Arsenic, vanadium, and zinc were detected between the MDL and the RL in the method blank for batch 237809; these analytes were detected in samples at a level at least 10 times that of the blank. No other analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

Total Organic Carbon (TOC) (WALKLEY-BLACK):
No analytical problems were encountered.

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279335**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/04/16**
Samples Received:	**08/04/16**

Particle Size (ASTM):
Cooper Testing Labs in Palo Alto, CA performed the analysis (not NELAP certified). Please see the Cooper Testing Labs case narrative.

CHAIN OF COUSTODY

Page 1 of 1

Chain of Custody #

Curtis & Tompkins Laboratories
ENVIRONMENTAL ANALYTICAL TESTING LABORATORY
In Business Since 1878

2323 Fifth Street
Berkeley, CA 94710

Phone (510) 486-0900
Fax (510) 486-0532

C&T LOGIN #279335

Project No: 1610277

Sampler:

Project Name: Former Nursery Detention Basin

Report To: Graham Bradner

Project P. O. No:

Company: GEI Consultants, Inc.

EDD Format: Report Level ☐ II ☐ III ☐ IV

Telephone: (916) 631-4577

Turnaround Time: ☐ RUSH ☑ Standard

Email: gbradner@geiconsultants.com

Lab No.	Sample ID.	Sampling: Date Collected	Sampling: Time Collected	Matrix: Water	Matrix: Solid	Matrix	Matrix	# of Containers	Chemical Preservative: HCl	H2SO4	HNO3	NaOH	None	Analytical Request: TOC	Metals 6010B or 6020	VOCs 8260	SVOCs 8270	PCB Aroclors 8082	Organochlorine Pesticides 8081A	Sieve w/ 200 wash
	MW#2	8/4/16	8:00am											1	1	1	1	1	1	1
	SB#3													1	1	1	1	1	1	1

Notes:

SAMPLE RECEIPT
☐ Intact
☐ Cold
☑ On Ice
☐ Ambient

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Maydel Uzcategui	8/4/16	13:29	Pat Honzaly	8/4/16	13:29

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 279335 Date Received 8/4/16 Number of coolers 1

Client GEI Project 1610277

Date Opened 8/4 By (print) CB (sign) [signature]

Date Logged in ↓ By (print) DTN (sign) dnguyen

Date Labelled ↓ By (print) CB (sign) [signature]

1. Did cooler come with a shipping slip (airbill, etc) YES **NO**
   Shipping info

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many Name Date

2B. Were custody seals intact upon arrival? YES NO **N/A**

3. Were custody papers dry and intact when received? **YES** NO

4. Were custody papers filled out properly (ink, signed, etc)? **YES** NO

5. Is the project identifiable from custody papers? (If so fill out top of form) **YES** NO

6. Indicate the packing in cooler: (if other, describe)

   ☐ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

   Type of ice used: ☒ Wet ☐ Blue/Gel ☐ None Temp(°C) 4.1

   ☒ Temperature blank(s) included? ☒ Thermometer# 4 ☐ IR Gun#

   ☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES **NO**
   If YES, what time were they transferred to freezer?

9. Did all bottles arrive unbroken/unopened? **YES** NO

10. Are there any missing / extra samples? YES **NO**

11. Are samples in the appropriate containers for indicated tests? **YES** NO

12. Are sample labels present, in good condition and complete? **YES** NO

13. Do the sample labels agree with custody papers? **YES** NO

14. Was sufficient amount of sample sent for tests requested? **YES** NO

15. Are the samples appropriately preserved? ~~YES NO~~ **N/A**

16. Did you check preservatives for all bottles for each sample? YES NO **N/A**

17. Did you document your preservative check? (pH strip lot#) YES NO **N/A**

18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO **N/A**

19. Did you change the hold time in LIMS for preserved terracores? YES NO **N/A**

20. Are bubbles > 6mm absent in VOA samples? YES NO **N/A**

21. Was the client contacted concerning this sample delivery? YES **NO**
   If YES, Who was called? By Date:

COMMENTS

Detections Summary for 279335

Results for any subcontracted analyses are not included in this summary.

Client : GEI Consultants, Inc.
Project : 1610277
Location : Former Nursery Detention Basin

Client Sample ID : MW #2 Laboratory Sample ID : 279335-001

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Phenanthrene	11	J	73	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	11	J	360	9.5	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.23	J	2.2	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	7.8		0.27	0.075	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	200		0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.090	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	110		0.27	0.079	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	19		0.27	0.050	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	28		0.68	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	9.5		0.27	0.073	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.17		0.019	0.0034	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.21	J	0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	120		0.27	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.19	J	2.2	0.076	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.050	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.055	J	0.27	0.054	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	54		0.33	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	72		1.1	0.27	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.86		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : SB #3 Laboratory Sample ID : 279335-002

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
2-Methylnaphthalene	12	J	72	11	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Phenanthrene	28	J	72	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	68	J	360	9.4	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.13	J	2.2	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	5.8		0.27	0.075	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	170		0.27	0.056	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.080	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	68		0.27	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	17		0.27	0.050	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	29		0.33	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	10		0.27	0.073	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.66		0.018	0.0033	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.44		0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	89		0.27	0.078	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.14	J	2.2	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.063	J	0.27	0.031	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.057	J	0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	44		0.69	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	62		1.1	0.27	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.43		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

J = Estimated value

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Diln Fac:	0.9940
Lab ID:	279335-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 8%

Analyte	Result	RL	MDL
Freon 12	ND	11	0.4
Chloromethane	ND	11	1.1
Vinyl Chloride	ND	11	1.0
Bromomethane	ND	11	1.3
Chloroethane	ND	11	0.5
Trichlorofluoromethane	ND	5.4	0.8
Acetone	ND	22	3.6
Freon 113	ND	5.4	0.5
1,1-Dichloroethene	ND	5.4	1.0
Methylene Chloride	ND	22	1.2
Carbon Disulfide	ND	5.4	0.9
MTBE	ND	5.4	1.1
trans-1,2-Dichloroethene	ND	5.4	0.9
Vinyl Acetate	ND	54	0.8
1,1-Dichloroethane	ND	5.4	1.2
2-Butanone	ND	11	1.5
cis-1,2-Dichloroethene	ND	5.4	0.9
2,2-Dichloropropane	ND	5.4	1.2
Chloroform	ND	5.4	1.4
Bromochloromethane	ND	5.4	1.0
1,1,1-Trichloroethane	ND	5.4	0.9
1,1-Dichloropropene	ND	5.4	0.7
Carbon Tetrachloride	ND	5.4	0.5
1,2-Dichloroethane	ND	5.4	1.0
Benzene	ND	5.4	1.0
Trichloroethene	ND	5.4	0.9
1,2-Dichloropropane	ND	5.4	0.8
Bromodichloromethane	ND	5.4	0.9
Dibromomethane	ND	5.4	0.8
4-Methyl-2-Pentanone	ND	11	1.1
cis-1,3-Dichloropropene	ND	5.4	0.7
Toluene	ND	5.4	0.8
trans-1,3-Dichloropropene	ND	5.4	0.7
1,1,2-Trichloroethane	ND	5.4	0.7
2-Hexanone	ND	11	0.9
1,3-Dichloropropane	ND	5.4	0.9
Tetrachloroethene	ND	5.4	0.6
Dibromochloromethane	ND	5.4	0.6
1,2-Dibromoethane	ND	5.4	0.7
Chlorobenzene	ND	5.4	0.7
1,1,1,2-Tetrachloroethane	ND	5.4	0.7
Ethylbenzene	ND	5.4	0.7
m,p-Xylenes	ND	5.4	1.4
o-Xylene	ND	5.4	0.7
Styrene	ND	5.4	0.6
Bromoform	ND	5.4	0.4
Isopropylbenzene	ND	5.4	0.5
1,1,2,2-Tetrachloroethane	ND	5.4	0.4
1,2,3-Trichloropropane	ND	5.4	0.6
Propylbenzene	ND	5.4	0.5
Bromobenzene	ND	5.4	0.6

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Diln Fac:	0.9940
Lab ID:	279335-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.4	0.6
2-Chlorotoluene	ND	5.4	0.7
4-Chlorotoluene	ND	5.4	0.7
tert-Butylbenzene	ND	5.4	0.4
1,2,4-Trimethylbenzene	ND	5.4	0.6
sec-Butylbenzene	ND	5.4	0.5
para-Isopropyl Toluene	ND	5.4	0.5
1,3-Dichlorobenzene	ND	5.4	0.5
1,4-Dichlorobenzene	ND	5.4	0.6
n-Butylbenzene	ND	5.4	0.4
1,2-Dichlorobenzene	ND	5.4	0.6
1,2-Dibromo-3-Chloropropane	ND	5.4	1.0
1,2,4-Trichlorobenzene	ND	5.4	0.5
Hexachlorobutadiene	ND	5.4	0.3
Naphthalene	ND	5.4	1.1
1,2,3-Trichlorobenzene	ND	5.4	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	88	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	SB #3	Diln Fac:	0.9560
Lab ID:	279335-002	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 7%

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.1
Vinyl Chloride	ND	10	1.0
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.1	0.7
Acetone	ND	21	3.4
Freon 113	ND	5.1	0.5
1,1-Dichloroethene	ND	5.1	1.0
Methylene Chloride	ND	21	1.1
Carbon Disulfide	ND	5.1	0.9
MTBE	ND	5.1	1.0
trans-1,2-Dichloroethene	ND	5.1	0.9
Vinyl Acetate	ND	51	0.7
1,1-Dichloroethane	ND	5.1	1.2
2-Butanone	ND	10	1.4
cis-1,2-Dichloroethene	ND	5.1	0.9
2,2-Dichloropropane	ND	5.1	1.1
Chloroform	ND	5.1	1.3
Bromochloromethane	ND	5.1	1.0
1,1,1-Trichloroethane	ND	5.1	0.8
1,1-Dichloropropene	ND	5.1	0.6
Carbon Tetrachloride	ND	5.1	0.5
1,2-Dichloroethane	ND	5.1	1.0
Benzene	ND	5.1	0.9
Trichloroethene	ND	5.1	0.9
1,2-Dichloropropane	ND	5.1	0.8
Bromodichloromethane	ND	5.1	0.9
Dibromomethane	ND	5.1	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.1	0.6
Toluene	ND	5.1	0.7
trans-1,3-Dichloropropene	ND	5.1	0.7
1,1,2-Trichloroethane	ND	5.1	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.1	0.9
Tetrachloroethene	ND	5.1	0.5
Dibromochloromethane	ND	5.1	0.5
1,2-Dibromoethane	ND	5.1	0.7
Chlorobenzene	ND	5.1	0.7
1,1,1,2-Tetrachloroethane	ND	5.1	0.6
Ethylbenzene	ND	5.1	0.7
m,p-Xylenes	ND	5.1	1.3
o-Xylene	ND	5.1	0.6
Styrene	ND	5.1	0.6
Bromoform	ND	5.1	0.4
Isopropylbenzene	ND	5.1	0.5
1,1,2,2-Tetrachloroethane	ND	5.1	0.4
1,2,3-Trichloropropane	ND	5.1	0.6
Propylbenzene	ND	5.1	0.5
Bromobenzene	ND	5.1	0.5

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

15.0

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	SB #3	Diln Fac:	0.9560
Lab ID:	279335-002	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.1	0.6
2-Chlorotoluene	ND	5.1	0.7
4-Chlorotoluene	ND	5.1	0.7
tert-Butylbenzene	ND	5.1	0.4
1,2,4-Trimethylbenzene	ND	5.1	0.6
sec-Butylbenzene	ND	5.1	0.4
para-Isopropyl Toluene	ND	5.1	0.4
1,3-Dichlorobenzene	ND	5.1	0.5
1,4-Dichlorobenzene	ND	5.1	0.6
n-Butylbenzene	ND	5.1	0.4
1,2-Dichlorobenzene	ND	5.1	0.5
1,2-Dibromo-3-Chloropropane	ND	5.1	1.0
1,2,4-Trichlorobenzene	ND	5.1	0.4
Hexachlorobutadiene	ND	5.1	0.3
Naphthalene	ND	5.1	1.0
1,2,3-Trichlorobenzene	ND	5.1	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	97	78-134
1,2-Dichloroethane-d4	92	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	237945
Units:	ug/Kg	Analyzed:	08/11/16
Diln Fac:	1.000		

Type: BS　　Lab ID: QC846870

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	27.21	109	70-134
Benzene	25.00	24.33	97	80-123
Trichloroethene	25.00	25.74	103	80-128
Toluene	25.00	23.96	96	80-120
Chlorobenzene	25.00	24.26	97	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	107	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	98	80-120
Bromofluorobenzene	102	78-123

Type: BSD　　Lab ID: QC846871

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	25.00	22.86	91	70-134	17	22
Benzene	25.00	22.09	88	80-123	10	21
Trichloroethene	25.00	22.71	91	80-128	13	23
Toluene	25.00	20.88	84	80-120	14	20
Chlorobenzene	25.00	21.82	87	80-123	11	20

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	100	78-123

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	114	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	107	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Batch#:	237945
MSS Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Analyzed:	08/11/16
Basis:	dry		

Type: MS　　Moisture: 8%
Lab ID: QC846987　　Diln Fac: 0.9843

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<1.015	53.49	58.61	110	56-133
Benzene	<0.9749	53.49	51.33	96	57-120
Trichloroethene	<0.9024	53.49	51.54	96	49-145
Toluene	<0.7686	53.49	55.51	104	51-120
Chlorobenzene	<0.7413	53.49	51.41	96	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	90	80-138
Toluene-d8	107	80-120
Bromofluorobenzene	101	78-123

Type: MSD　　Moisture: 8%
Lab ID: QC846988　　Diln Fac: 0.9960

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	54.13	55.40	102	56-133	7	46
Benzene	54.13	48.64	90	57-120	7	44
Trichloroethene	54.13	47.74	88	49-145	9	46
Toluene	54.13	46.50	86	51-120	19	47
Chlorobenzene	54.13	44.70	83	47-120	15	50

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #2	Batch#:	237795
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	14
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	730	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	540
bis(2-Chloroethoxy)methane	ND	360	12
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	11
Naphthalene	ND	73	9.5
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	66
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	ND	73	11
Hexachlorocyclopentadiene	ND	730	66
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.5
2-Chloronaphthalene	ND	360	60
2-Nitroaniline	ND	730	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	73	9.3
2,6-Dinitrotoluene	ND	360	9.6
3-Nitroaniline	ND	730	36
Acenaphthene	ND	73	13
2,4-Dinitrophenol	ND	730	170
4-Nitrophenol	ND	730	75
Dibenzofuran	ND	360	9.5
2,4-Dinitrotoluene	ND	360	11
Diethylphthalate	ND	360	9.2
Fluorene	ND	73	9.7
4-Chlorophenyl-phenylether	ND	360	11
4-Nitroaniline	ND	730	36
4,6-Dinitro-2-methylphenol	ND	730	46
N-Nitrosodiphenylamine	ND	360	61
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	64
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #2	Batch#:	237795
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	730	160
Phenanthrene	11 J	73	10
Anthracene	ND	73	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	73	9.4
Pyrene	ND	73	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	730	47
Benzo(a)anthracene	ND	73	9.4
Chrysene	ND	73	13
bis(2-Ethylhexyl)phthalate	11 J	360	9.5
Di-n-octylphthalate	ND	360	9.2
Benzo(b)fluoranthene	ND	73	13
Benzo(k)fluoranthene	ND	73	9.4
Benzo(a)pyrene	ND	73	9.4
Indeno(1,2,3-cd)pyrene	ND	73	13
Dibenz(a,h)anthracene	ND	73	13
Benzo(g,h,i)perylene	ND	73	9.4

Surrogate	%REC	Limits
2-Fluorophenol	114	25-120
Phenol-d5	108	36-120
2,4,6-Tribromophenol	77	27-120
Nitrobenzene-d5	83	44-120
2-Fluorobiphenyl	89	47-120
Terphenyl-d14	93	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	SB #3	Batch#:	237795
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Moisture: 7%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	13
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	720	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	540
bis(2-Chloroethoxy)methane	ND	360	12
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	10
Naphthalene	ND	72	9.4
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	65
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	12 J	72	11
Hexachlorocyclopentadiene	ND	720	65
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.4
2-Chloronaphthalene	ND	360	59
2-Nitroaniline	ND	720	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	72	9.2
2,6-Dinitrotoluene	ND	360	9.4
3-Nitroaniline	ND	720	36
Acenaphthene	ND	72	13
2,4-Dinitrophenol	ND	720	170
4-Nitrophenol	ND	720	74
Dibenzofuran	ND	360	9.4
2,4-Dinitrotoluene	ND	360	10
Diethylphthalate	ND	360	9.1
Fluorene	ND	72	9.6
4-Chlorophenyl-phenylether	ND	360	10
4-Nitroaniline	ND	720	36
4,6-Dinitro-2-methylphenol	ND	720	45
N-Nitrosodiphenylamine	ND	360	60
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	63
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	SB #3	Batch#:	237795
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	720	160
Phenanthrene	28 J	72	10
Anthracene	ND	72	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	72	9.3
Pyrene	ND	72	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	720	46
Benzo(a)anthracene	ND	72	9.3
Chrysene	ND	72	13
bis(2-Ethylhexyl)phthalate	68 J	360	9.4
Di-n-octylphthalate	ND	360	9.1
Benzo(b)fluoranthene	ND	72	13
Benzo(k)fluoranthene	ND	72	9.3
Benzo(a)pyrene	ND	72	9.3
Indeno(1,2,3-cd)pyrene	ND	72	13
Dibenz(a,h)anthracene	ND	72	13
Benzo(g,h,i)perylene	ND	72	9.3

Surrogate	%REC	Limits
2-Fluorophenol	115	25-120
Phenol-d5	106	36-120
2,4,6-Tribromophenol	74	27-120
Nitrobenzene-d5	87	44-120
2-Fluorobiphenyl	92	47-120
Terphenyl-d14	94	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

25.0

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846262	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	330	42
Phenol	ND	330	15
bis(2-Chloroethyl)ether	ND	330	22
2-Chlorophenol	ND	330	14
1,3-Dichlorobenzene	ND	330	42
1,4-Dichlorobenzene	ND	330	42
Benzyl alcohol	ND	330	16
1,2-Dichlorobenzene	ND	330	22
2-Methylphenol	ND	330	14
bis(2-Chloroisopropyl) ether	ND	330	16
4-Methylphenol	ND	330	16
N-Nitroso-di-n-propylamine	ND	330	15
Hexachloroethane	ND	330	42
Nitrobenzene	ND	330	22
Isophorone	ND	330	10
2-Nitrophenol	ND	670	39
2,4-Dimethylphenol	ND	330	19
Benzoic acid	ND	1,700	380
bis(2-Chloroethoxy)methane	ND	330	10
2,4-Dichlorophenol	ND	330	9.3
1,2,4-Trichlorobenzene	31 J	330	22
Naphthalene	ND	67	13
4-Chloroaniline	ND	330	13
Hexachlorobutadiene	ND	330	22
4-Chloro-3-methylphenol	ND	330	8.7
2-Methylnaphthalene	ND	67	9.9
Hexachlorocyclopentadiene	ND	670	76
2,4,6-Trichlorophenol	ND	330	11
2,4,5-Trichlorophenol	ND	330	9.2
2-Chloronaphthalene	ND	330	8.4
2-Nitroaniline	ND	670	34
Dimethylphthalate	ND	330	8.4
Acenaphthylene	ND	67	8.4
2,6-Dinitrotoluene	ND	330	34
3-Nitroaniline	ND	670	42
Acenaphthene	ND	67	8.4
2,4-Dinitrophenol	ND	670	150
4-Nitrophenol	ND	670	75
Dibenzofuran	ND	330	8.4
2,4-Dinitrotoluene	ND	330	8.3
Diethylphthalate	ND	330	8.4
Fluorene	ND	67	8.4
4-Chlorophenyl-phenylether	ND	330	8.4
4-Nitroaniline	ND	670	42
4,6-Dinitro-2-methylphenol	ND	670	42
N-Nitrosodiphenylamine	ND	330	8.4
Azobenzene	ND	330	8.4
4-Bromophenyl-phenylether	ND	330	8.4
Hexachlorobenzene	ND	330	8.4
Pentachlorophenol	ND	670	100
Phenanthrene	ND	67	8.4
Anthracene	ND	67	9.0

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

27.0

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846262	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Result	RL	MDL
Di-n-butylphthalate	ND	330	9.5
Fluoranthene	ND	67	9.4
Pyrene	ND	67	8.4
Butylbenzylphthalate	ND	330	9.6
3,3'-Dichlorobenzidine	ND	670	79
Benzo(a)anthracene	ND	67	8.4
Chrysene	ND	67	8.4
bis(2-Ethylhexyl)phthalate	ND	330	8.5
Di-n-octylphthalate	ND	330	34
Benzo(b)fluoranthene	ND	67	8.4
Benzo(k)fluoranthene	ND	67	8.4
Benzo(a)pyrene	ND	67	8.4
Indeno(1,2,3-cd)pyrene	ND	67	8.4
Dibenz(a,h)anthracene	ND	67	8.4
Benzo(g,h,i)perylene	ND	67	8.4

Surrogate	%REC	Limits
2-Fluorophenol	70	25-120
Phenol-d5	72	36-120
2,4,6-Tribromophenol	32	27-120
Nitrobenzene-d5	54	44-120
2-Fluorobiphenyl	58	47-120
Terphenyl-d14	52	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	LCS	Diln Fac:	2.000
Lab ID:	QC846263	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Phenol	2,661	2,043	77	42-120
2-Chlorophenol	2,661	2,089	78	45-120
1,4-Dichlorobenzene	2,661	2,281	86	48-120
N-Nitroso-di-n-propylamine	2,661	2,340	88	27-123
1,2,4-Trichlorobenzene	2,661	2,400	90	50-120
4-Chloro-3-methylphenol	2,661	2,126	80	59-120
Acenaphthene	998.0	739.2	74	53-120
4-Nitrophenol	2,661	1,965	74	47-120
2,4-Dinitrotoluene	2,661	2,245	84	55-120
Pentachlorophenol	2,661	1,291	48	32-120
Pyrene	998.0	764.1	77	52-120

Surrogate	%REC	Limits
2-Fluorophenol	63	25-120
Phenol-d5	66	36-120
2,4,6-Tribromophenol	70	27-120
Nitrobenzene-d5	53	44-120
2-Fluorobiphenyl	60	47-120
Terphenyl-d14	51	49-120

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #2	Batch#:	237742
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.9	0.27
beta-BHC	ND	1.9	0.44
gamma-BHC	ND	1.9	0.43
delta-BHC	ND	1.9	0.22
Heptachlor	ND	1.9	0.41
Aldrin	ND	1.9	0.46
Heptachlor epoxide	ND	1.9	0.27
Endosulfan I	ND	1.9	0.35
Dieldrin	ND	1.9	0.51
4,4'-DDE	ND	3.6	0.48
Endrin	ND	3.6	0.64
Endosulfan II	ND	3.6	0.53
Endosulfan sulfate	ND	3.6	0.53
4,4'-DDD	ND	3.6	0.51
Endrin aldehyde	ND	3.6	0.43
4,4'-DDT	ND	3.6	0.48
alpha-Chlordane	ND	1.9	0.28
gamma-Chlordane	ND	1.9	0.40
Methoxychlor	ND	19	2.9
Toxaphene	ND	66	16

Surrogate	%REC	Limits
TCMX	110	44-125
Decachlorobiphenyl	95	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	SB #3	Batch#:	237742
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 7%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.8	0.26
beta-BHC	ND	1.8	0.42
gamma-BHC	ND	1.8	0.42
delta-BHC	ND	1.8	0.22
Heptachlor	ND	1.8	0.39
Aldrin	ND	1.8	0.44
Heptachlor epoxide	ND	1.8	0.26
Endosulfan I	ND	1.8	0.34
Dieldrin	ND	1.8	0.50
4,4'-DDE	ND	3.5	0.47
Endrin	ND	3.5	0.62
Endosulfan II	ND	3.5	0.52
Endosulfan sulfate	ND	3.5	0.51
4,4'-DDD	ND	3.5	0.50
Endrin aldehyde	ND	3.5	0.42
4,4'-DDT	ND	3.5	0.46
alpha-Chlordane	ND	1.8	0.27
gamma-Chlordane	ND	1.8	0.38
Methoxychlor	ND	18	2.8
Toxaphene	ND	64	15

Surrogate	%REC	Limits
TCMX	101	44-125
Decachlorobiphenyl	94	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846053	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
alpha-BHC	ND	0.86	0.12
beta-BHC	ND	0.86	0.20
gamma-BHC	ND	0.86	0.20
delta-BHC	ND	0.86	0.10
Heptachlor	ND	0.86	0.19
Aldrin	ND	0.86	0.21
Heptachlor epoxide	ND	0.86	0.12
Endosulfan I	ND	0.86	0.16
Dieldrin	ND	0.86	0.23
4,4'-DDE	ND	1.7	0.22
Endrin	ND	1.7	0.29
Endosulfan II	ND	1.7	0.24
Endosulfan sulfate	ND	1.7	0.24
4,4'-DDD	ND	1.7	0.24
Endrin aldehyde	ND	1.7	0.20
4,4'-DDT	ND	1.7	0.22
alpha-Chlordane	ND	0.86	0.13
gamma-Chlordane	ND	0.86	0.18
Methoxychlor	ND	8.6	1.3
Toxaphene	ND	30	7.3

Surrogate	%REC	Limits
TCMX	86	44-125
Decachlorobiphenyl	76	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846054	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.18	14.17	107	44-121
Heptachlor	13.18	14.18	108	45-129
Aldrin	13.18	14.15	107	45-120
Dieldrin	13.18	13.40 #	102	49-131
Endrin	13.18	12.12	92	43-135
4,4'-DDT	13.18	10.06	76	37-141

Surrogate	%REC	Limits
TCMX	108	44-125
Decachlorobiphenyl	87	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Prepared:	08/08/16
Diln Fac:	1.000	Analyzed:	08/09/16
Batch#:	237812		

Field ID: MW #2 Lab ID: 279335-001
Type: SAMPLE Moisture: 8%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.6
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.9
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	94	25-135

Field ID: SB #3 Lab ID: 279335-002
Type: SAMPLE Moisture: 7%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.5
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.8
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	89	25-135

Type: BLANK Lab ID: QC846342

Analyte	Result	RL	MDL
Aroclor-1016	ND	4.8	1.2
Aroclor-1221	ND	9.6	3.2
Aroclor-1232	ND	4.8	1.5
Aroclor-1242	ND	4.8	1.4
Aroclor-1248	ND	4.8	1.5
Aroclor-1254	ND	4.8	1.2
Aroclor-1260	ND	4.8	0.77

Surrogate	%REC	Limits
Decachlorobiphenyl	107	25-135

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846343	Batch#:	237812
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	165.6	174.4	105	64-140
Aroclor-1260	165.6	155.8	94	65-146

Surrogate	%REC	Limits
Decachlorobiphenyl	92	25-135

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Field ID:	ZZZZZZZZZZ	Batch#:	237812
MSS Lab ID:	279347-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/09/16
Diln Fac:	1.000		

Type: MS Lab ID: QC846344

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.952	166.2	159.0	96	60-161
Aroclor-1260	38.23	166.2	248.9	127	42-166

Surrogate	%REC	Limits
Decachlorobiphenyl	91	25-135

Type: MSD Lab ID: QC846345

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	166.6	158.4	95	60-161	1	43
Aroclor-1260	166.6	269.4	139	42-166	8	51

Surrogate	%REC	Limits
Decachlorobiphenyl	90	25-135

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279335	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	MW #2	Basis:	dry
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	mg/Kg		

Moisture: 8%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.23 J	2.2	0.081	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Arsenic	7.8	0.27	0.075	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Barium	200	0.27	0.055	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Beryllium	0.55	0.27	0.052	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Cadmium	0.090 J	0.27	0.030	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Chromium	110	0.27	0.079	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Cobalt	19	0.27	0.050	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Copper	28	0.68	0.11	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Lead	9.5	0.27	0.073	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Mercury	0.17	0.019	0.0034	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.21 J	0.27	0.082	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Nickel	120	0.27	0.077	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Selenium	0.19 J	2.2	0.076	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Silver	0.050 J	0.27	0.030	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Thallium	0.055 J	0.27	0.054	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Vanadium	54	0.33	0.11	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Zinc	72	1.1	0.27	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279335	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	SB #3	Basis:	dry
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	mg/Kg		

Moisture: 7%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.13 J	2.2	0.082	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Arsenic	5.8	0.27	0.075	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Barium	170	0.27	0.056	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Beryllium	0.55	0.27	0.052	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Cadmium	0.080 J	0.27	0.030	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Chromium	68	0.27	0.080	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Cobalt	17	0.27	0.050	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Copper	29	0.33	0.11	25.00	237809	08/08/16	08/30/16	EPA 3050B	EPA 6020
Lead	10	0.27	0.073	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Mercury	0.66	0.018	0.0033	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.44	0.27	0.082	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Nickel	89	0.27	0.078	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Selenium	0.14 J	2.2	0.077	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Silver	0.063 J	0.27	0.031	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Thallium	0.057 J	0.27	0.055	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Vanadium	44	0.69	0.11	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Zinc	62	1.1	0.27	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Type:	BLANK	Diln Fac:	25.00
Lab ID:	QC846328	Batch#:	237809
Matrix:	Soil	Prepared:	08/08/16
Units:	mg/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
Antimony	ND	2.0	0.077
Arsenic	0.21 J	0.25	0.071
Barium	ND	0.25	0.052
Beryllium	ND	0.25	0.049
Cadmium	ND	0.25	0.029
Chromium	0.47 b	0.25	0.075
Cobalt	ND	0.25	0.047
Copper	ND	0.31	0.10
Lead	ND	0.25	0.069
Molybdenum	ND	0.25	0.077
Nickel	ND	0.25	0.073
Selenium	ND	2.0	0.072
Silver	ND	0.25	0.029
Thallium	ND	0.25	0.052
Vanadium	0.17 J	0.31	0.10
Zinc	0.43 J	1.0	0.25

J= Estimated value
b= See narrative
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Matrix:	Soil	Batch#:	237809
Units:	mg/Kg	Prepared:	08/08/16
Diln Fac:	25.00	Analyzed:	08/08/16

Type: BS Lab ID: QC846329

Analyte	Spiked	Result	%REC	Limits
Antimony	24.51	22.22	91	80-120
Arsenic	24.51	24.33	99	80-121
Barium	24.51	25.17	103	80-121
Beryllium	12.25	11.87	97	80-120
Cadmium	24.51	23.24	95	80-120
Chromium	24.51	25.05	102	80-131
Cobalt	24.51	24.79	101	80-132
Copper	24.51	22.06	90	80-137
Lead	24.51	24.50	100	80-125
Molybdenum	24.51	23.39	95	80-120
Nickel	24.51	24.78	101	77-141
Selenium	24.51	23.84	97	80-129
Silver	2.451	2.456	100	80-122
Thallium	24.51	23.82	97	80-120
Vanadium	24.51	23.80	97	80-128
Zinc	24.51	24.60	100	80-133

Type: BSD Lab ID: QC846330

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.27	21.29	88	80-120	3	20
Arsenic	24.27	23.51	97	80-121	2	21
Barium	24.27	23.99	99	80-121	4	20
Beryllium	12.14	11.12	92	80-120	6	20
Cadmium	24.27	22.66	93	80-120	2	20
Chromium	24.27	24.32	100	80-131	2	25
Cobalt	24.27	24.32	100	80-132	1	24
Copper	24.27	21.41	88	80-137	2	27
Lead	24.27	23.39	96	80-125	4	20
Molybdenum	24.27	22.62	93	80-120	2	20
Nickel	24.27	23.62	97	77-141	4	29
Selenium	24.27	23.26	96	80-129	1	22
Silver	2.427	2.250	93	80-122	8	20
Thallium	24.27	22.92	94	80-120	3	20
Vanadium	24.27	22.85	94	80-128	3	24
Zinc	24.27	23.52	97	80-133	3	23

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Field ID:	ZZZZZZZZZZ	Batch#:	237809
MSS Lab ID:	279117-003	Sampled:	07/26/16
Matrix:	Soil	Received:	07/28/16
Units:	mg/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/08/16
Diln Fac:	25.00		

Type: MS Lab ID: QC846331

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	0.1860	26.32	13.79	52	21-120
Arsenic	10.05	26.32	36.50	101	75-122
Barium	27.36	26.32	49.12	83	54-148
Beryllium	0.06667	13.16	12.69	96	80-120
Cadmium	<0.02565	26.32	24.92	95	80-120
Chromium	20.47	26.32	47.05	101	60-158
Cobalt	5.534	26.32	31.29	98	73-142
Copper	1.791	26.32	27.46	98	59-150
Lead	1.692	26.32	26.70	95	68-137
Molybdenum	0.4329	26.32	23.96	89	71-120
Nickel	23.53	26.32	48.61	95	57-161
Selenium	<0.06483	26.32	24.70	94	75-128
Silver	<0.02583	2.632	2.547	97	77-120
Thallium	<0.04630	26.32	24.87	95	76-120
Vanadium	18.18	26.32	42.68	93	65-150
Zinc	18.17	26.32	44.64	101	44-158

Type: MSD Lab ID: QC846332

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.04	11.72	48	21-120	7	29
Arsenic	24.04	32.30	93	75-122	6	24
Barium	24.04	41.79	60	54-148	12	28
Beryllium	12.02	11.34	94	80-120	2	20
Cadmium	24.04	22.70	94	80-120	0	20
Chromium	24.04	43.55	96	60-158	3	36
Cobalt	24.04	29.05	98	73-142	0	34
Copper	24.04	37.09	147	59-150	38	52
Lead	24.04	26.13	102	68-137	6	32
Molybdenum	24.04	21.68	88	71-120	1	20
Nickel	24.04	46.41	95	57-161	0	47
Selenium	24.04	22.85	95	75-128	1	20
Silver	2.404	2.351	98	77-120	1	20
Thallium	24.04	22.57	94	76-120	1	20
Vanadium	24.04	40.52	93	65-150	0	28
Zinc	24.04	46.81	119	44-158	10	33

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	238064
Lab ID:	QC847358	Prepared:	08/15/16
Matrix:	Soil	Analyzed:	08/15/16
Units:	mg/Kg		

Result	RL	MDL
0.0058 J	0.016	0.0029

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	238064
Matrix:	Soil	Prepared:	08/15/16
Units:	mg/Kg	Analyzed:	08/16/16
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC847359	0.2083	0.1913	92	80-120		
BSD	QC847360	0.2049	0.1943	95	80-120	3	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	238064
MSS Lab ID:	279344-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg	Prepared:	08/15/16
Basis:	as received	Analyzed:	08/15/16

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC847361	0.2728	0.2016	0.4747	100	69-142		
MSD	QC847362		0.1953	0.4610	96	69-142	2	36

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Total Organic Carbon (TOC)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Batch#:	237846
Matrix:	Soil	Sampled:	08/04/16
Units:	%	Received:	08/04/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL	Moisture
MW #2	SAMPLE	279335-001	0.86	0.05	8%
SB #3	SAMPLE	279335-002	0.43	0.05	7%
	BLANK	QC846469	ND	0.01	

ND= Not Detected
RL= Reporting Limit

Batch QC Report

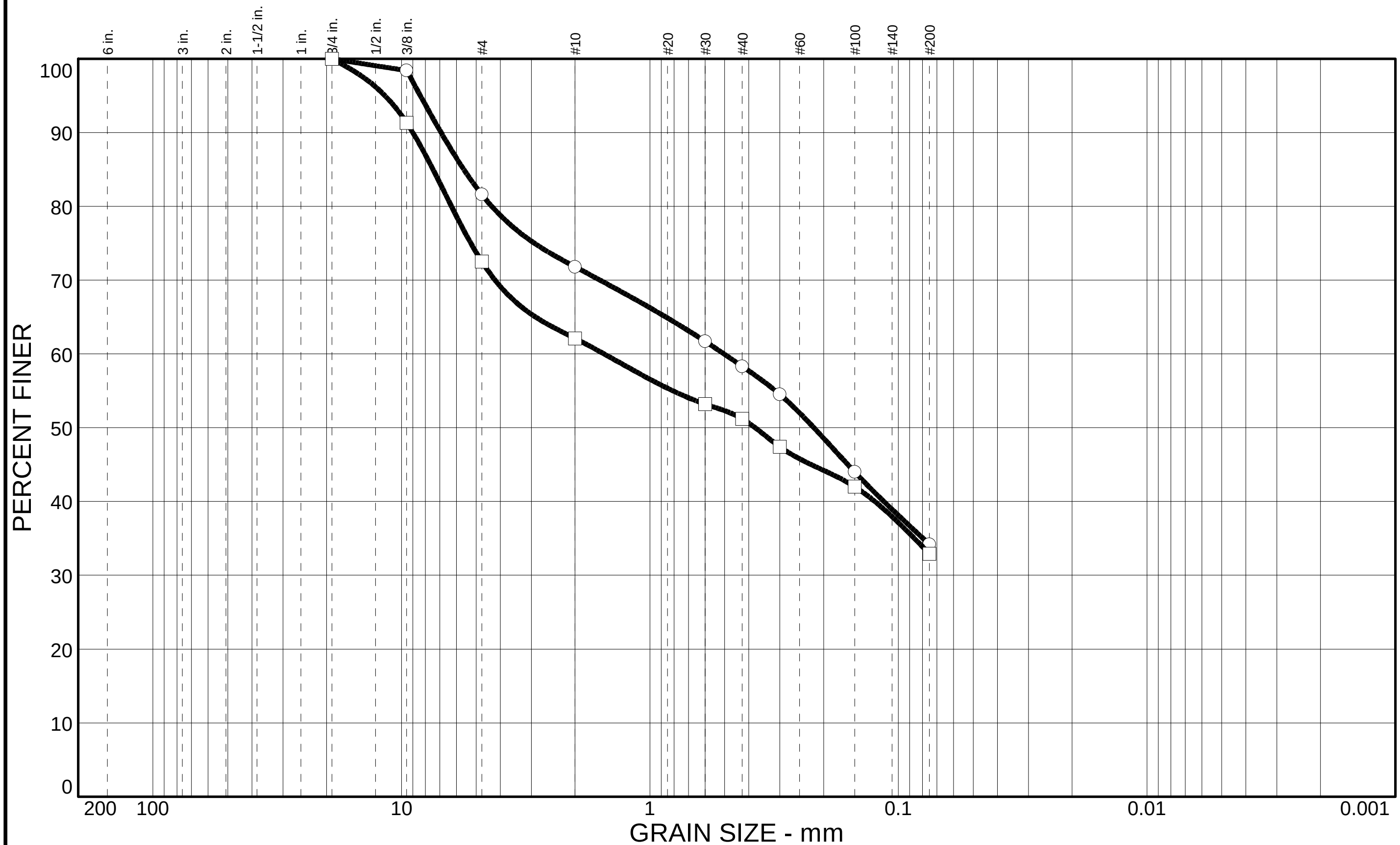
Total Organic Carbon (TOC)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Diln Fac:	1.000
Field ID:	MW #1	Batch#:	237846
MSS Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	%	Analyzed:	08/08/16
Basis:	dry		

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	Moisture	RPD	Lim
LCS	QC846470		0.1300	0.1240	95	80-120			
MS	QC846471	1.020	0.7030	1.655	90	66-120	8%		
MSD	QC846472		0.6996	1.579	80	66-120	8%	5	20

RPD= Relative Percent Difference

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		18.4	47.4	34.2					
□		27.5	39.6	32.9					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	98.4	91.3	
	GRAIN SIZE		
D_{60}	0.504	1.53	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	81.6	72.5	
#10	71.8	62.1	
#30	61.7	53.2	
#40	58.3	51.2	
#50	54.5	47.4	
#100	44.0	42.0	
#200	34.2	32.9	

SOIL DESCRIPTION

○ Yellowish Brown Clayey SAND w/ Gravel

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #2

□ Source: SB #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins

Project: Nursery Detention Basin - 279335

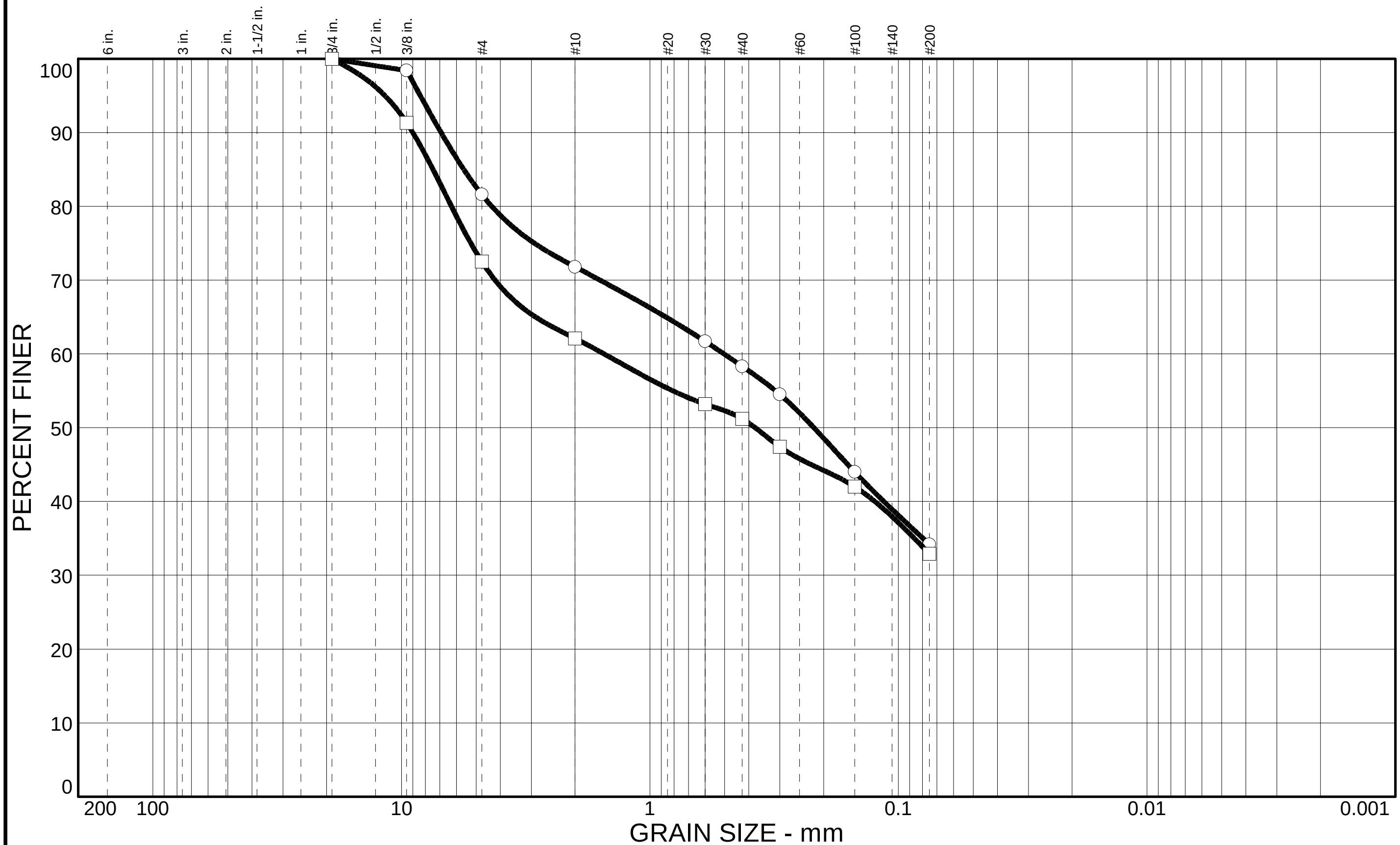
Project No.: 202-067 Figure

Laboratory Job Number 279335

Subcontracted Products

Cooper Testing Labs

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		18.4	47.4	34.2					
□		27.5	39.6	32.9					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	98.4	91.3	

	GRAIN SIZE		
D_{60}	0.504	1.53	
D_{30}			
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	81.6	72.5	
#10	71.8	62.1	
#30	61.7	53.2	
#40	58.3	51.2	
#50	54.5	47.4	
#100	44.0	42.0	
#200	34.2	32.9	

SOIL DESCRIPTION

○ Yellowish Brown Clayey SAND w/ Gravel

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #2

□ Source: SB #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins

Project: Nursery Detention Basin - 279335

Project No.: 202-067

Figure

Appendix D

Transducer Installation Records, Calibration Reports, and CD of Operation Manual

Table D-1 - Transducer Installation Records
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Piezometer	Ground Surface Elevation (feet)[1]	Height of Vault Above Ground Surface (feet)	Date	Time	Manual Depth to Water From Top of Vault (feet)	Transducer Pressure Reading (psi)[2]	Absolute Pressure Reading (psi)	Height of Water Above Transducer (feet)	Calculated Transducer Elevation (feet)	Transducer Elevation for Pressure Conversion (feet)
MW#1	233.9	0.17	12/5/2016	2:05 PM	8.71	19.11	4.48	10.33	215.03	**215.02**
			11/23/2016	11:05 AM	8.84	19.18	4.43	10.22	215.01	
MW#2	234.6	0.08	12/5/2016	2:40 PM	8.78	19.49	4.86	11.22	214.68	**214.70**
			11/23/2016	10:00 AM	9.00	19.51	4.75	10.97	214.71	
MW#3	232.9	0.08	12/5/2016	3:00 PM	8.31	19.37	4.74	10.95	213.72	**213.73**
			11/23/2016	10:35 AM	8.52	19.40	4.64	10.72	213.74	
Baro	N/A	N/A	12/5/2016	2:00 PM	N/A	14.64	0.00	0.00	N/A	N/A
			12/5/2016	3:00 PM	N/A	14.63	0.00	0.00	N/A	N/A
			11/23/2016	12:00 PM	N/A	14.76	0.00	0.00	N/A	N/A

Notes:

[1]Existing Ground Elevations (ft) obtained from MCFCWD LiDAR assembled in 2011 and revised in 2013 (6th edition, dated 12/18/2013)

[2]Readings from transducer collected on 11/23/16 at 11:00 AM & 12:00 PM; 12/5/16 at 2:00 PM

MW-1

In-Situ Inc.

Calibration Report

Report Number: 20160928155447-478804
221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**478804**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-28 15:54:47 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7452	35.7479	0.0027	FT
Depth	18.0596	18.0641	0.0045	FT
Depth	0.3756	0.3750	-0.0005	FT
Temperature	19.9755	19.9323	-0.0432	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621434
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu Instrulab Model 406X-0031-01 SerialNo 2-31140
Manu Instrulab Model 3312A-14-15-24 SerialNo 31139
Manu Agilent Model 34970A SerialNo MY44038788

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: TG

MW-2

Calibration Report

Report Number: 2016092815533-478802
221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

In-Situ Inc.

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**478802**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-28 15:53:03 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7450	35.7414	-0.0036	FT
Depth	18.0594	18.0516	-0.0078	FT
Depth	0.3754	0.3797	0.0044	FT
Temperature	19.8705	19.8818	0.0113	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621384
Manu Agilent Model 53131A-010 SerialNo MY40012869
Manu Instrulab Model 406X-0031-01 SerialNo 3-31103
Manu Instrulab Model 3312A-14-15-24 SerialNo 31140

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: TG

MW-3

In-Situ Inc.

Calibration Report

Report Number: 20160419154829-454884

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**454884**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-04-19 15:48:29 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7454	35.7428	-0.0027	FT
Depth	18.0598	18.0584	-0.0015	FT
Depth	0.3747	0.3767	0.0021	FT
Temperature	19.9885	19.9421	-0.0464	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621384
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu Instrulab Model 406X-0031-01 SerialNo 31098-2
Manu Instrulab Model 3312A-14-15-24 SerialNo 31139

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: KK

In-Situ Inc.

Calibration Report

Report Number: 20160921203032-477615
221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged BaroTROLL**
Full Scale Depth Range:	**0- 15 Ft (0- 1 m)**
Serial Number:	**477615**
Hardware Version:	0
Firmware Version:	1.01

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-21 20:30:32 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7450	35.7488	0.0038	FT
Depth	9.2175	9.2204	0.0029	FT
Depth	-17.3088	-17.3105	-0.0016	FT
Temperature	19.9940	20.0006	0.0066	C

Calibration Procedures and Equipment Used:

Manu Mensor Model APC600 SerialNo 622739
Manu Agilent Model 53131A-010 SerialNo MY47001576
Manu Instrulab Model 406X-0031-01 SerialNo 1-31139
Manu Instrulab Model 3312A-14-15-24 SerialNo 31134
Manu Mensor Model APC600 SerialNo 610914

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: RG

APPENDIX D
Hydrology Supporting Documentation

Table of Contents

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Guide to Appendix D

This appendix is a compilation of a number of technical memoranda and other reports that provide detailed information about the flood modeling with and without the Project, alone and in combination with foreseeable projects, and the alternatives to it that were discussed in the Draft EIR's Chapter 6, *Alternatives*. The appendix also includes information about potential geomorphic change within the watershed. Some of the most relevant contents of this appendix are as follows.

<u>Basin Design Drawings</u>

For Nursery Basin design drawings, including the different basins considered in Chapter 6's alternatives to the proposed Project, see figures on **pages 10 through 13** in D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin* (Stetson Engineers, January 2018). The Nursery Basin Element design for the proposed Project is on **Figure 1** on **page 10**. This is the same design as in Alternative – Raised Building Alternative. The Nursery Basin Element design for Alternative 4 – Increased Capacity Basin Alternative is on **Figure 2** on **page 11**. The Nursery Basin Element design for the Alternative 2 – Morningside/Passive Basin Alternative is on **Figure 4** on **page 13**. This is the same design as in the "Modified Alternative".

<u>Flood Model Results – Proposed Project vs. Existing Conditions</u>

For flood modeling comparing existing conditions and proposed Project completion for the 10-year, 25-year, and 100-year events, see figures on **pages 14 through 22** in D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 10-year event results are shown on **Figures 5a**, **5b**, and **5c** of that document. The 25-year event results are shown on **Figures 6a**, **6b**, and **6c** of that document. The 100-year event results are shown on **Figures 7a**, **7b**, and **7c** of that document. In that same document, **Figures 8a**, **8b**, and **8c** show the only changes (the differences) between the existing conditions and the post-Project implementation conditions for the 10-year event. **Figures 9a**, **9b**, and **9c** show the changes in the 25-year event; **Figures 10a**, **10b**, and **10c** show the changes in the 100-year event. These figures are on **pages 23 through 31**.

<u>Flood Model Results – Proposed Project PLUS Expected Future Projects vs. Existing Conditions</u>

For flood modeling of the Project with expected future projects, including those being planned as part of the Ross Valley Flood Protection and Watershed Program (e.g., the Winship Bridge Replacement Project and others, as discussed in Chapter 5, *Growth-Inducing and Cumulative Impacts*), see **Figures 5c, 5d, 6c, 6d, 7c,** and **7d** in D-3: *Supplemental Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A: Hydraulic Analysis of Complete Removal of Bridge Building #2.* These figures are on **pages 10 through 15**.

Flood Model Results – Alternatives to the Project

For flood modeling of alternatives to the proposed Project (as presented in *Chapter 6, Alternatives*), see the following:

- **Alternative 2 – Morningside/Passive Basin Alternative** – The 10-year event results are shown on **Figures 1a, 1b, 1c,** and **1d** of the D-2: *Report on Hydraulic Analysis of the Morningside Alternative.* The 25-year event results are shown on **Figures 2a, 2b, 2c,** and **2d** of that document. The 100-year event results are shown on **Figures 3a, 3b, 3c,** and **3d** of that document. The Morningside/Passive Basin Alternative combined with the foreseeable projects (i.e., the same expected future removals of the Winship Bridge and others) for the 10-year event results are shown on **Figures 4a, 4b, 4c,** and **4d.** The Morningside/Passive Basin Alternative combined with foreseeable projects for the 25-year event results are shown on **Figures 5a, 5b, 5c,** and **5d.** The Morningside/Passive Basin Alternative combined with foreseeable projects for the 100-year event results are shown on **Figures 6a, 6b, 6c,** and **6d.**
- **Alternative 3 – Raised Building Alternative** – This alternative was not separately modeled for changes in flood risk because – with the building's foundation out of the creek channel – the effects on hydraulics and flooding would be almost identical to the proposed Project.
- **Alternative 4 – Increased Capacity Basin Alternative** – The 10-year event results are shown on **Figures 8a, 8b,** and **8c** of the D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 25-year event results are shown on **Figures 9a, 9b,** and **9c** of that document. The 100-year event results are shown on **Figures 10a, 10b,** and **10c** of that document. These figures are on **pages 23 through 31**.

Modified Alternative (Passive Basin from Alternative 2 plus Downtown San Anselmo element from proposed Project) - The 10-year event results are shown on **Figures 11a, 11b,** and **11c** of the D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 25-year event results are shown on **Figures 12a, 12b,** and **12c** of that document. The 100-year event results are shown on **Figures 13a, 13b,** and **13c** of that document. These figures are on **pages 32 through 40**.

D-1 San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin

San Anselmo Flood Risk Reduction Project CEQA Support
Conceptual Designs and Supplemental Modeling of Option 2A
for Different Layouts of Sunnyside Detention Basin

Stetson Engineers Inc.
January 31, 2018

Background

Stetson previously prepared a conceptual design of the Sunnyside Nursery DB (about 39 acre-ft in storage capacity at the spillway crest; Layout 1 in Table 1) and prepared HEC-RAS hydraulic modeling of the San Anselmo Flood Risk Reduction Project, Option 2A[1] (Stetson, 2017). The previous modeling analysis found that the Sunnyside DB would provide flood reduction benefit during the 10-year flood in the Fairfax and Downtown San Anselmo areas, but, due to its limited storage capacity, would have less benefit during the 25-year flood and very little benefit during the 100-year flood.

Stetson recently revised the conceptual design of the Sunnyside Nursery DB (about 34 acre-ft in storage capacity at the spillway crest; Layout 3 in Table 1) based on CH2M's gravity design and the District's direction to narrow the width of the perimeter road from 15 ft to 10 ft. Hydraulic modeling analysis of this layout was also performed and documented (Stetson, 2018). As expected, the revised DB design would further reduce the flood damage reduction benefit due to the reduction in storage capacity.

As an alternative, the District also considered a deepened/enlarged Sunnyside DB with a pump for complete draining. The deepening was to the depth needed to achieve the storage capacity of 39 acre-ft at the spillway crest to match Stetson's previous design. The purpose of the pump would be to prevent the DB from partially filling (in the day/hours prior to initiation of detention operations) due to inflowing groundwater seepage, and thereby maintain open space in the DB for a later time when detention of floodwater is needed. The pump would also be used after detention operations to remove water down to the floor of the basin in order to ready the basin for detention again, if/when needed. The concept design of this layout (Layout 4 in Table 1) was documented in the Stetson 12/20/2017 technical memorandum entitled "San Anselmo Flood Risk Reduction Project CEQA Support/ Conceptual Designs for Deepened/Enlarged Sunnyside Detention Basin and Pump Station."

The District is now also considering other layouts. Table 1 shows a list of layouts. This technical memorandum summarizes the conceptual designs and hydraulic modeling for Layouts 2, 6, and 7.

---

[1]The San Anselmo Flood Risk Reduction Project, Option 2A aims to reduce the risk and the extent and severity of flooding in Ross Valley by providing temporary storage of floodwaters and increasing the capacity of the creek to convey floodwaters. Floodwater storage would be provided in an improved former Nursery near White Hill, just west of Fairfax, commonly referred to as the "Former Nursery Detention Basin" or "Sunnyside Nursery Detention Basin." Increased conveyance capacity would be achieved by removing the commercial building that spans over the creek in downtown San Anselmo located at 634-636 San Anselmo Avenue, commonly referred to as Building Bridge #2.

Table 1 Design Layouts for Sunnyside Detention Basin

Layout	Description	E&W setback (feet)	E berm top. elev. (ft NAVD 88)	WSE at Spillway Crest (ft NAVD88)	Storage Capacity at Spillway Crest (acre-feet)	Modeled by Stetson ?	How was DB modeled?	EIR analysis?	Notes
1	Naturalistic design dated 6/14/17 with 2:1 side slopes, no perimeter road incoporated	50	238	235	39	Yes	Storage Area	No	Relied on LIDAR and side slopes steeper than current design, this design didn't incorporate permiter road
2 (Proposed Project)	CH2M gravity design, 15' wide perimeter road, same berm top elevation as Option 1	50	238	235	33	No, but assume results would be similar to Option 3		**Yes, Proposed Project**	Consistent with NOP; Detailed field survey topo data provided by CH2M
3	Stetson's gravity design dated 12/7/17 where the perimeter road width is reduced from 15' to 10'	50	238	235	34	Yes	2D Flow Area	No	Consistent with NOP; Detailed field survey topo data provided by CH2M
4	Stetson's pump design dated 12-7-17 with basin deepened by 2.5', 10' wide perimeter road	50	238	235	39	No, but assume results would be similar to Option 1		No	Detailed field survey topo data provided by CH2M
5	Narrower setback, same berm top, gravity design, 15' wide perimeter road	25	238	235	36	No		No	
6 (Deeper Basin)	Narrower setback, same berm top and deepened basin by 2.5', basin drains by pump, 15' wide perimeter road	25	238	235	41	To be modeled by Stetson	2D Flow Area	**Yes, Alternative**	Detailed field survey topo data provided by CH2M
7 (Passive Basin)	Narrower setbacks, basin fills and drains passively with no creek diversion structure; berms on the east and west end of the basin, 15' wide perimeter road	25	232	N/A (No spillway)	20 acre-ft at the max WSE	To be modeled by Stetson	2D Flow Area	**Yes, Alternative**	Detailed field survey topo data provided by CH2M

Conceptual Designs for Layouts 2, 6, and 7 of the Sunnyside DB

Conceptual Design for Layout 2 (Proposed Project)

Figure 1 shows the conceptual design for Layout 2 of the Sunnyside DB based on the CH2M gravity design with a 15 ft wide perimeter road. Layout 2 has a setback of 50 ft from the property lines on the east and west sides. The design was based on the field topographic survey data provided by CH2M. The top of the perimeter road has an elevation of 238 ft NAVD88 and the DB has a lowest bottom floor elevation of 223.8 ft NAVD88 at the southeast corner. The resulting storage at the spillway crest elevation of 235 ft NAVD88 is about 33 acre-ft, which is about 6 acre-ft less than the previous design by Stetson for Layout 1. The conceptual design was intended to address concerns expressed by nearby property owners regarding the configuration and positioning of the basin.

Because of the limited storage capacity of the detention basin and the need to use available storage space to its fullest to reduce flooding downstream, the detention basin was designed to have two outlets penetrating the spillway structure across the creek: one is a smaller (6 ft by 4 ft) ungated box culvert that is always open to allow limited, continuous discharge during detention operations and to allow passage of sediment, woody debris, and wildlife; and the other is a larger (10 ft by 5 ft) box culvert with a gate control which would normally be kept open to allow unimpeded passage of a range of flows. The larger gated culvert would be closed during a flood event. The timing of closure of the gated culvert would be just before the time of incipient flooding downstream. When the gated culvert is closed, the creek water level behind the spillway will rise until it reaches the top of the left bank (looking downstream). When the rising creek water level rises above the top of the left bank, flood water will then start to flow over the left bank into the detention basin area. This overflow would be similar to flow over a side weir.

A 36-inch diameter low-level drain outlet pipe with an invert elevation at about 223.8 ft NAVD88 was designed to drain the detention basin. After a flood event, the basin will first be passively drained by the ungated culvert (6 ft by 4 ft box culvert) to about 228 ft NAVD88 (the lowest top elevation of the left bank). The remainder of the basin will be actively drained by opening of the low-level outlet pipe (by a flood operator). It would take about 8 hours for the outlet pipe to fully drain the water remaining in the basin. The low-level drain outlet pipe would normally be kept open[2] and then closed for flood detention at the same time the gated culvert on the spillway structure is closed.

The spillway structure includes a 95-ft long broad-crested spillway which, in conjunction with the ungated culvert, conveys surcharge flows downstream. There are 3 ft of *freeboard*, which is the difference between the elevation of the spillway crest (235 ft NAVD88) and the elevation of the top of the berm (238 ft NAVD88). The spillway structure conveys discharges up to the 1,000-year discharge with 1.5 ft of *residual freeboard*, which is the difference between the maximum water surface elevation (during

[2] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

the 1,000-year flood) and the top of the berm. This complies with DSOD's requirement for a minimum of 1.5 ft of *residual freeboard*.

<u>Conceptual Design for Layout 6 (Deeper Basin)</u>

Figure 2 shows the conceptual design for Layout 6, the deepened/enlarged Sunnyside DB. This design is similar to Layout 4 except that the width of the perimeter road is widened from 10 ft to 15 ft and the setback on the east and west sides is narrowed from 50 ft to 25 ft. Layout 6 has a storage capacity of about 41 acre-ft at the spillway crest.

The conceptual design for Layout 6 of the deepened/enlarged Sunnyside DB (Figure 2) also shows the configuration of the inlet/outlet features of a pump station. Figure 3 shows the pump station profile. A vertical turbine pump would be suitable for this application. The pump house should be located well above the 100-year water level of about 236.5 ft NAVD. The pump station was designed with the following main elements:

- catch basin with trash rack/sediment screen at the southeast corner of the DB;
- pipe for directing flow from the catch basin to the pump sump;
- vertical turbine pump with concrete supporting structures; and
- pump discharge pipe.

The sizing of the pump station and general rules of the DB operations provided for Layout 4 would also apply for Layout 6. Refer to the Stetson 12/20/2017 technical memorandum entitled "San Anselmo Flood Risk Reduction Project CEQA Support/ Conceptual Designs for Deepened/Enlarged Sunnyside Detention Basin and Pump Station", for sizing of the pump station and general rules of the DB operations.

The pump station was sized to have a minimum hydraulic power of about 10 horsepower for delivery of water at a discharge rate of 1,170 gpm.

The following is a summary of general rules of the DB operations:

<u>More than 24 hours prior to a forecasted flood event (i.e., normal operations):</u>

1. Keep the 36-inch diameter low-level drain outlet pipe open for draining the groundwater seepage and minimizing accumulation of water in the DB[3].

<u>24-hour prior to a forecasted flood event:</u>

1) Turn the pump on to evacuate any accumulated water in the deepened part of the DB and prevent further accumulation of water prior to the time when the DB gate is closed.

<u>Immediately prior to a flood event:</u>

1) Close the 36-inch diameter low-level drain outlet pipe for flood detention at the same time the gated culvert is closed.
2) Turn off the pump.

---

[3] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

3) Close the gated culvert to initiate floodwater diversion (Note: The timing of closure of the gated culvert would be just before the time of incipient flooding downstream).

Immediately after a flood event:

1) Open the gated culvert for draining floodwater.
2) Open the 36-inch diameter low-level drain outlet pipe for additional draining of floodwater and keep it open.

Conceptual Design for Layout 7 (Passive Basin)

Figure 4 shows the conceptual design for Layout 7 of the Sunnyside DB with no creek diversion structure for passive operations. The side weir along the left bank of the creek was designed to have a crest elevation of 228 ft NAVD88. This elevation is the water surface elevation in the creek at the DB site at the time of incipient flooding downstream. In other words, at the time when downstream incipient flooding occurs, a portion of flood water would begin to passively enter into the DB over the side weir. The side weir of Layout 7 has the same crest elevation and length as Layouts 2 and 6. This allows for an even comparison of flood reduction benefit among the three layouts. Layout 7 has an east berm top elevation of 232 ft NAVD88 and a storage capacity of about 20 acre-ft at the simulated 100-year maximum water surface elevation (229.9 ft NAVD88).

Under this concept, the 36-inch diameter low-level outlet pipe would be kept open all the time for passive operations[4].

Hydraulic Modeling for Layouts 2, 6, and 7 of the Sunnyside DB with Complete Removal of Building Bridge #2

Stetson performed hydraulic modeling to assess the project effects and cumulative effects of Option 2A with regard to flooding. For the modeling, Stetson used US Army Corp of Engineers software, HEC-RAS version 5.0, which has combined 1D and 2D hydraulic modeling capabilities. Stetson recently developed a combined 1D/2D unsteady-flow model application for the Corte Madera Creek watershed. The model starts at the bay and extends upstream along the mainstream and tributaries to the proposed upper watershed detention basins in Fairfax that are currently under environmental review. The model was calibrated to the 12/15/2016 bankfull event and the 12/31/2005 flood event (an approximate 100-year flood), and verified to the 1/4/1982 flood event (an approximate 150-year flood; Stetson, 2017). The model was peer reviewed by the US Army Corp of Engineers in 2017.

[4] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

The following scenarios were analyzed:

- Existing Conditions (EC), to serve as the "Baseline" basis for comparison
- Option 2A (Sunnyside DB Layout 2 and complete removal of BB#2) added to EC, to assess "Project" effects
- Option 2A (Sunnyside DB Layout 6 and complete removal of BB#2) added to EC, to assess "Project" effects
- Option 2A (Sunnyside DB Layout 7 and complete removal of BB#2) added to EC, to assess "Project" effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 flood
- Q25, moderate, infrequent flood
- Q10, minor flood, less frequent than 2017 flood event (7-year flood event)

Results of Hydraulic Analysis in Terms of Floodplain Inundation

Figures 5a to 5c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 2 and complete removal of BB#2) and existing conditions for the 10-year flood. Figures are provided covering Fairfax, Upper San Anselmo, and Lower San Anselmo areas. Similarly, Figures 6a to 6c show the model-simulated results for the 25-year flood and Figures 7a to 7c for the 100-year flood.

Figures 8a to 8c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 6 and complete removal of BB#2) and existing conditions for the 10-year flood. Similarly, Figures 9a to 9c show the model-simulated results for the 25-year flood and Figures 10a to 10c for the 100-year flood.

Figures 11a to 11c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 7 and complete removal of BB#2) and existing conditions for the 10-year flood. Similarly, Figures 12a to 12c show the model-simulated results for the 25-year flood and Figures 13a to 13c for the 100-year flood.

Tables 2, 3, and 4 are a summary of results for Option 2A for the three layouts of Sunnyside DB (Layout 2, Layout 6, and Layout 7, respectively).

Table 2 Summary of Benefits of Option 2A (Sunnyside DB Layout 2 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 5a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 10 inches	None
Figure 5b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 17 inches	None
Figure 5c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 18 inches	None
Figure 6a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 1 inch	None
Figure 6b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	None
Figure 6c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 7a	Q100	Fairfax	• Nearly zero reduction	None
Figure 7b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	None
Figure 7c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	Minor increase in flooding in the area between Winship and Barber Bridges

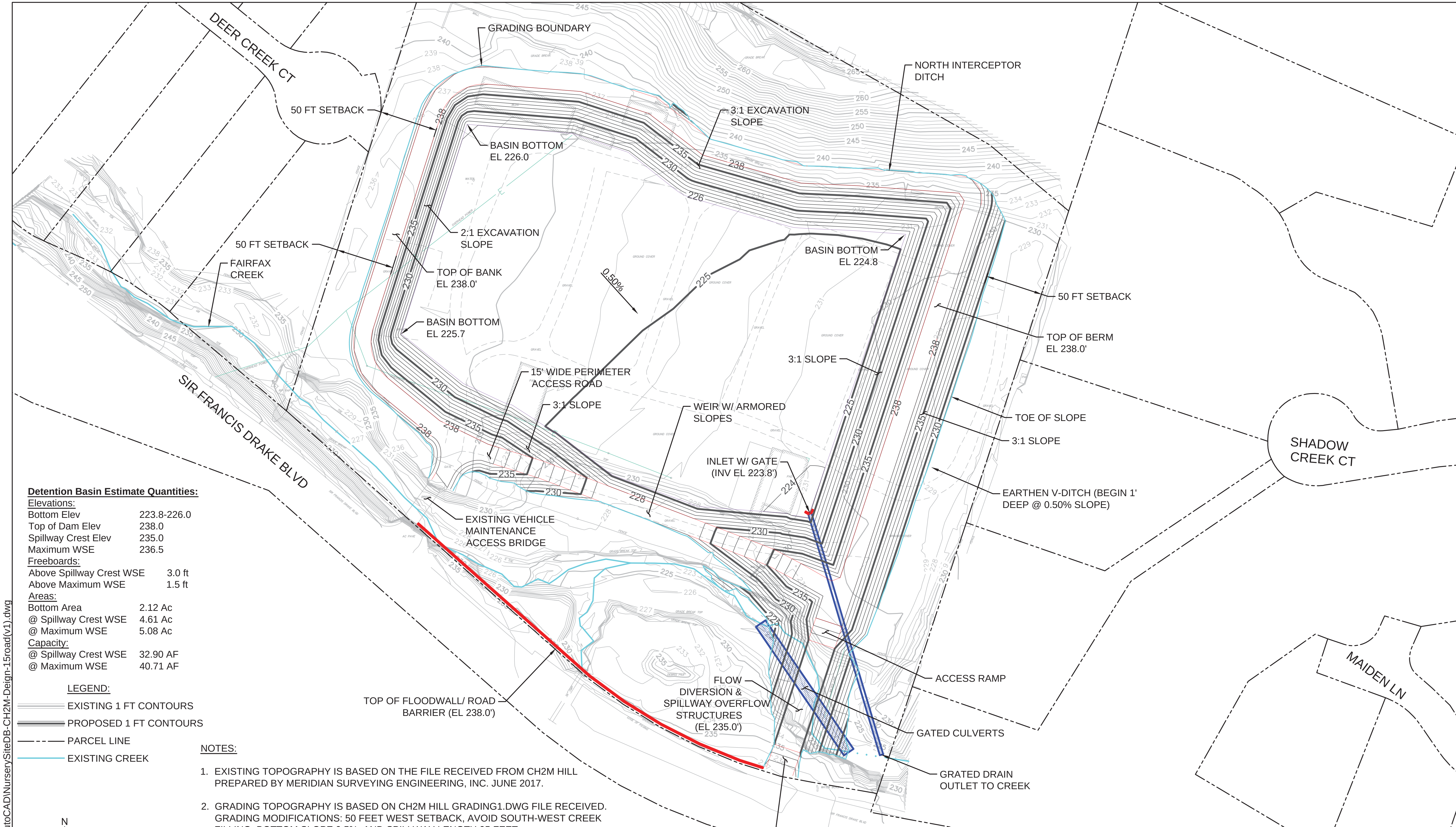
Table 3 Summary of Benefits of Option 2A (Sunnyside DB Layout 6 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 8a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 14 inches	None
Figure 8b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 23 inches	None
Figure 8c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 24 inches	None
Figure 9a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inches	None
Figure 9b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	None
Figure 9c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 10a	Q100	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inches	None
Figure 10b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 7 inches	None
Figure 10c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges

Table 4 Summary of Benefits of Option 2A (Sunnyside DB Layout 7 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 11a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 4 inches	None
Figure 11b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 12 inches	None
Figure 11c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 13 inches	None
Figure 12a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 1 inch	None
Figure 12b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	None
Figure 12c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 13a	Q100	Fairfax	• Nearly zero reduction	None
Figure 13b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	None
Figure 13c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	Minor increase in flooding in the area between Winship and Barber Bridges

Figure 1



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	223.8-226.0
Top of Dam Elev	238.0
Spillway Crest Elev	235.0
Maximum WSE	236.5
Freeboards:	
Above Spillway Crest WSE	3.0 ft
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.12 Ac
@ Spillway Crest WSE	4.61 Ac
@ Maximum WSE	5.08 Ac
Capacity:	
@ Spillway Crest WSE	32.90 AF
@ Maximum WSE	40.71 AF

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. GRADING TOPOGRAPHY IS BASED ON CH2M HILL GRADING1.DWG FILE RECEIVED. GRADING MODIFICATIONS: 50 FEET WEST SETBACK, AVOID SOUTH-WEST CREEK FILLING, BOTTOM SLOPE 0.5%, AND SPILLWAY LENGTH 95 FEET.
3. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
4. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
5. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

F:\DATA\2431\17-16\AutoCAD\NurserySiteDB-CH2M-Deign-15road(v1).dwg

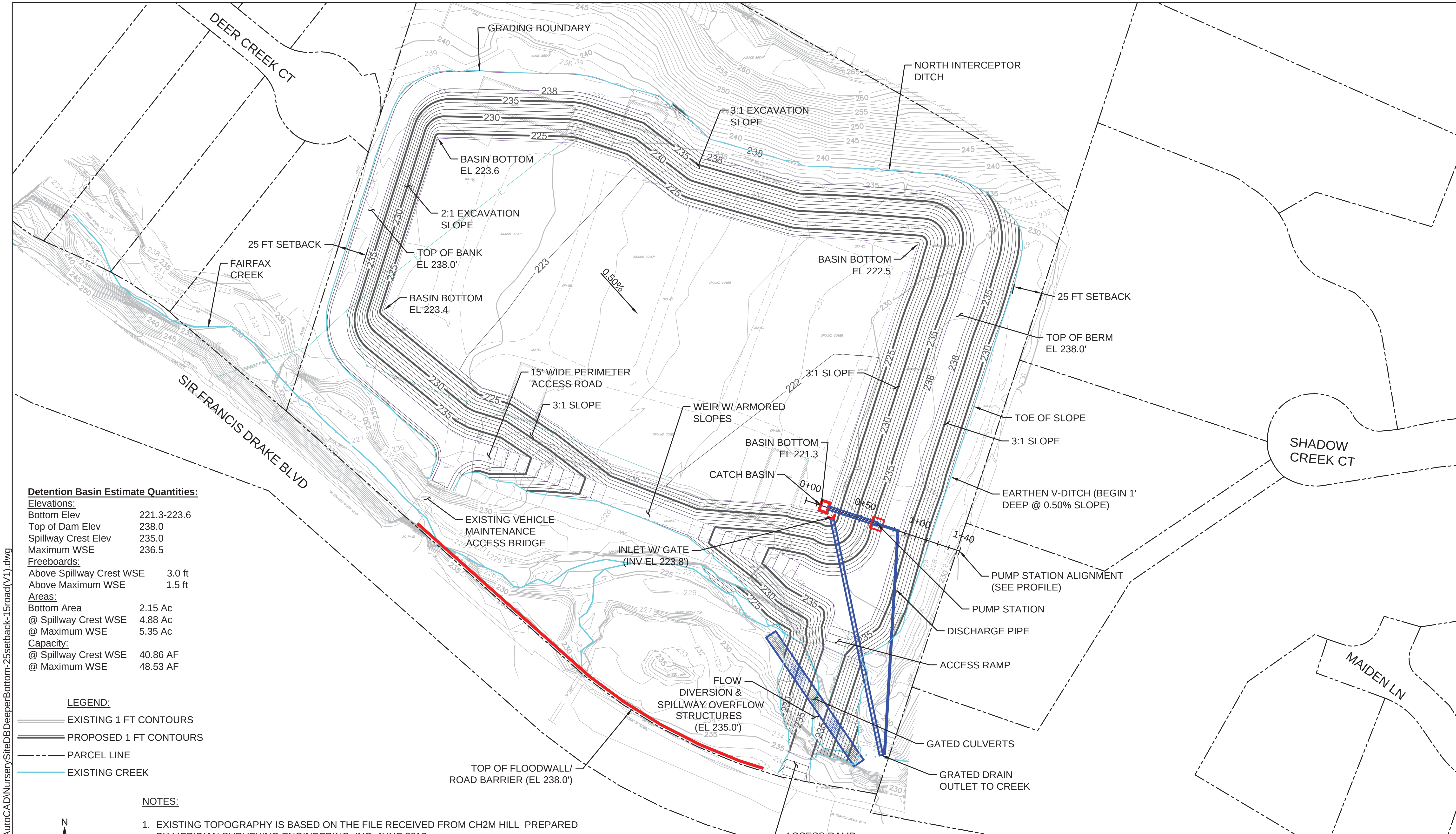
STETSON ENGINEERS INC.

DATE: JANUARY 12, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 2 (Proposed Project)

CH2M HILL DESIGN DETENTION BASIN WITH 50' SETBACK AND 15' PERIMETER ROAD

Figure 2



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	221.3-223.6
Top of Dam Elev	238.0
Spillway Crest Elev	235.0
Maximum WSE	236.5
Freeboards:	
Above Spillway Crest WSE	3.0 ft
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.15 Ac
@ Spillway Crest WSE	4.88 Ac
@ Maximum WSE	5.35 Ac
Capacity:	
@ Spillway Crest WSE	40.86 AF
@ Maximum WSE	48.53 AF

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

N W E S

SCALE (FEET)
0 40 80

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

F:\DATA\2431\17-16\AutoCAD\NurserySiteDBDeeperBottom-25setback-15road(V1).dwg

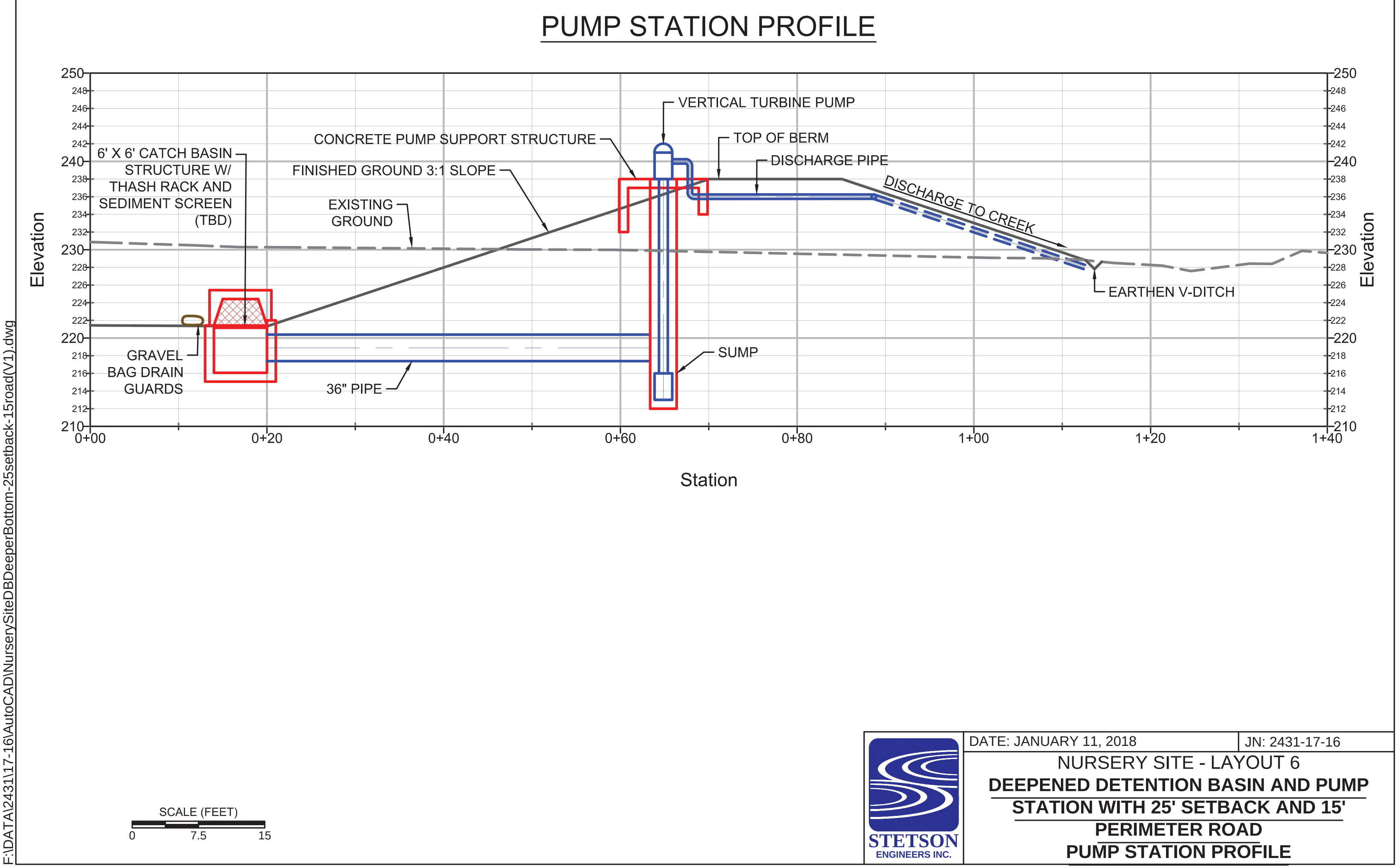
STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 6 (Deeper Basin)

DEEPENED DETENTION BASIN AND PUMP STATION WITH 25' SETBACK AND 15' PERIMETER ROAD

Figure 3



STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018

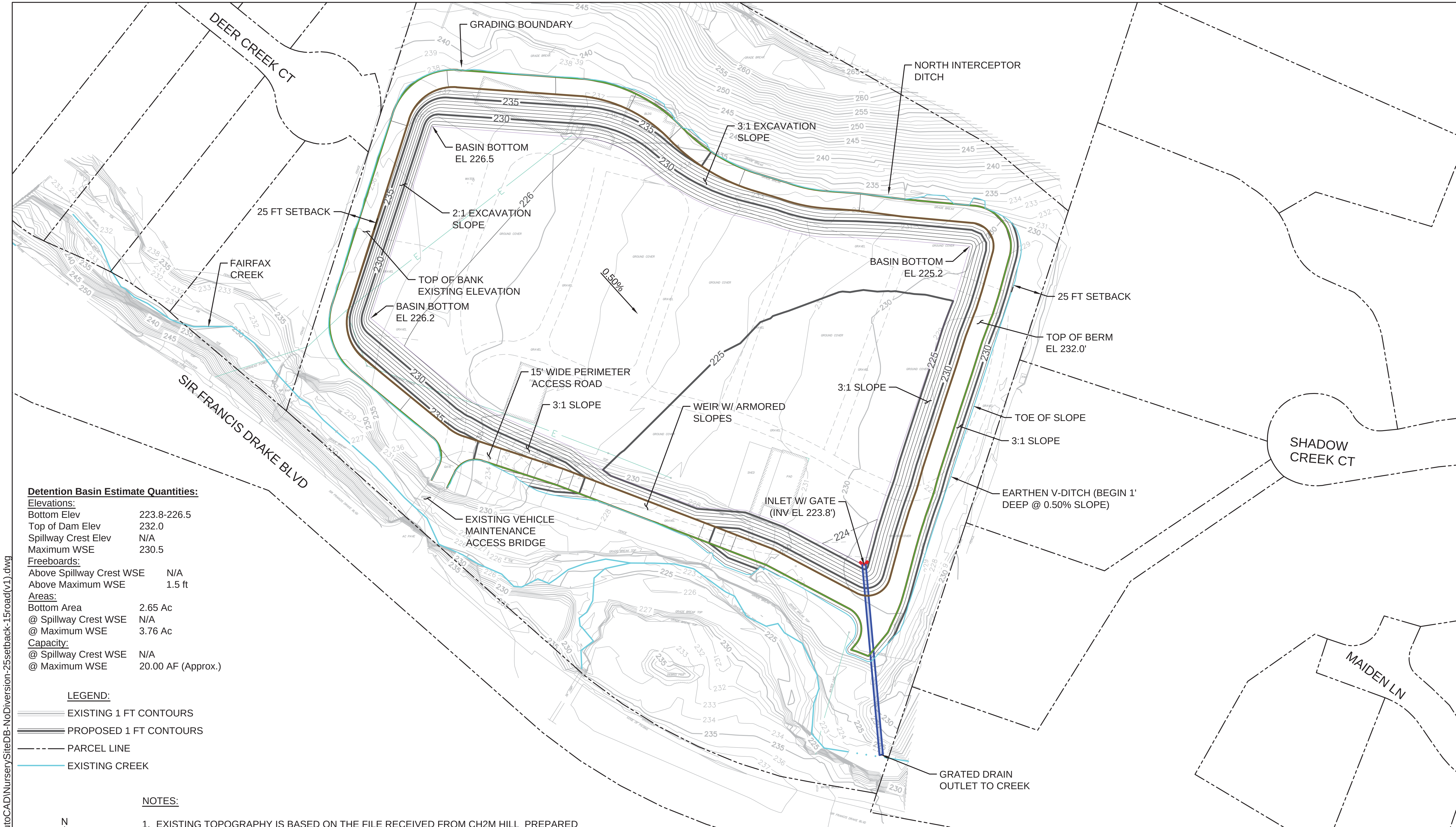
JN: 2431-17-16

NURSERY SITE - LAYOUT 6

DEEPENED DETENTION BASIN AND PUMP STATION WITH 25' SETBACK AND 15' PERIMETER ROAD

PUMP STATION PROFILE

Figure 4



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	223.8-226.5
Top of Dam Elev	232.0
Spillway Crest Elev	N/A
Maximum WSE	230.5
Freeboards:	
Above Spillway Crest WSE	N/A
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.65 Ac
@ Spillway Crest WSE	N/A
@ Maximum WSE	3.76 Ac
Capacity:	
@ Spillway Crest WSE	N/A
@ Maximum WSE	20.00 AF (Approx.)

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

N W E S

SCALE (FEET) 0 40 80

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

F:\DATA\2431\17-16\AutoCAD\NurserySiteDB-NoDiversion-25setback-15road(v1).dwg

STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 7 (Passive Basin)

NO CREEK DIVERSION DETENTION BASIN OPTION WITH 25' SETBACK AND 15' PERIMETER ROAD

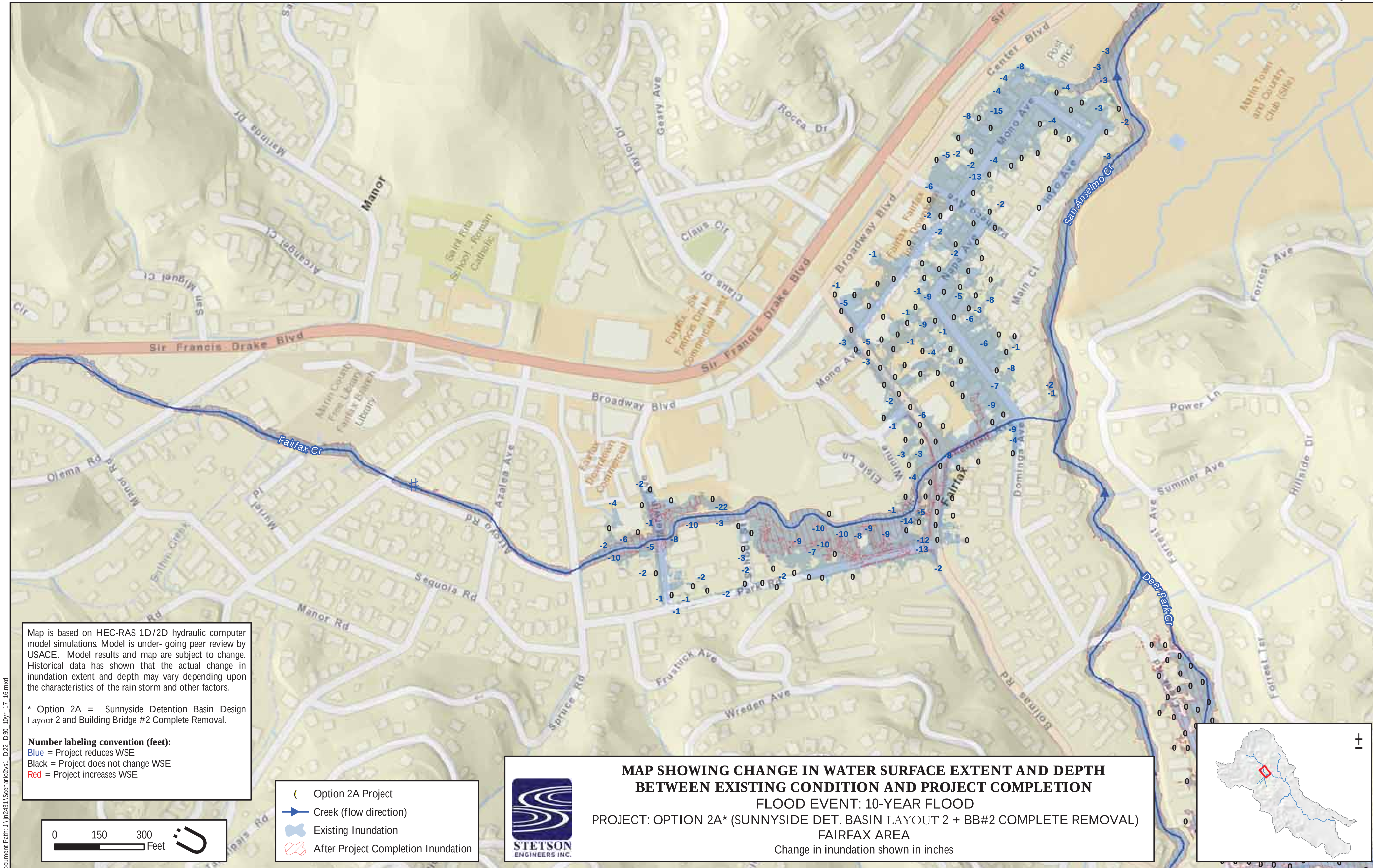
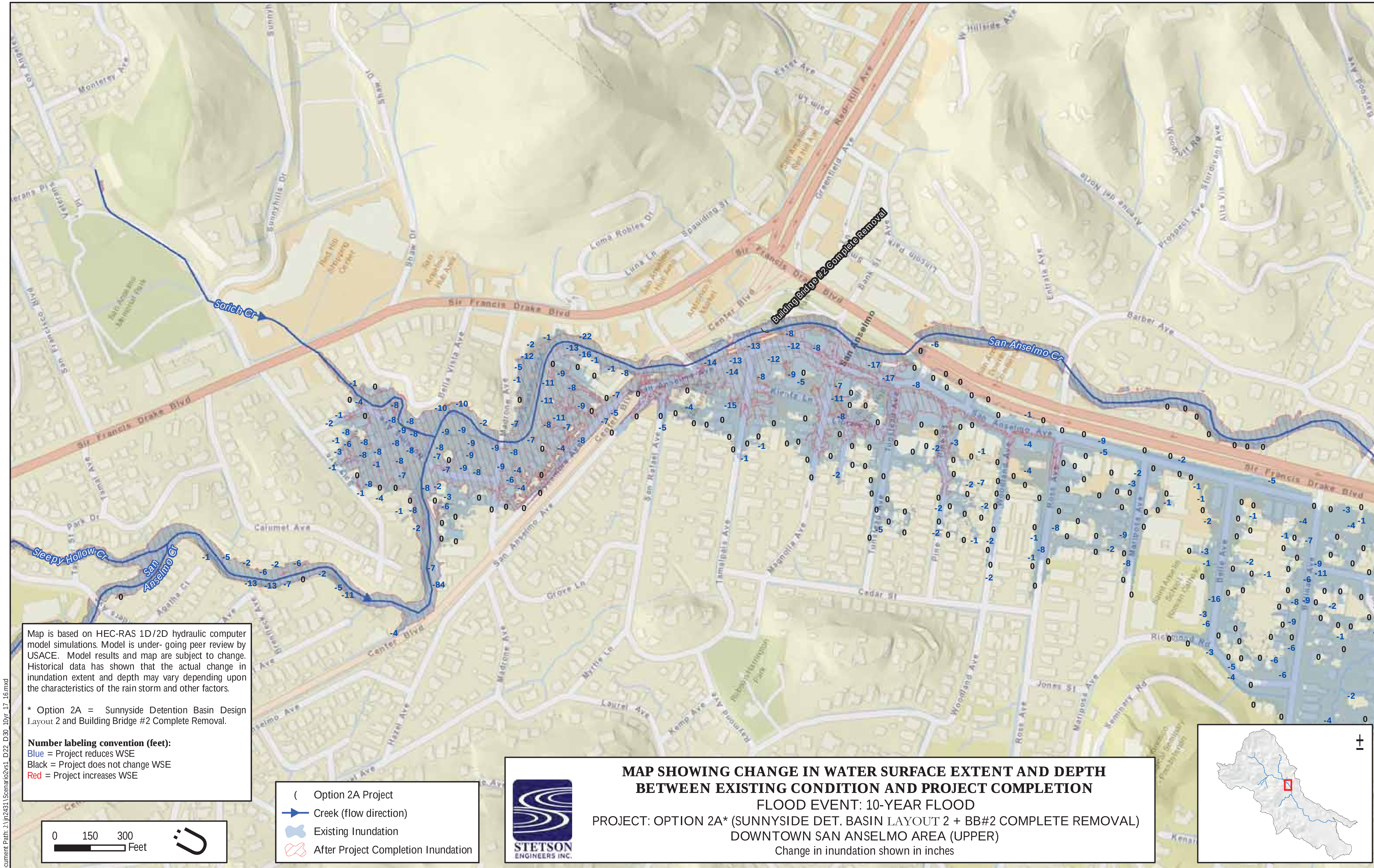

Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 150 300 Feet
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
STETSON ENGINEERS INC.
MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches
Sir Francis Drake Blvd
Broadway Blvd
Fairfax Cr
San Anselmo Cr
Deer Park Cr
Center Blvd
Bolinas Rd
Manor Rd
Sequoia Rd
Park Rd
Marin Town and Country Club (Site)
Saint Rita School - Roman Catholic
Marin County Free Library Fairfax Branch Library
Document Path: J:\jn2431\Scenario2vs1_D22_D30_10yr_17_16.mxd

Figure 5b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 10-YEAR FLOOD

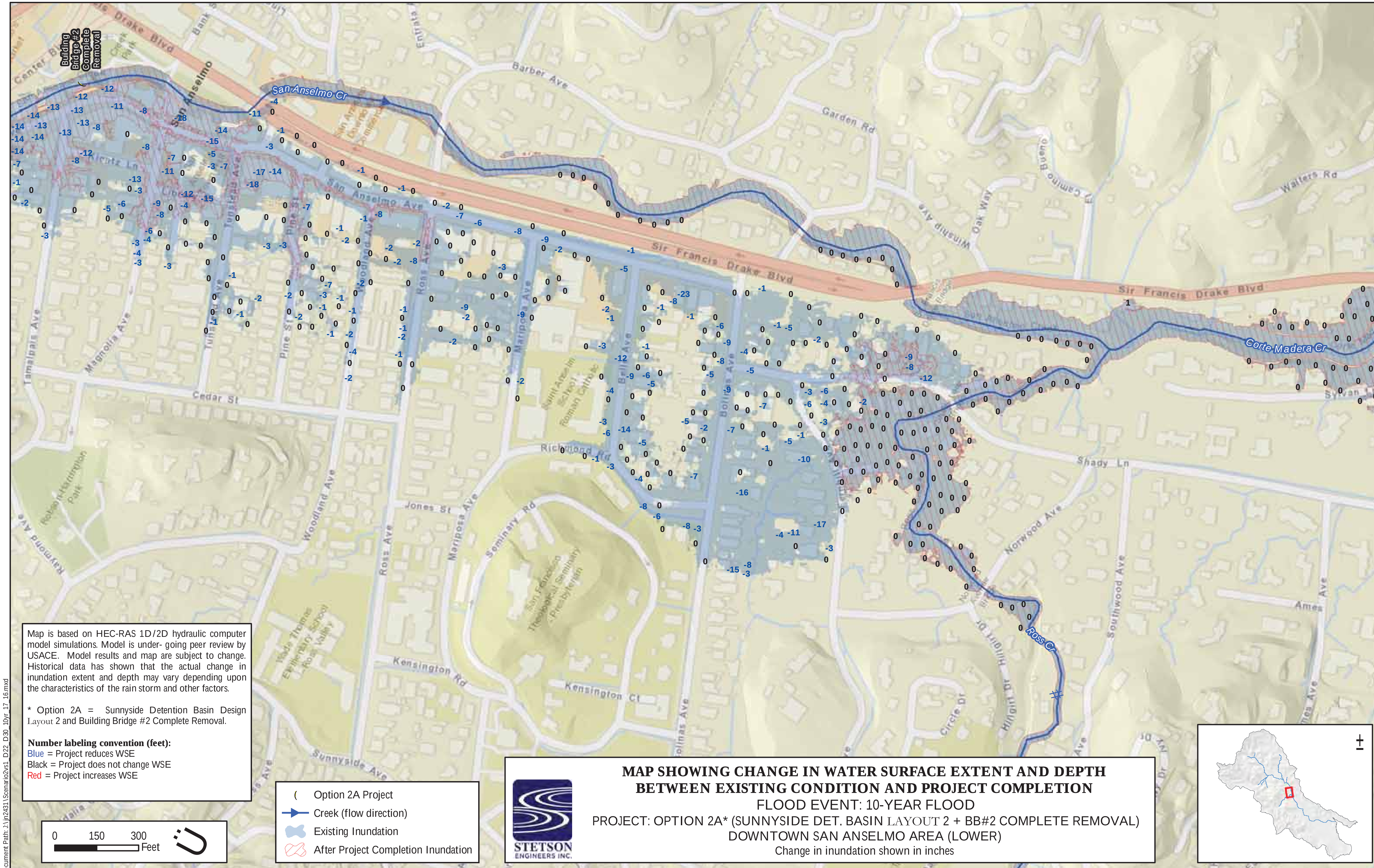
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D22_D30_10yr_17_16.mxd



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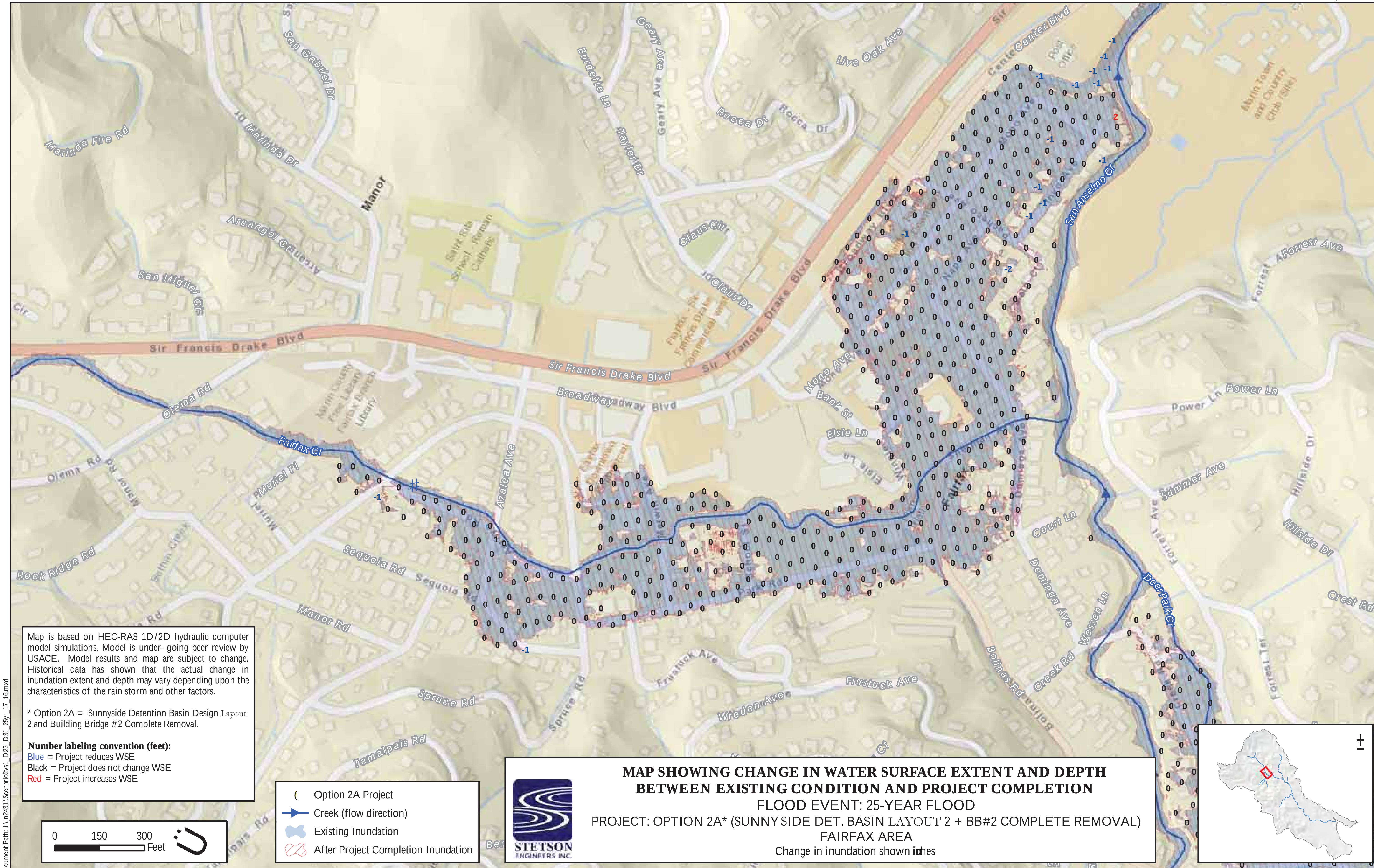


Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

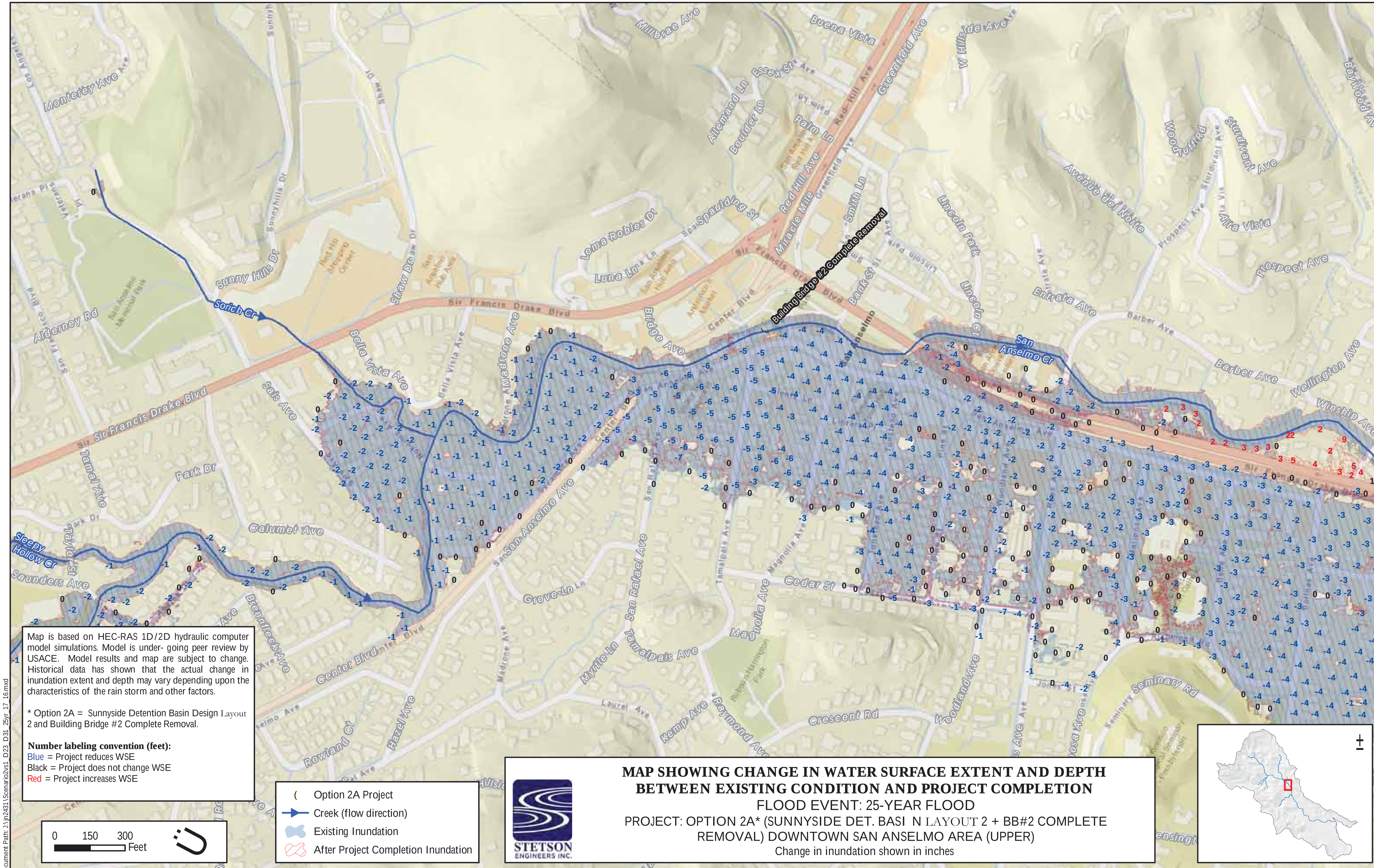
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNY SIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown inches

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):

Blue = Project reduces WSE

Black = Project does not change WSE

Red = Project increases WSE

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD

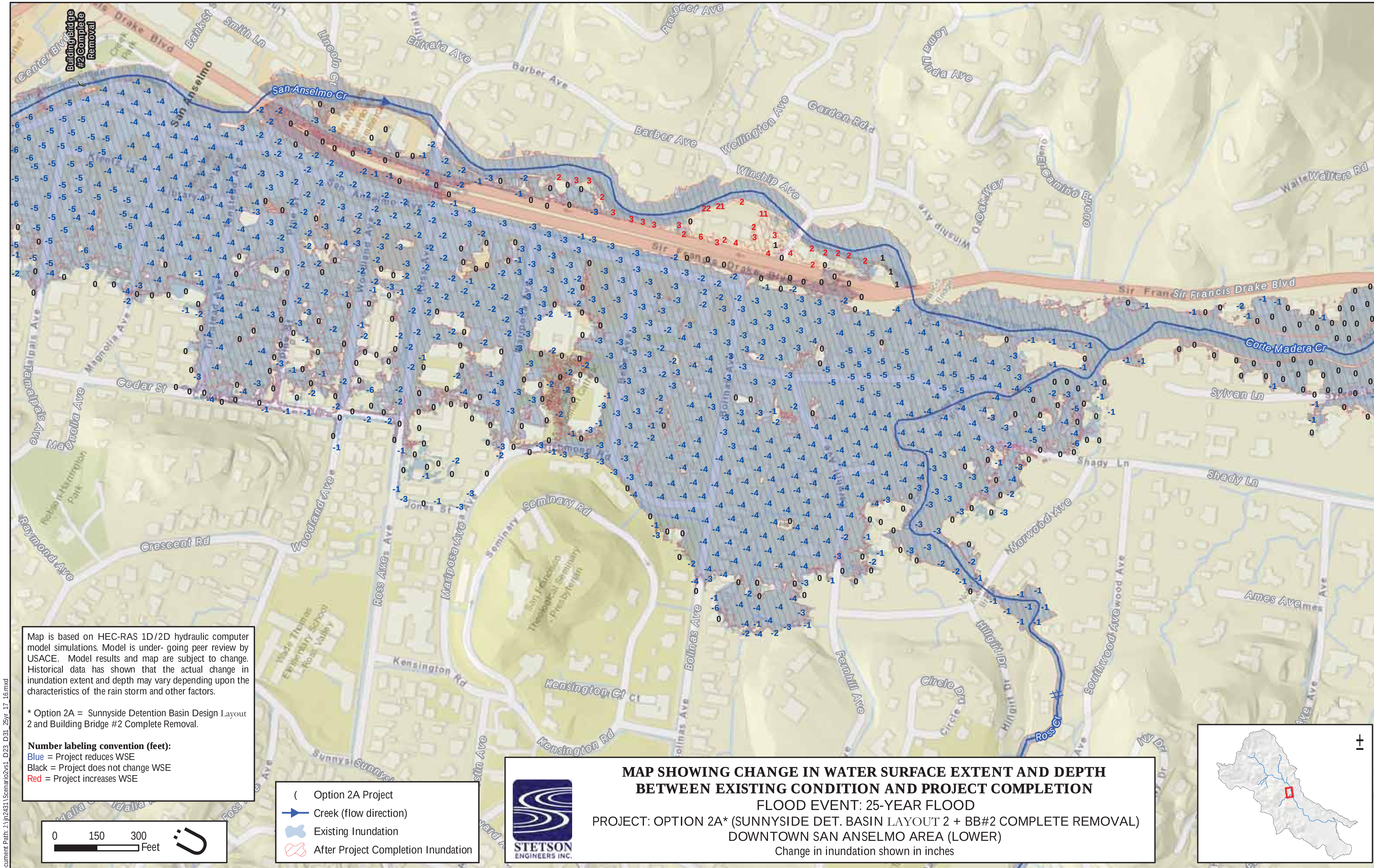
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASI N LAYOUT 2 + BB#2 COMPLETE REMOVAL) DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd

Figure 6c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

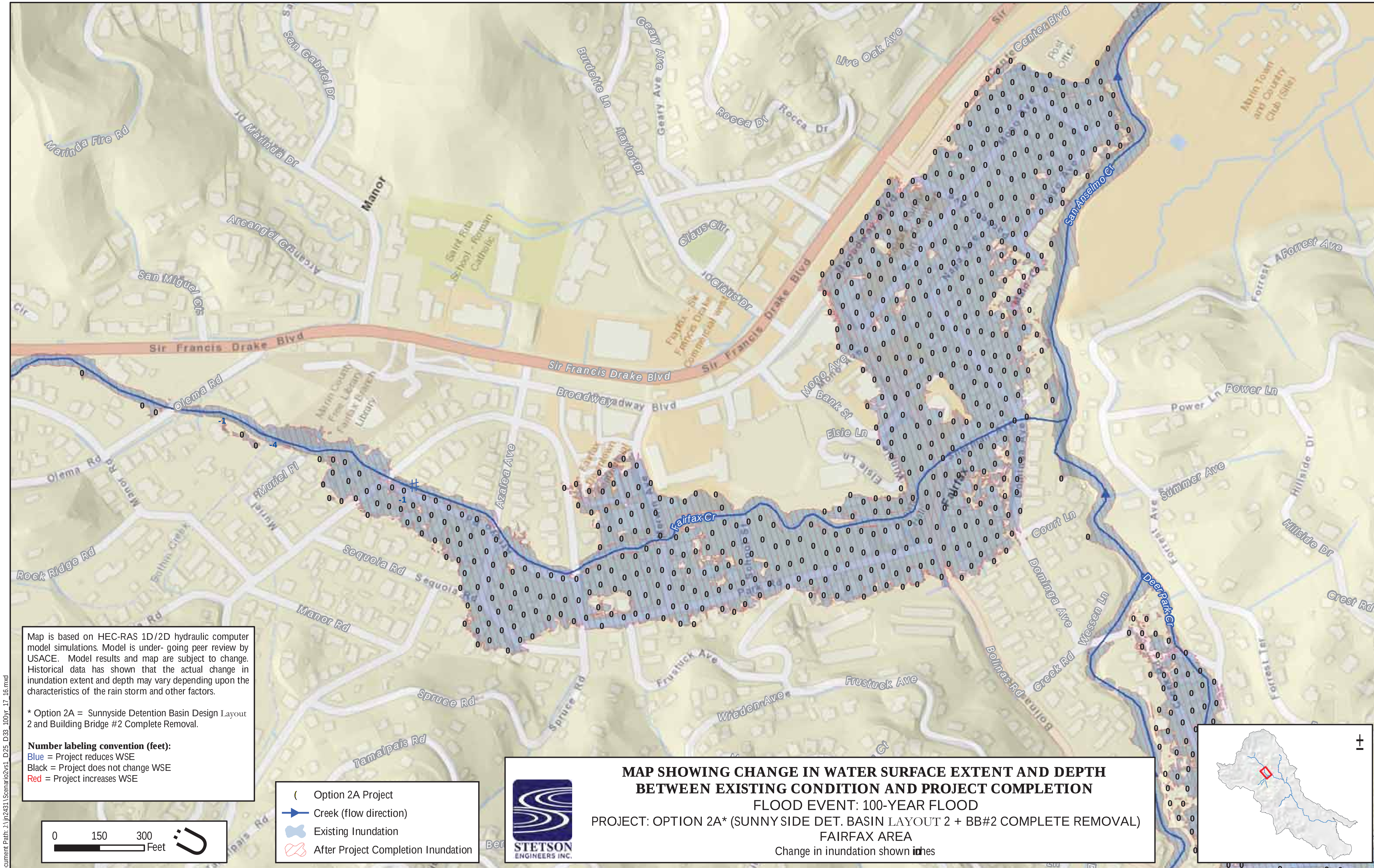
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd

Figure 7a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

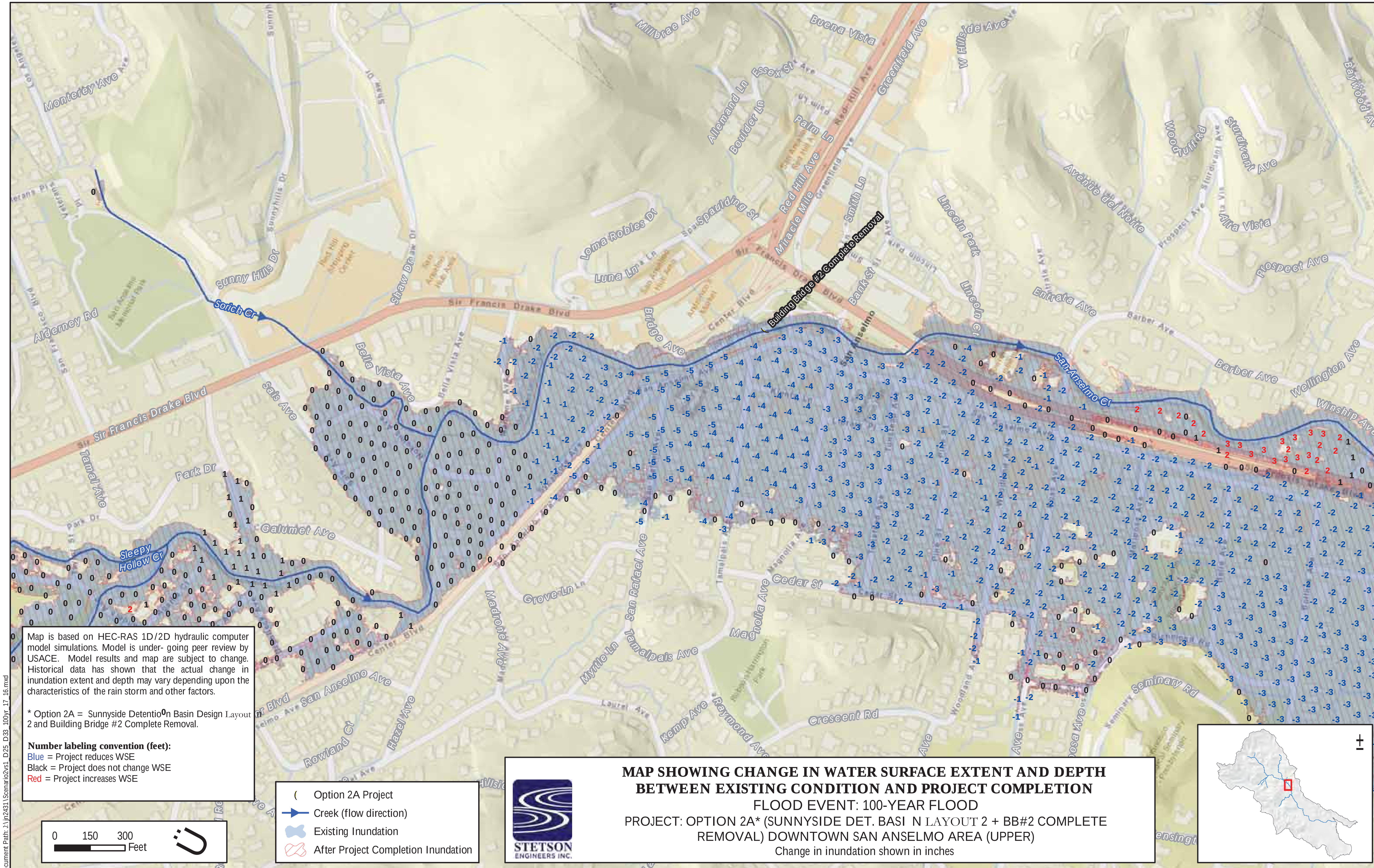
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNY SIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D25_D33_100yr_17_16.mxd

Figure 7b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

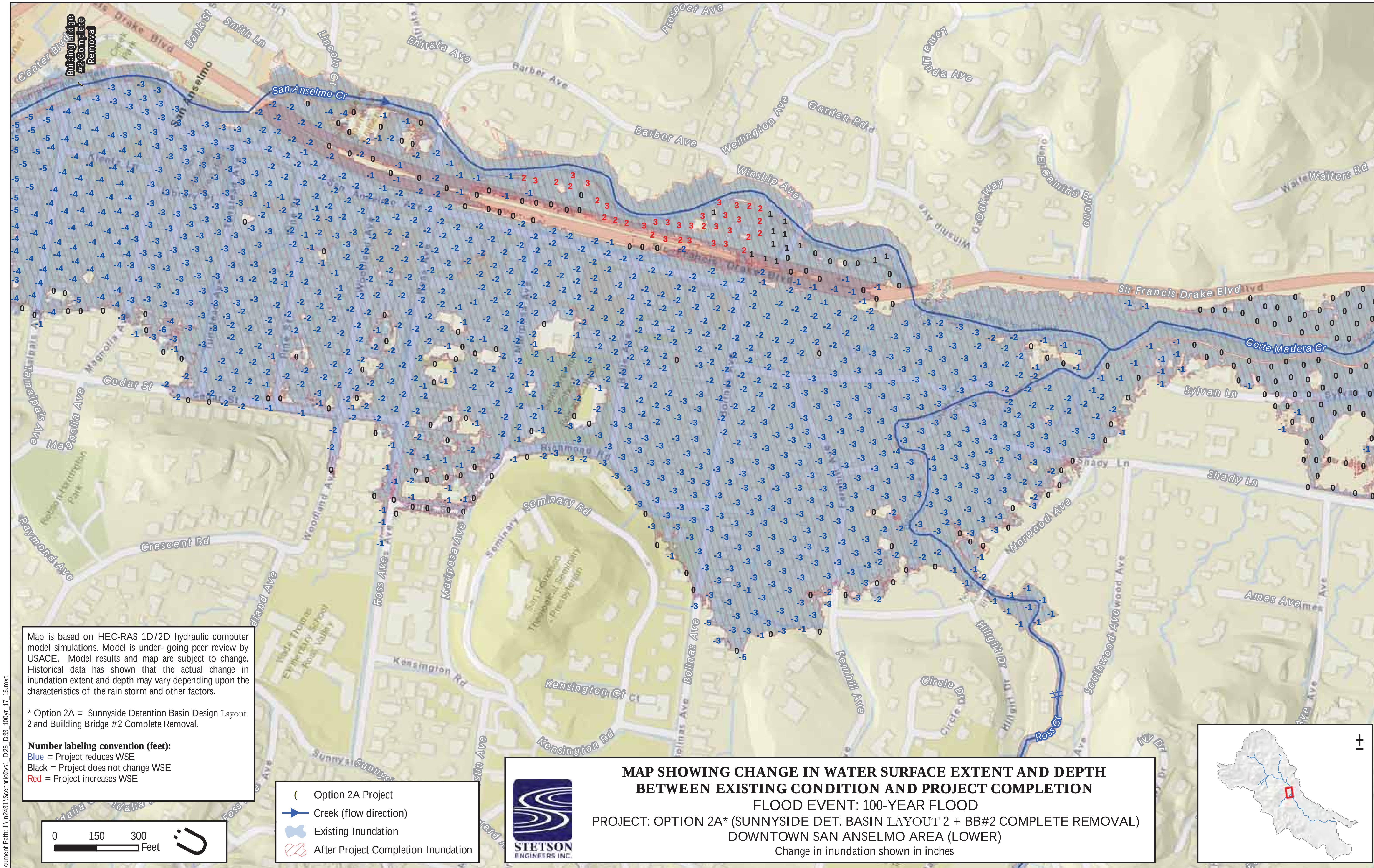
FLOOD EVENT: 100-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL) DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2vs1_D25_D33_100yr_17_16.mxd

Figure 7c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):

Blue = Project reduces WSE

Black = Project does not change WSE

Red = Project increases WSE

0 150 300 Feet

Option 2A Project

Creek (flow direction)

Existing Inundation

After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

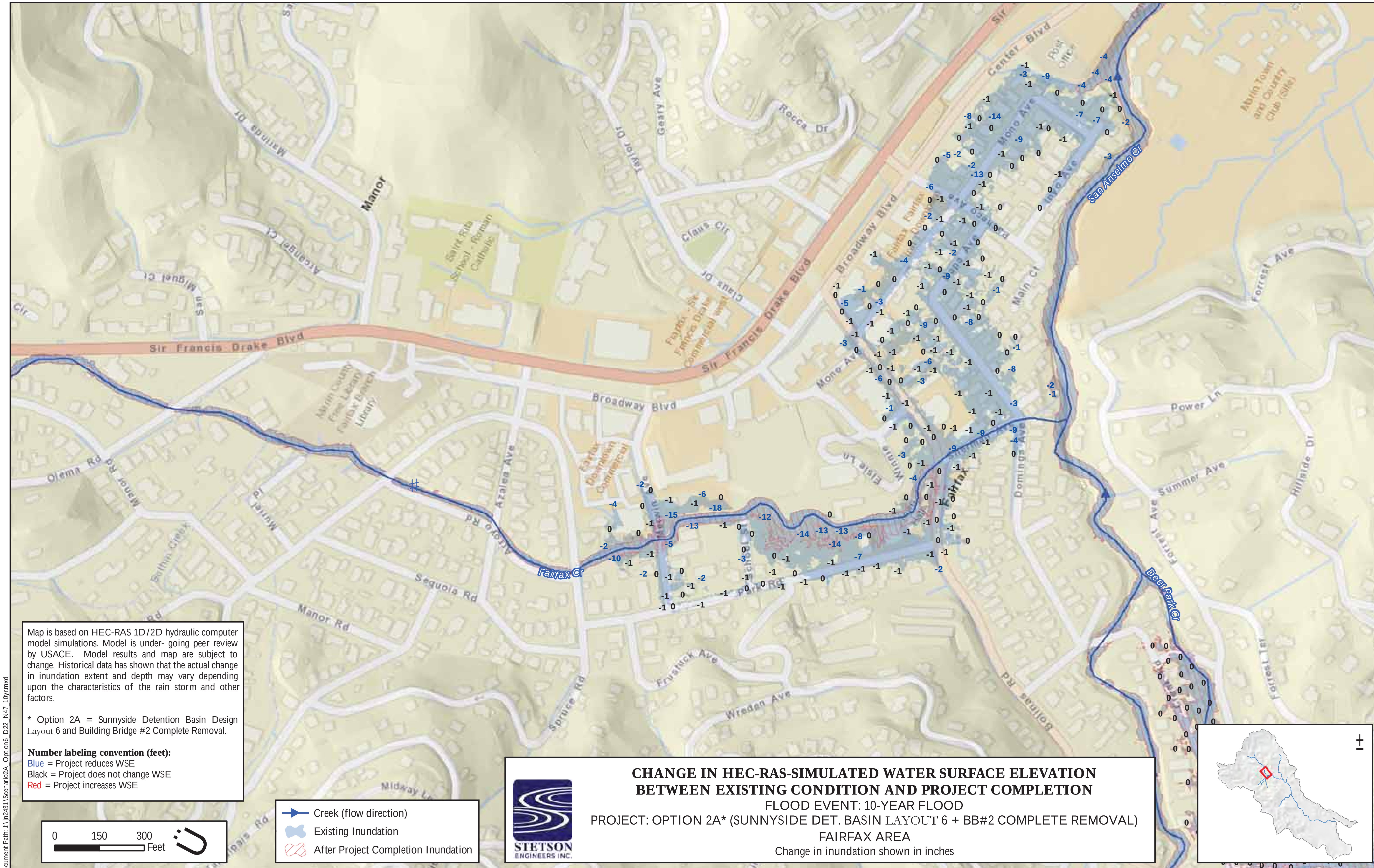
FLOOD EVENT: 100-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)

DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2vs1_D25_D33_100yr_17_16.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

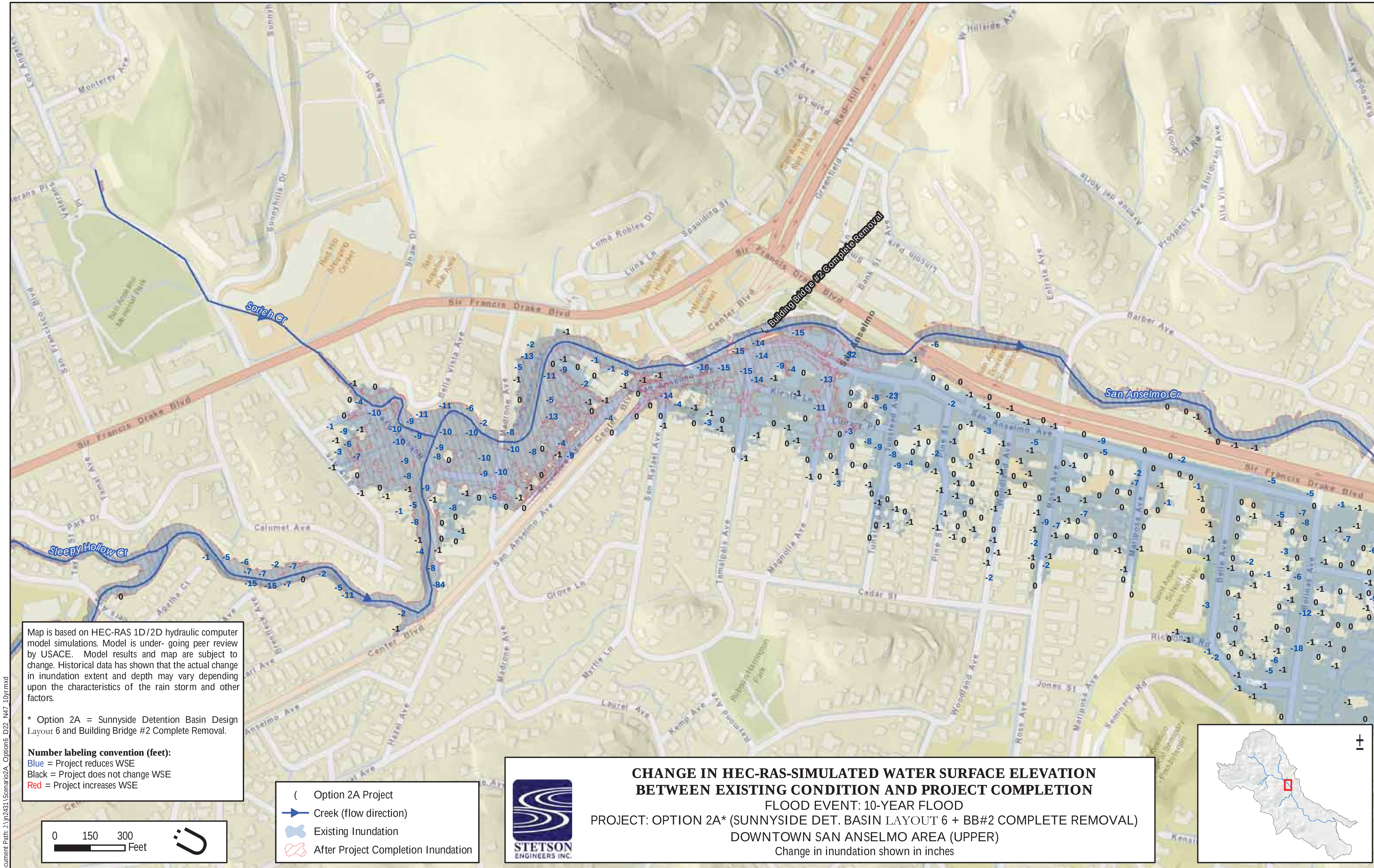
0 150 300 Feet

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option6_D22_N47_10yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

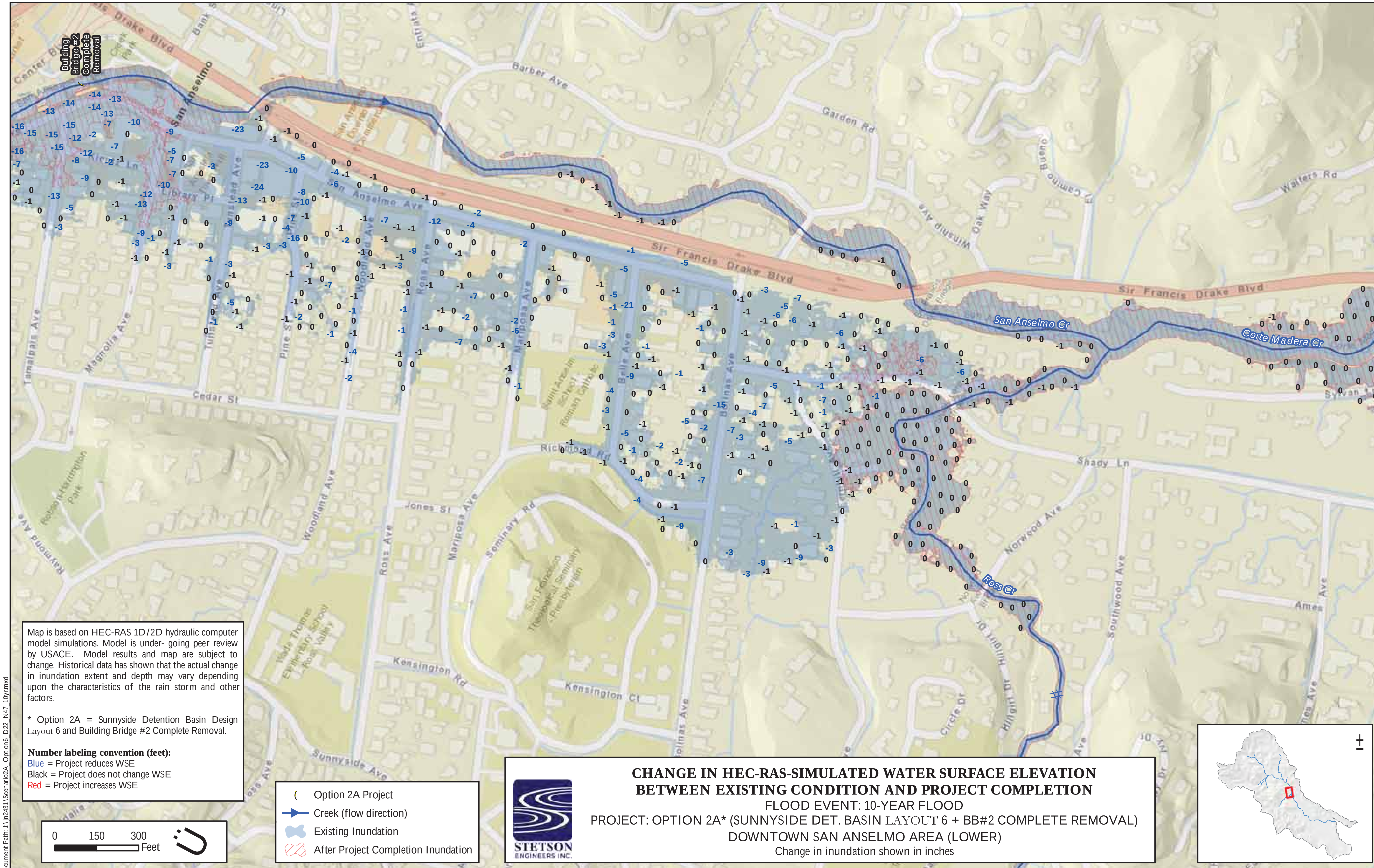
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option6_D22_N47_10yr.mxd

Figure 9a

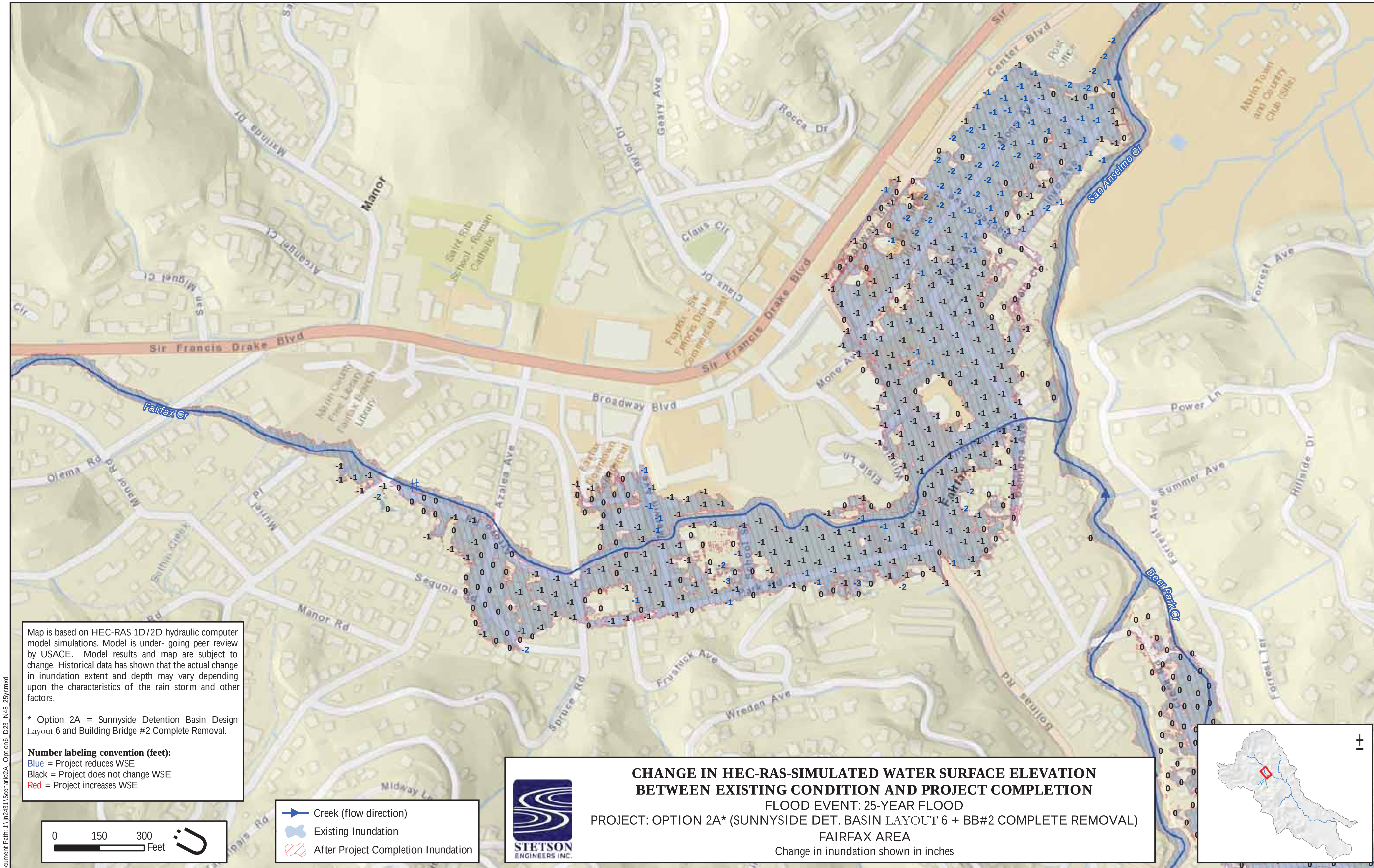

Sir Francis Drake Blvd
Broadway Blvd
Center Blvd
Fairfax Cr
San Anselmo Cr
Deer Park Cr
Marinda Dr
Manor
Arcangel Cir
Miguel Cir
Saint Rita School - Roman Catholic
Taylor Dr
Geary Ave
Rocca Dr
Claus Cir
Marin Town and Country Club (Site)
Forrest Ave
Power Ln
Summer Ave
Hillside Dr
Olema Rd
Manor Rd
Muriel Pl
Azalea Ave
Sequoia
Frustuck Ave
Wreden Ave
Spruce Rd
Bolinas Rd
Mono Ave
Elsie Ln
Forrest Ter
Midway Ln
Tamalpais Rd
Marin County Free Library Fairfax Branch Library
Post Office
Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 150 300 Feet
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
STETSON ENGINEERS INC.
CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches
Document Path: J:\jn2431\Scenario2A_Option6_D23_N48_25yr.mxd

Figure 9b

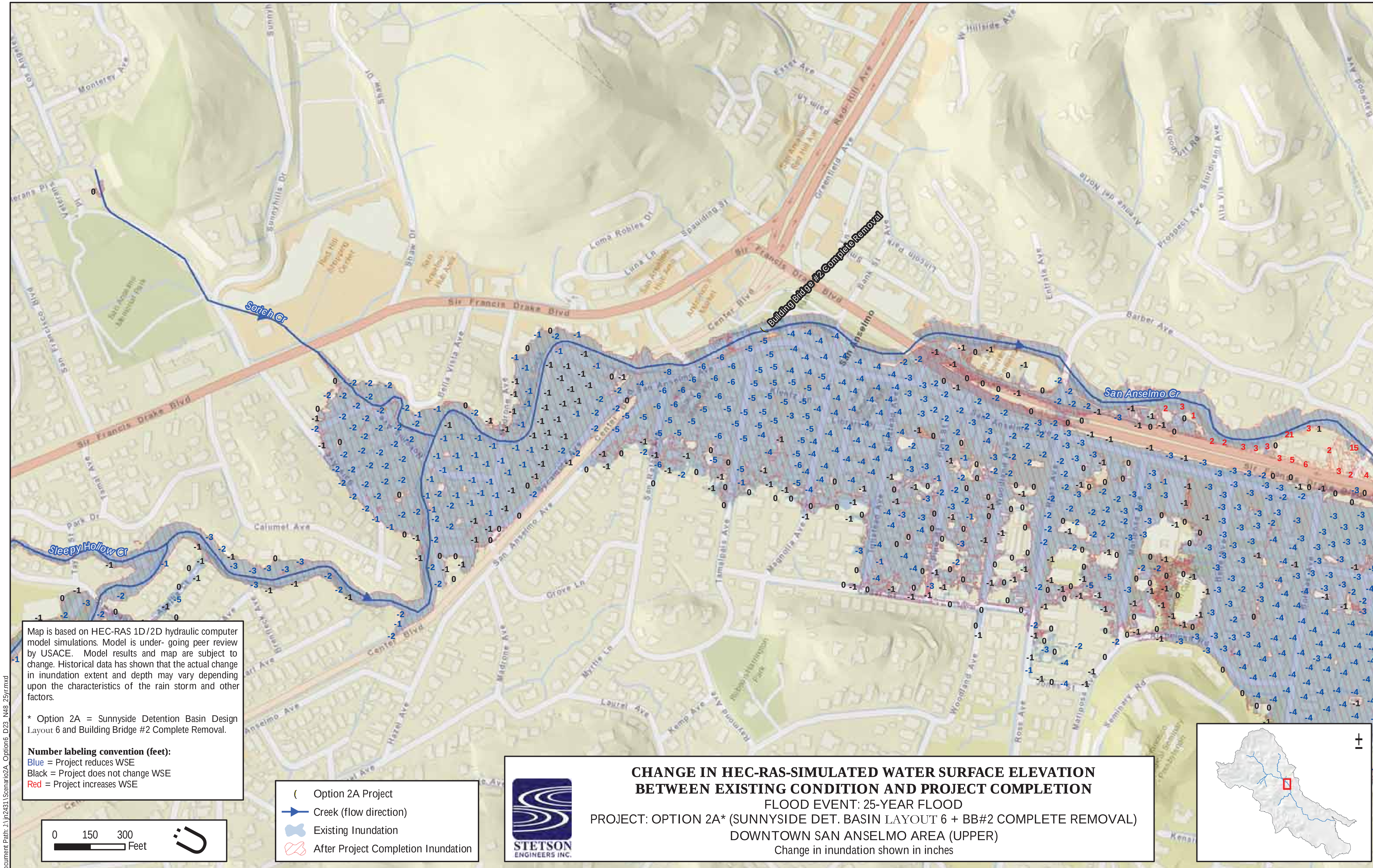
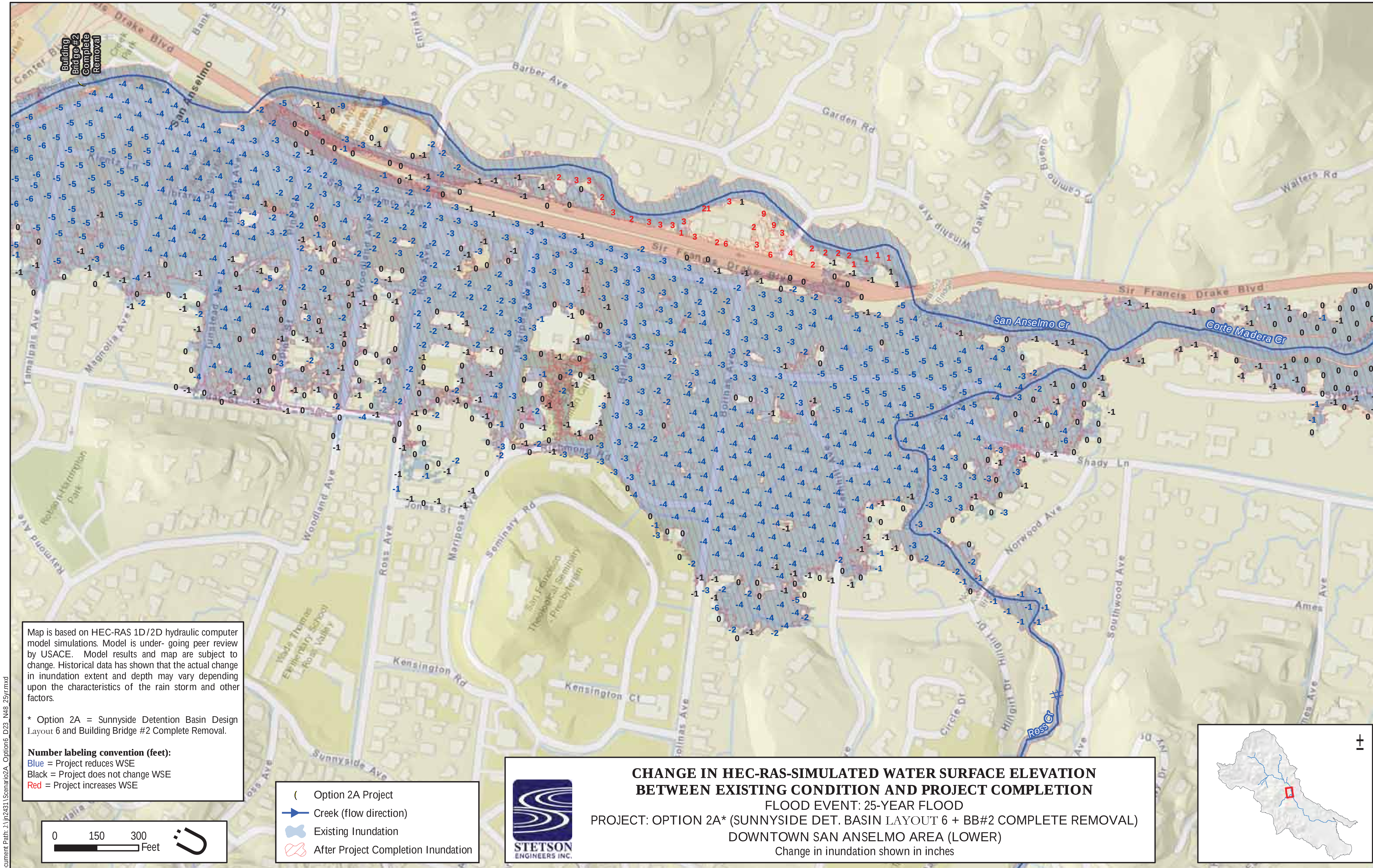

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION
BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches
STETSON ENGINEERS INC.
Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
0 150 300
Feet
Building Bridge #2 Complete Removal
Sorich Cr
Sleepy Hollow Cr
San Anselmo Cr
Sir Francis Drake Blvd
Center Blvd
Red Hill Ave
Document Path: J:\jn2431\Scenario2A_Option6_D23_N48_25yr.mxd

Figure 9c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

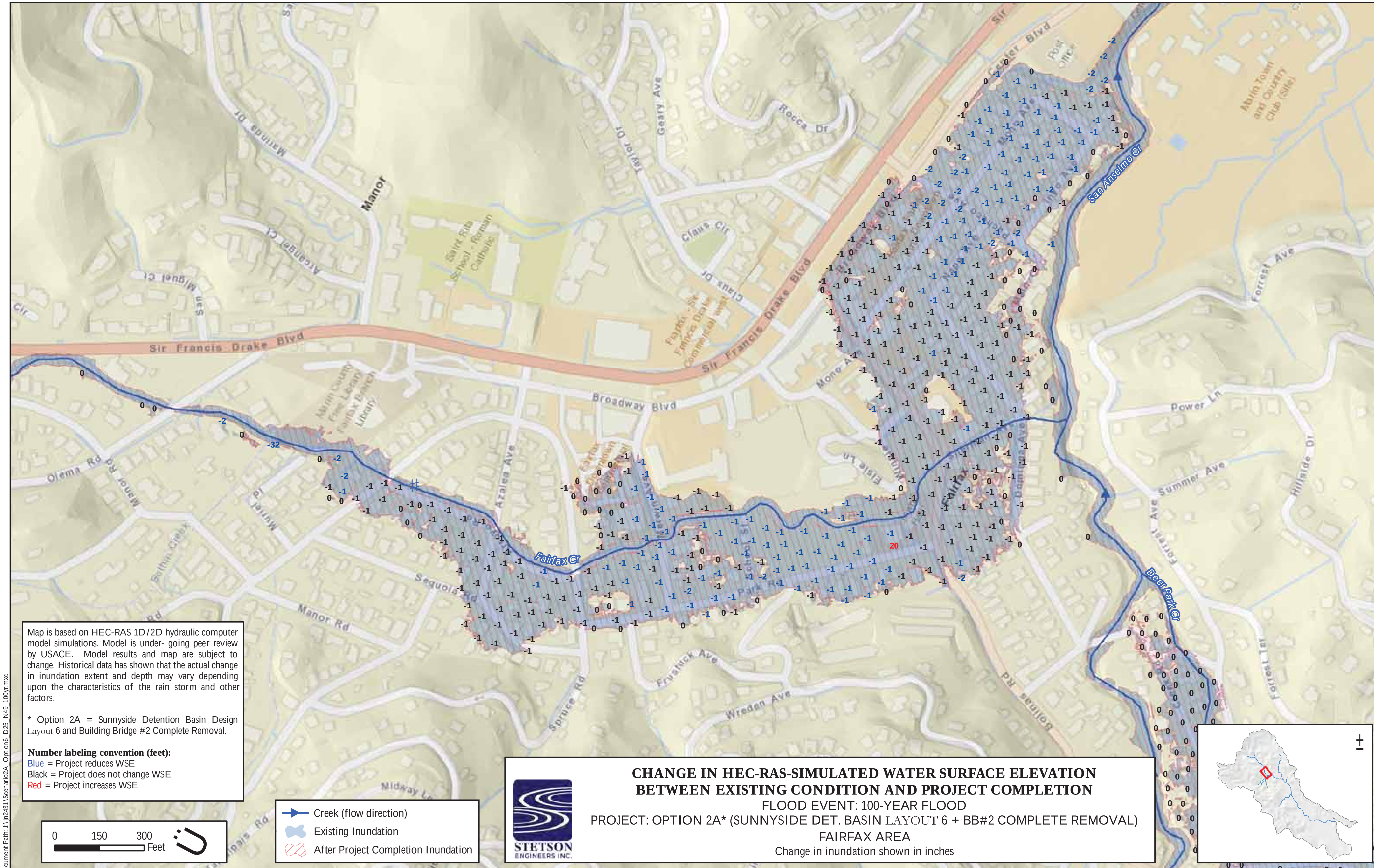
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

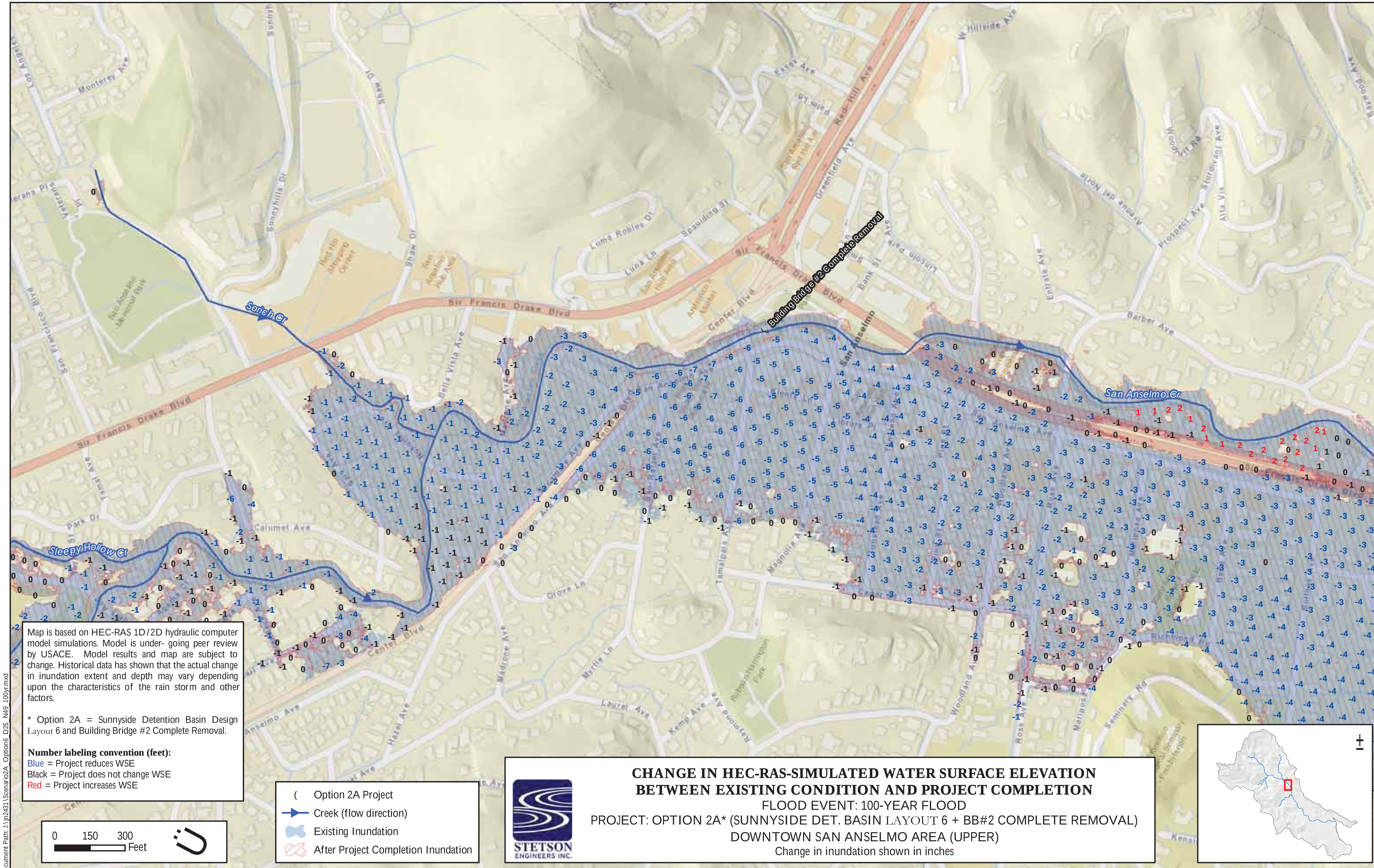
Document Path: J:\jn2431\Scenario2A_Option6_D23_N48_25yr.mxd

Figure 10a



Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd

Figure 10b



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* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

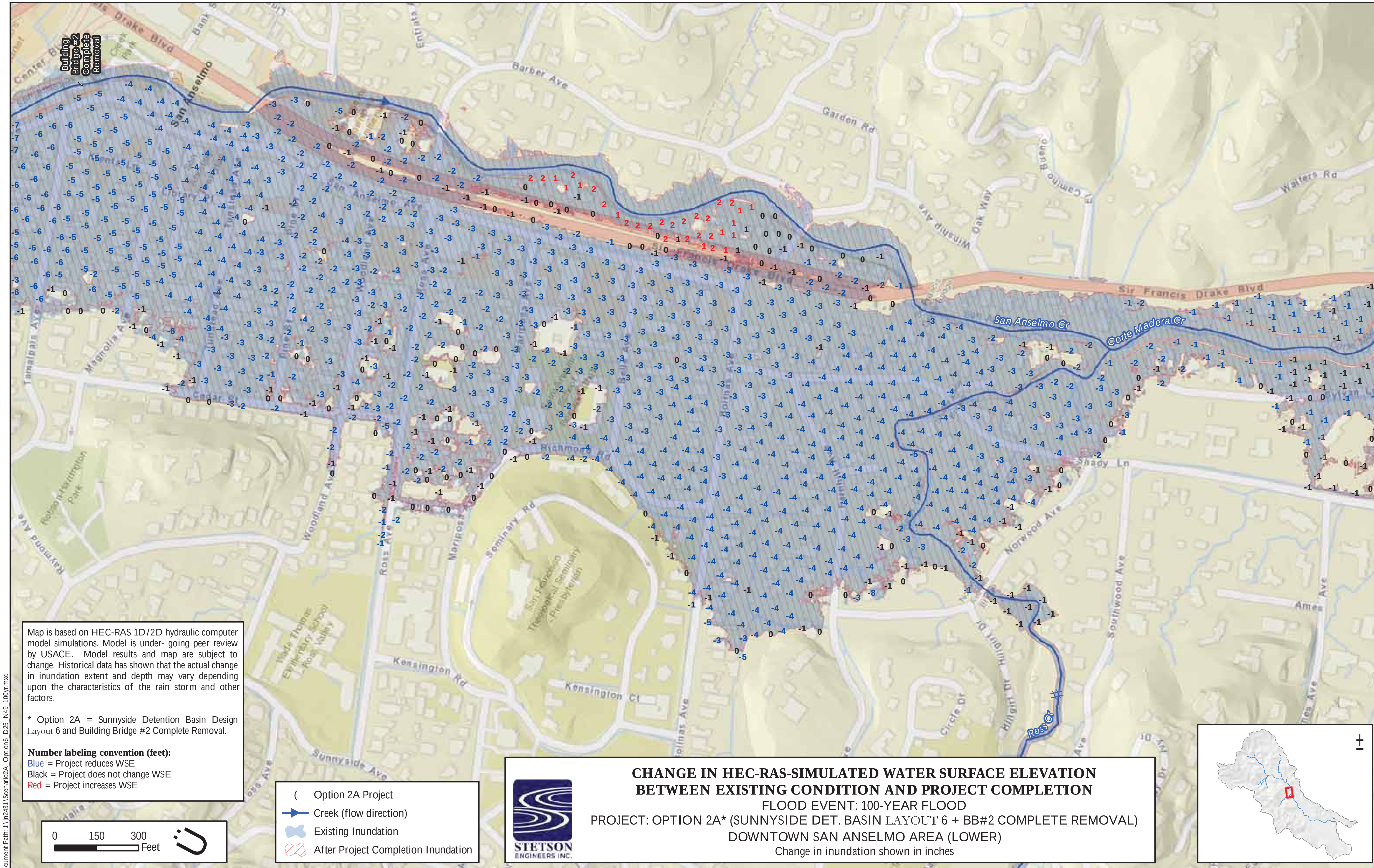
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd

Figure 10c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

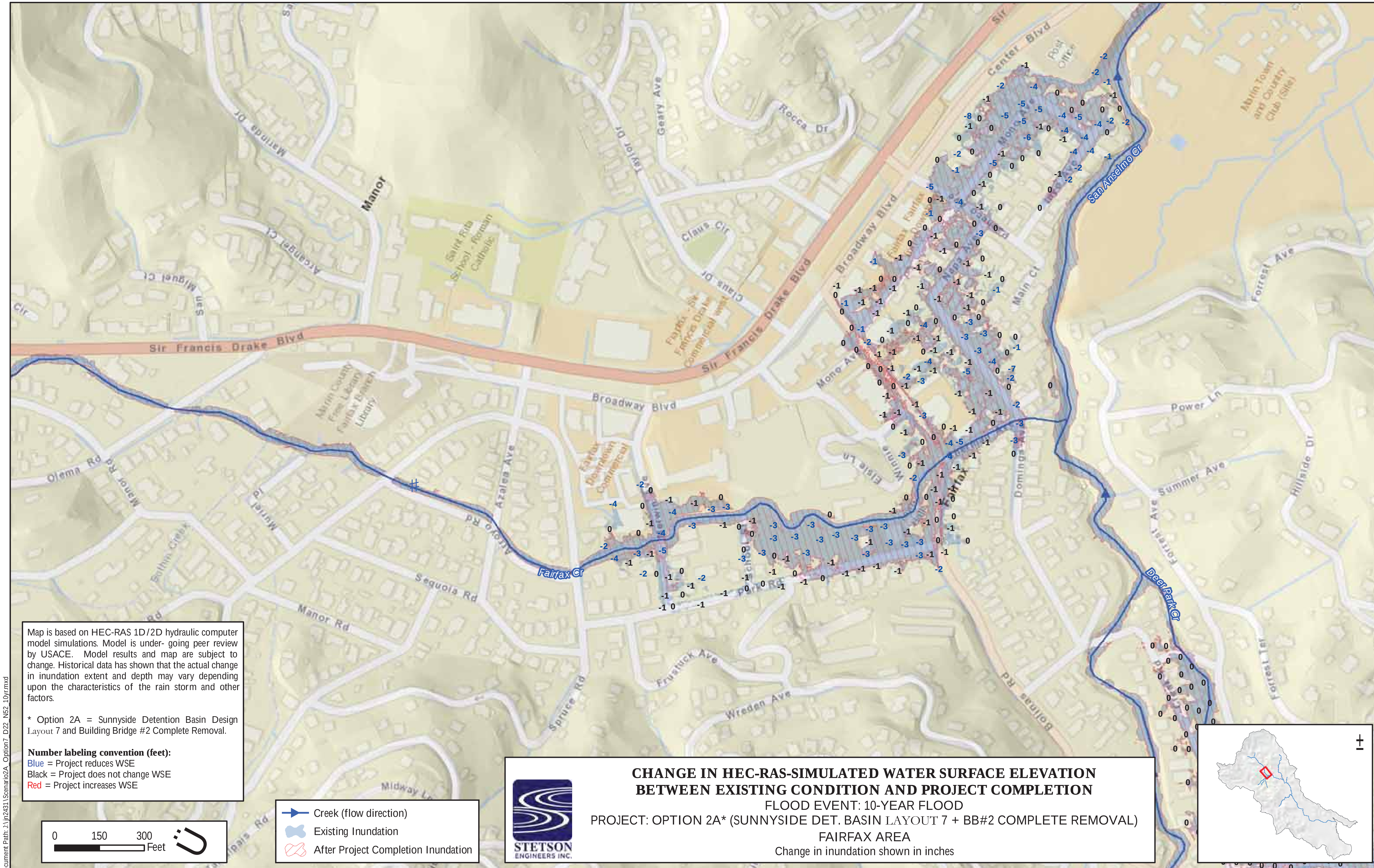
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd

Figure 11a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

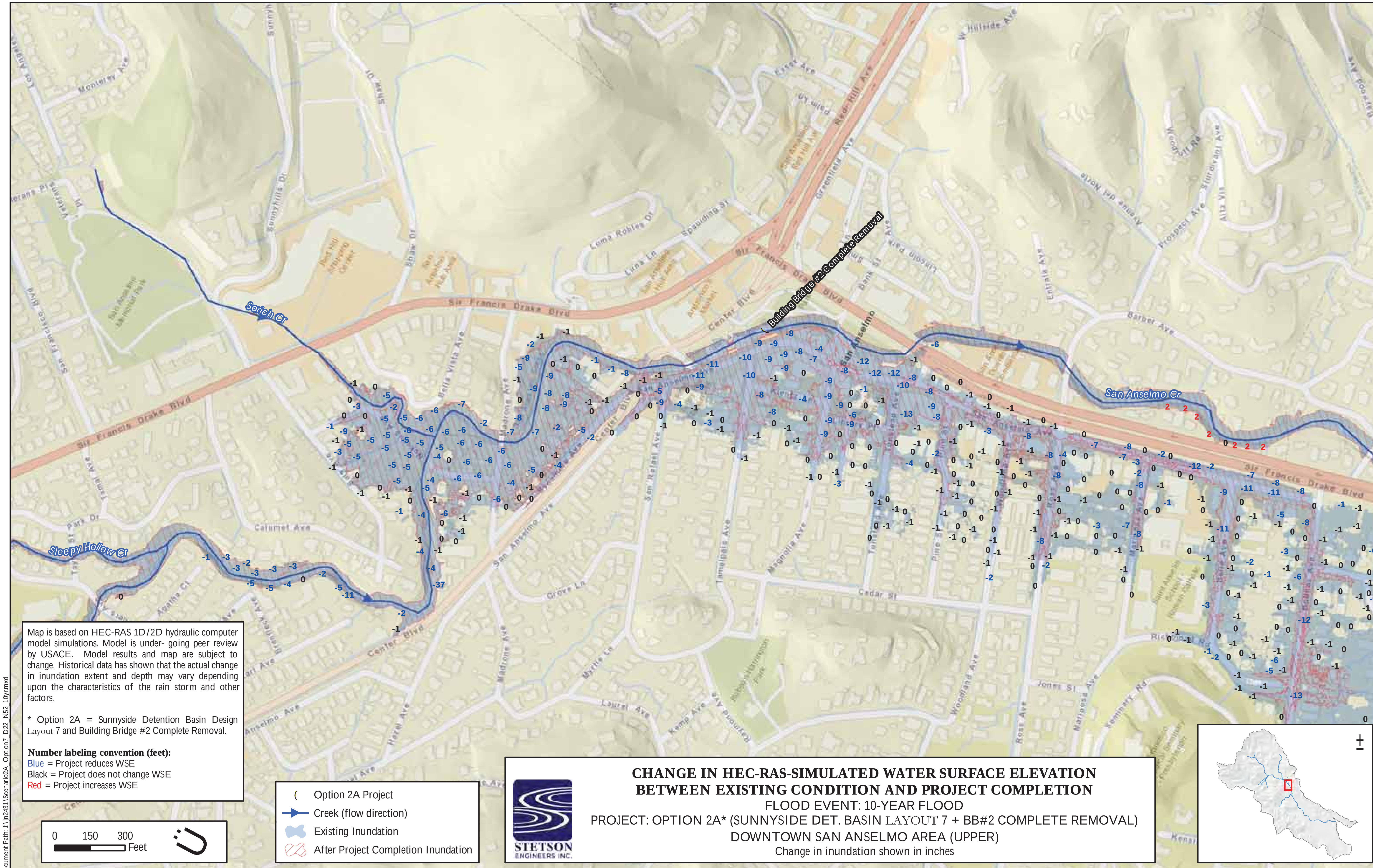
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.



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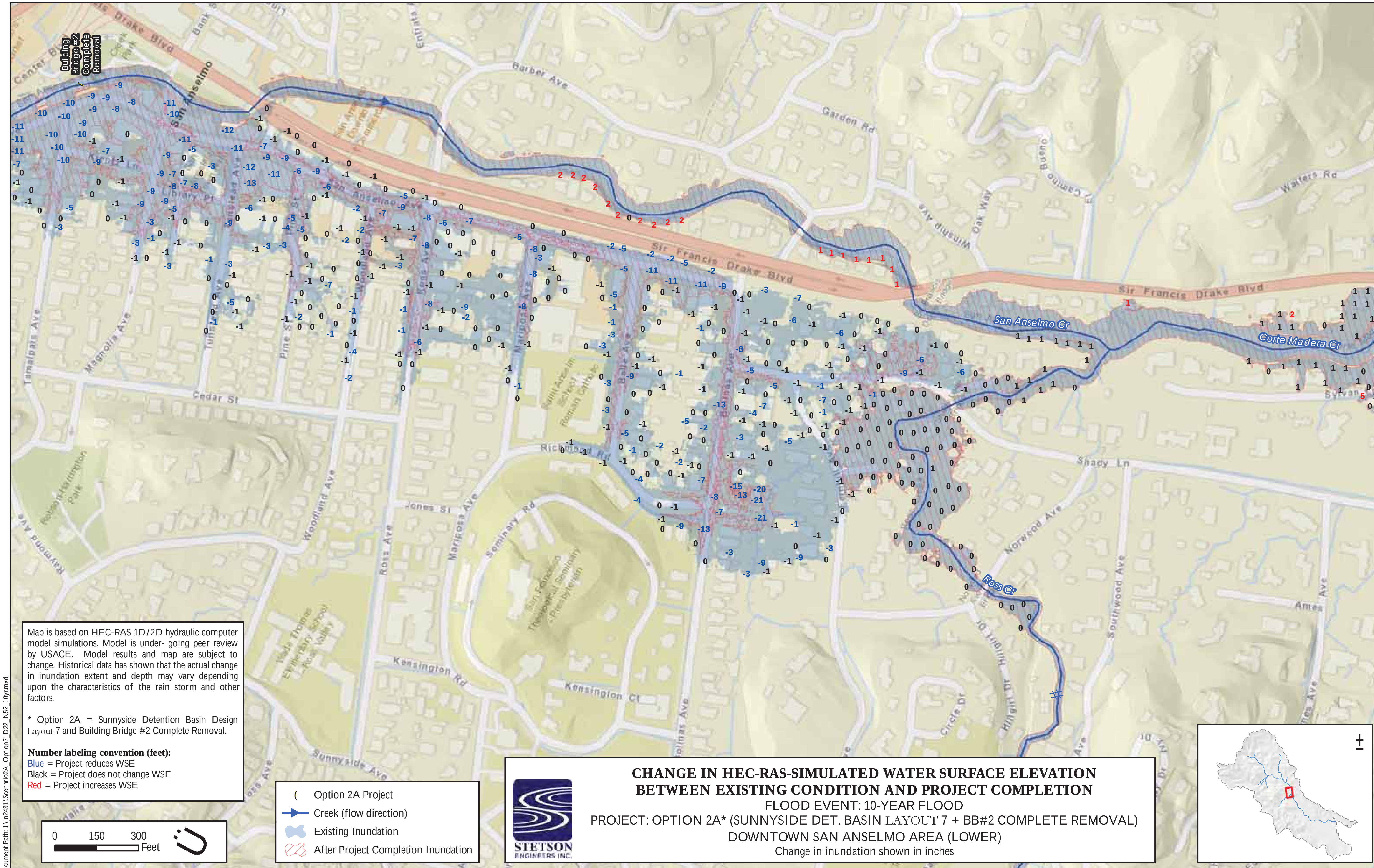
* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

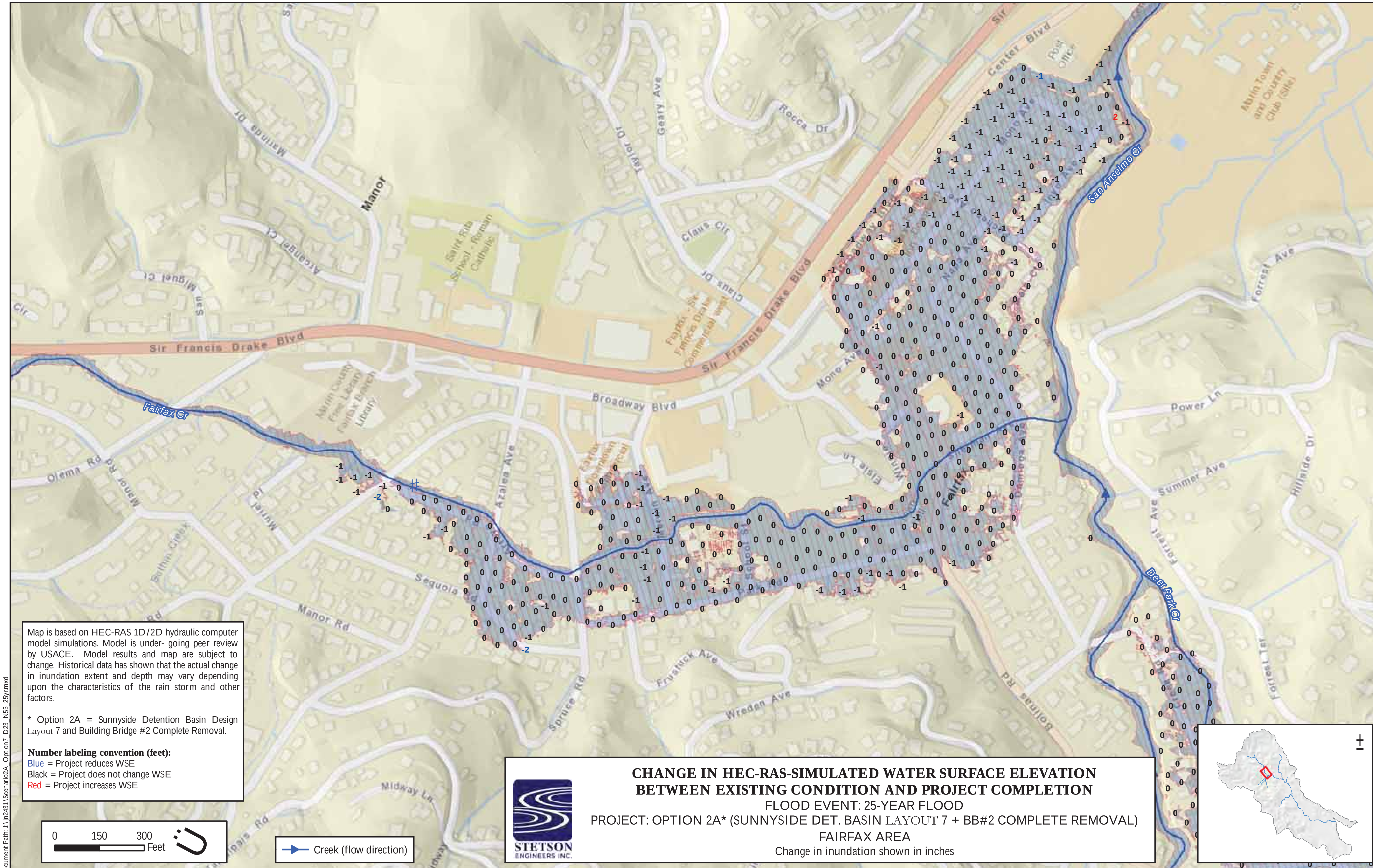
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D22_N52_10yr.mxd

Figure 12a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Creek (flow direction)

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

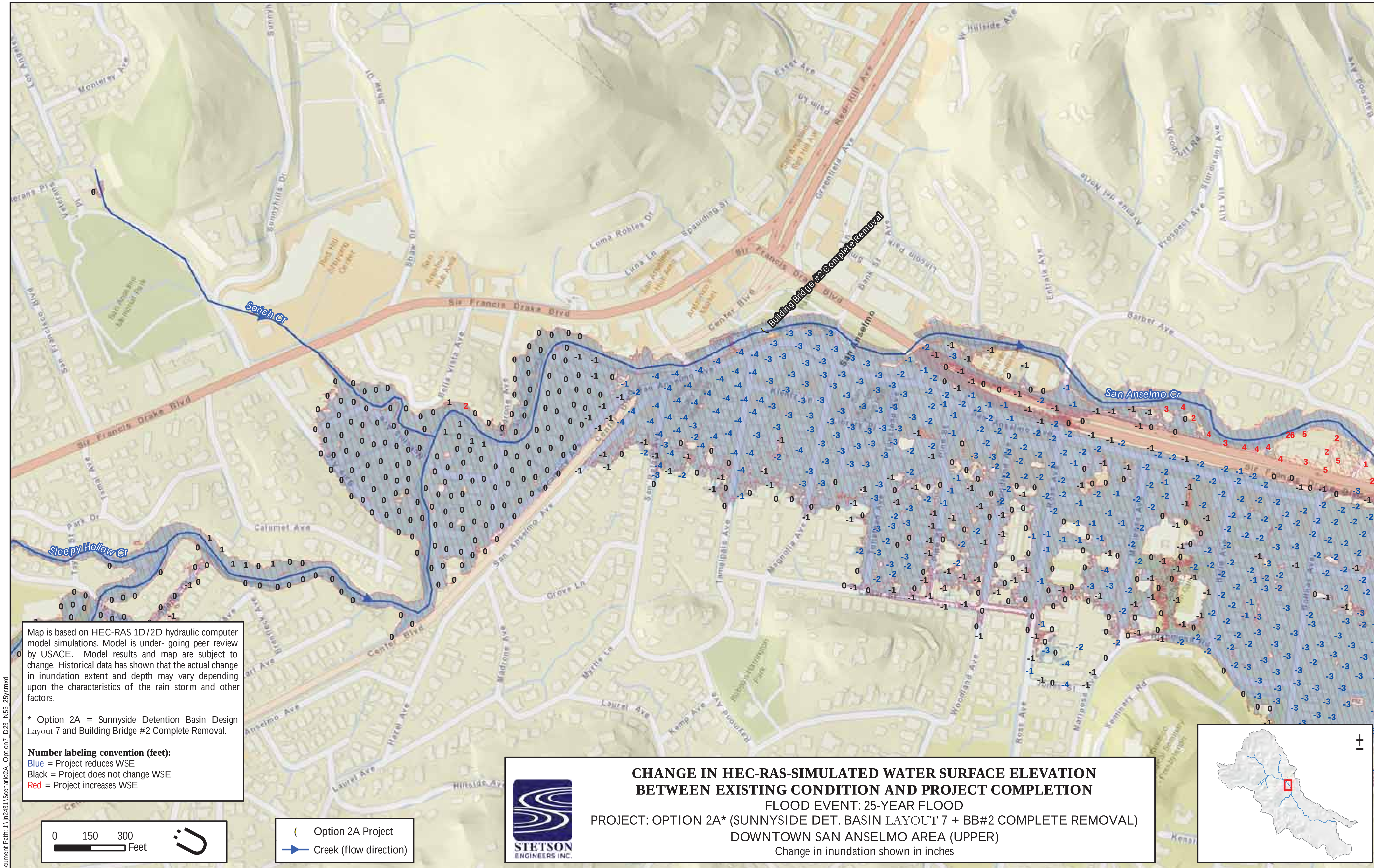
FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option7_D23_N53_25yr.mxd

Figure 12b



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* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

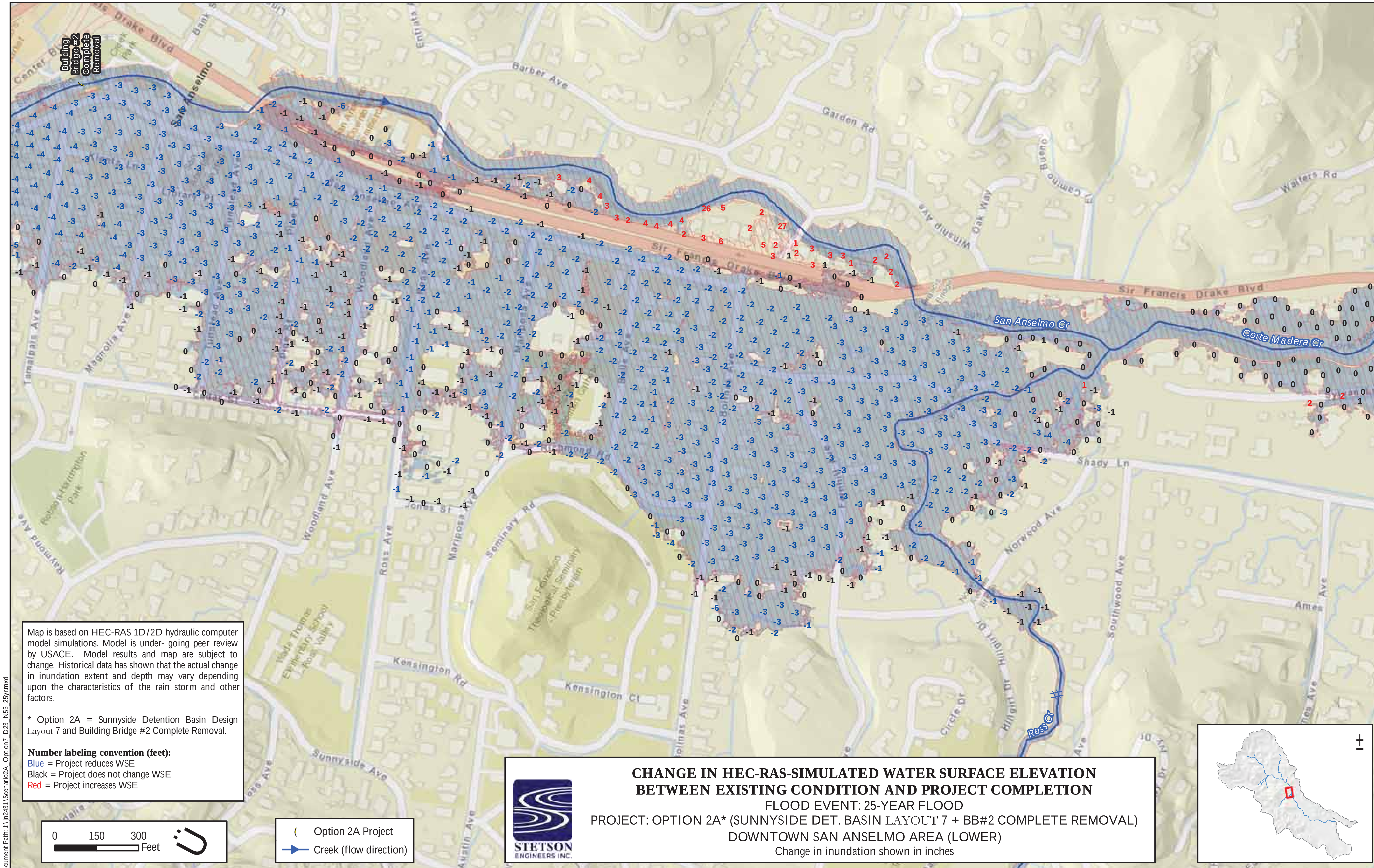
0 150 300 Feet

Option 2A Project
Creek (flow direction)

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Figure 12c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

(Option 2A Project
Creek (flow direction)

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

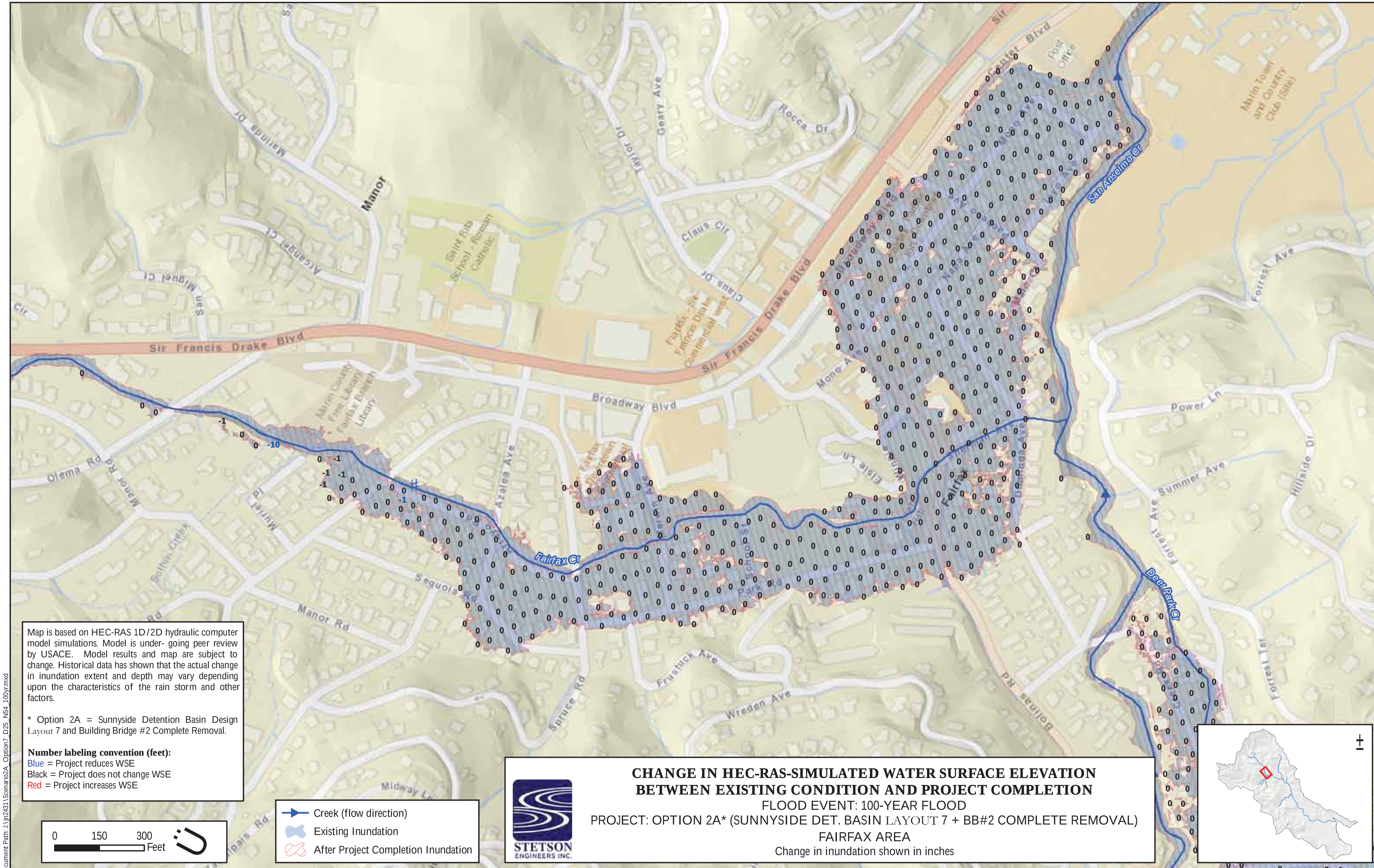
FLOOD EVENT: 25-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

Figure 13a



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* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

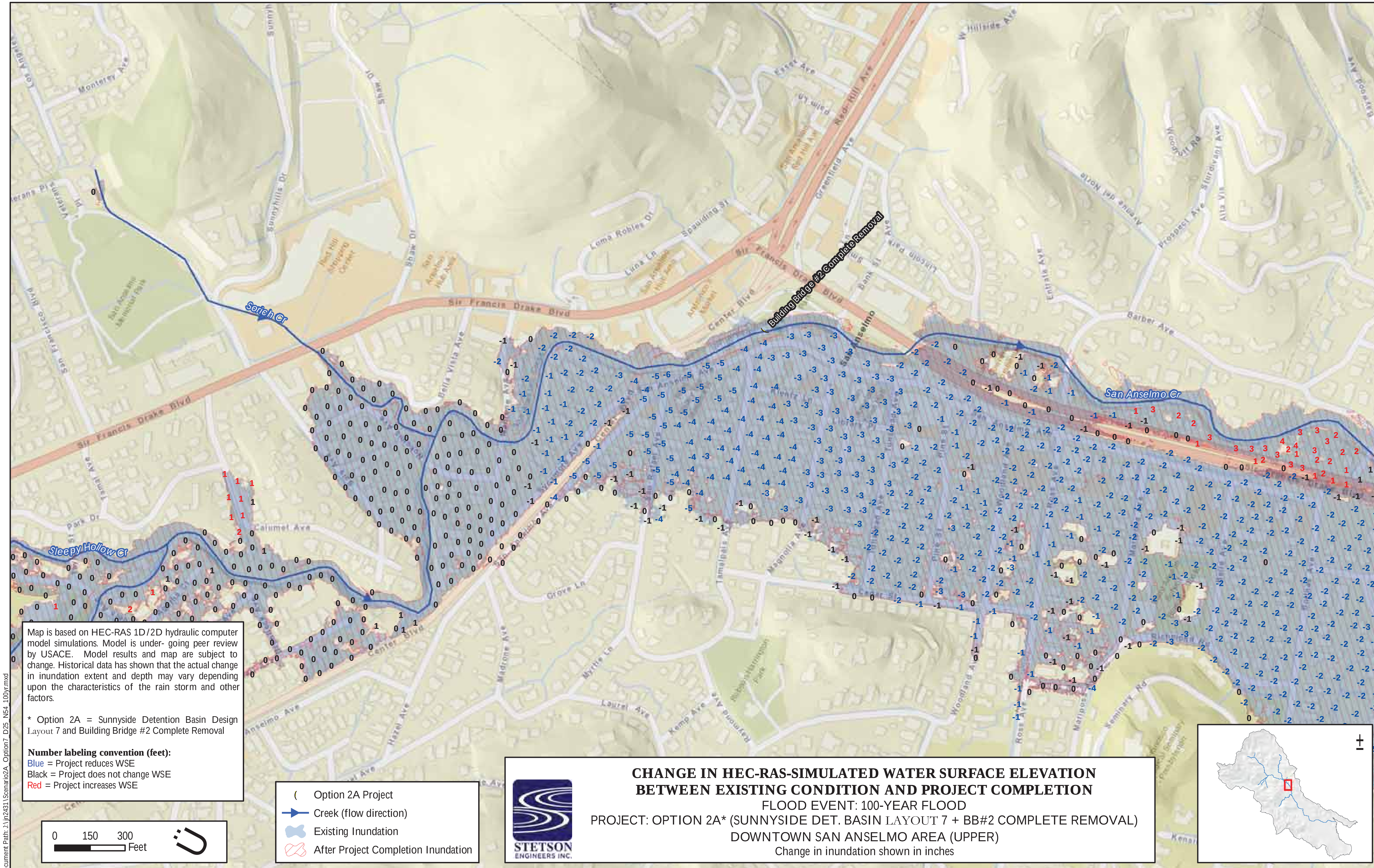
FLOOD EVENT: 100-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

FAIRFAX AREA

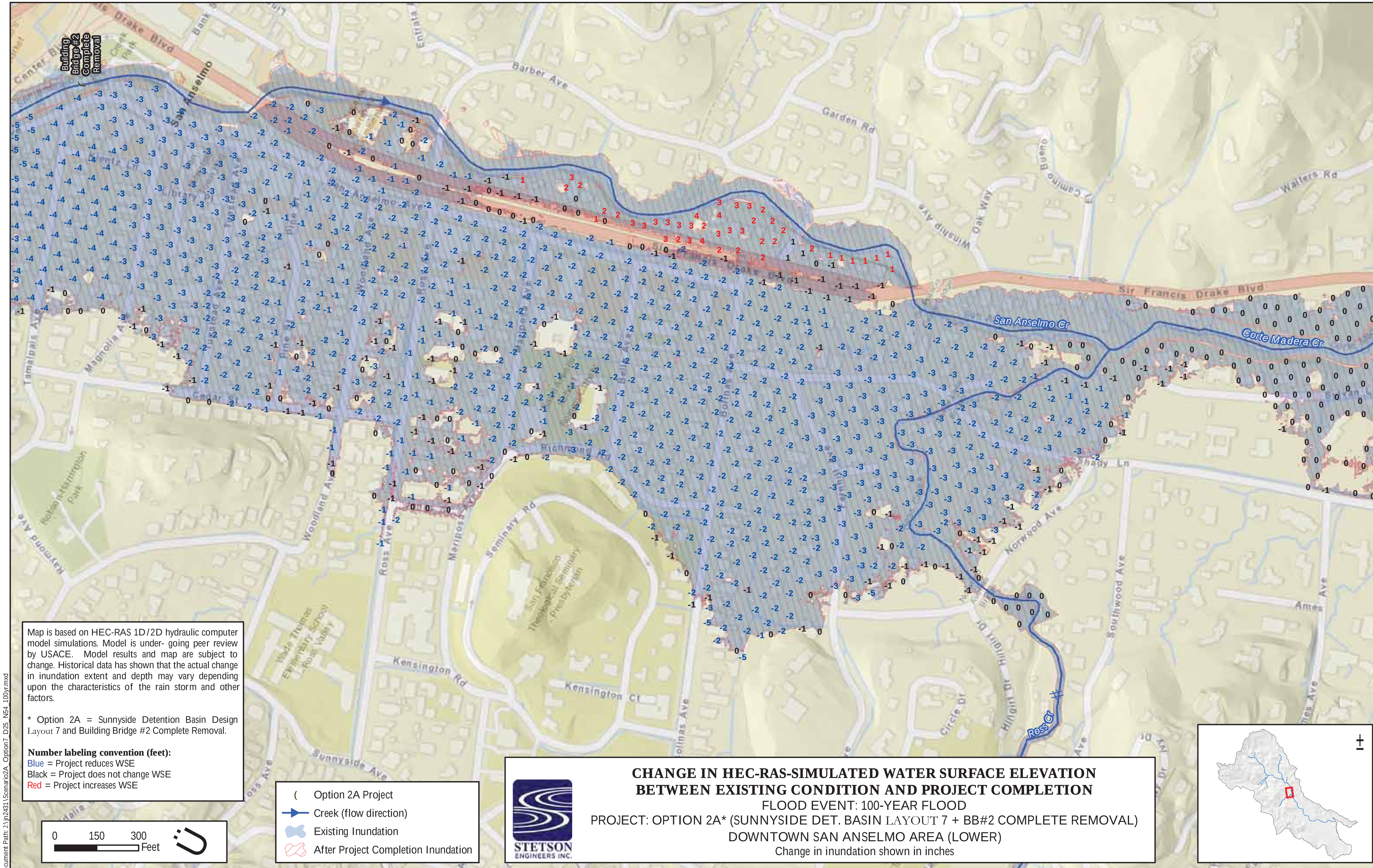
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D25_N54_100yr.mxd



CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION
BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches
STETSON ENGINEERS INC.
Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
0 150 300 Feet
Building Bridge #2 Complete Removal
San Anselmo Cr
Sorich Cr
Sleepy Hollow Cr
Sir Francis Drake Blvd

Figure 13c



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* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option7_D25_N54_100yr.mxd

D-2 Report on Hydraulic Analysis of the Morningside Alternative

Report on Hydraulic Analysis of the Morningside Alternative

Stetson Engineers Inc.
May 2, 2018

Introduction

This report documents the hydraulic analysis and assessment of the Morningside Alternative for flood risk management of Sleepy Hollow Creek. The assessment considered both project effects and cumulative effects in conjunction with other foreseeable projects[1] with regard to flooding.

The Morningside Alternative consists of the following measures:

- Removal of Morningside Bridge;
- Replacement of Mountain View Bridge; and
- Construction of Sunnyside passive detention basin (DB).

Stetson prepared a conceptual design for the Mountain View replacement bridge in November 2016 and for the Sunnyside passive DB[2] in January 2018. The design for the Mountain View replacement bridge would create a bigger opening and raise the bridge soffit from the existing elevation 76.9 ft to 78.3 ft NAVD88. Refer to Attachment A for the conceptual design. The approximate flood magnitude when the water surface elevation reaches the new soffit in terms of recurrence interval is about the 9-year flood.

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[1] The foreseeable projects here are the same foreseeable projects as in other reports related to the San Anselmo Flood Risk Management Project <u>except no Building Bridge #2 removal</u>. Specifically, the foreseeable projects here include the following projects:

- Azalea Avenue Bridge Replacement;
- Madrone Avenue Bridge Replacement;
- Nokomis Avenue Bridge Replacement;
- Sycamore Avenue/Center Boulevard Bridge Replacement;
- Bridge Avenue Bridge Replacement;
- Winship Avenue Bridge Replacement; and
- Unit 4 Measures 1, 2, and 3 in Stetson's 2008 Letter Report to the Corps.

[2] The Sunnyside passive DB was designed with no creek diversion structure. The side weir along the left bank of the creek was designed to have a crest elevation of 228 ft NAVD88. This elevation is the water surface elevation in the creek at the DB site at the time of incipient flooding downstream in Fairfax. In other words, at the time when downstream incipient flooding occurs, a portion of flood water would begin to passively enter into the DB over the side weir. The Sunnyside passive DB would have an east berm top elevation of 232 ft NAVD88 and a storage capacity of about 20 acre-ft at the simulated 100-year maximum water surface elevation (229.9 ft NAVD88).

A 36-inch diameter low-level drain outlet pipe with an invert elevation at about 223.8 ft NAVD88 was designed to drain the detention basin. Under this concept, the designed 36-inch diameter low-level outlet pipe would be kept open at all times.

Hydraulic Modeling for the Morningside Alternative

Stetson performed hydraulic modeling to assess the project effects and cumulative effects of the Morningside Alternative with regard to flooding. For the modeling, Stetson used US Army Corps of Engineers software, HEC-RAS version 5.0, which has combined 1D and 2D hydraulic modeling capabilities. Stetson recently developed a combined 1D/2D unsteady-flow model application for the Corte Madera Creek watershed. The model starts from the bay and extends upstream along the mainstream and tributaries (including the Sleepy Hollow Creek) to the proposed upper watershed detention basins in Fairfax that are currently under environmental review. The model was calibrated to the 12/15/2016 bankfull event and the 12/31/2005 flood event (an approximate 100-year flood), and verified to the 1/4/1982 flood event (an approximate 150-year flood; Stetson, 2017). The model is undergoing peer review by the US Army Corps of Engineers.

The following three scenarios were analyzed:

- Existing Conditions (EC), to serve as the "Baseline" basis for comparison
- Morningside Alternative added to EC, to assess "Project" effects
- Morningside Alternative + Foreseeable Projects added to EC, to assess "cumulative" effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 flood
- Q25, moderate, infrequent flood
- Q10, minor flood, less frequent than 2017 flood event (7-year flood event)

<u>Results of Hydraulic Analysis in Terms of Floodplain Inundation</u>

Figures 1a to 1d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Morningside Alternative and existing conditions for the 10-year flood. Figures are provided covering Fairfax, Sleepy Hollow, Upper San Anselmo, and Lower San Anselmo areas. Similarly, Figures 2a to 2d show the model-simulated results for the 25-year flood and Figure 3a to 3d for the 100-year flood.

Figures 4a to 4d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Morningside Alternative + Foreseeable Projects and existing conditions for the 10-year flood. Similarly, Figures 5a to 5d show the model-simulated results for the 25-year flood and Figures 6a to 6d for the 100-year flood.

Table 1 is a summary of results for Morningside Alternative and Table 2 is a summary of results for Morningside Alternative + Foreseeable Projects.

The Morningside Alternative alone would slightly increase flooding in the Downtown SA area during the 25-year (see Figures 1c and 1d). But the Morningside Alternative + the Foreseeable Projects would mitigate for the slight increase in flooding caused by Morningside Alternative alone.

Table 2 Summary of Benefits of Morningside Alternative verses Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 1a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside passive DB • Reduces inundation depth by up to 13 inches	None
Figure 1b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 28 inches	Slightly increases flooding in the area near Sorich Creek confluence
Figure 1c		Downtown SA (Upper)	• No effect	Slightly increases flooding in the area near Sorich Creek confluence
Figure 1d		Downtown SA (Lower)	• No effect	None
Figure 2a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inch	None
Figure 2b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 24 inches	Slightly increases flooding in the area below Mountain View replacement bridge and in the area between Sleepy Hollow Creek and Sorich Creek
Figure 2c		Downtown SA (Upper)	• Nearly zero effect in inundation extent	Slightly increases flooding in the upper Down SA area
Figure 2d		Downtown SA (Lower)	• Nearly zero effect in inundation extent	Slightly increases flooding in the lower Down SA area
Figure 3a	Q100	Fairfax	• No effect	None
Figure 3b		Sleepy Hollow	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 7 inch	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 3c		Downtown SA (Upper)	• No effect	None
Figure 3d		Downtown SA (Lower)	• No effect	None

Table 3 Summary Benefits of Morningside Alternative + Foreseeable Projects verses Existing Condition

Figure No.	Flow Condition	Location	Summary of Results	Any Increased Flooding?
Figure 4a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside passive DB • Reduces inundation depth by up to 13 inches	None
Figure 4b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 28 inches	None
Figure 4c		Downtown SA (Upper)	• Reduces inundation extent due to replacements of Nokomis, Madrone, Center and Bridge Ave Bridges. • Reduces inundation depth by up to 26 inches	None
Figure 4d		Downtown SA (Lower)	• Reduces inundation extent due to replacements of Center and Bridge Ave Bridges. • Reduces inundation depth by up to 16 inches	None
Figure 5a	Q25	Fairfax	• Reduces inundation extent due to replacement of Azalea Bridge • Reduces inundation depth by up to 27 inches	None
Figure 5b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 24 inches	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 5c		Downtown SA (Upper)	• Reduces inundation extent • Reduces inundation depth by up to 20 inches	None
Figure 5d		Downtown SA (Lower)	• Nearly no effect	Slightly increases flooding in the area below Winship replacement bridge
Figure 6a	Q100	Fairfax	• Reduces inundation extent due to replacement of Azalea Bridge • Reduces inundation depth by up to 14 inches	None
Figure 6b		Sleepy Hollow	• Nearly no effect on inundation extent • Reduces inundation depth by up to 7 inches	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 6c		Downtown SA (Upper)	• Reduces inundation extent • Reduces inundation depth by up to 18 inches	None
Figure 6d		Downtown SA (Lower)	• Reduces inundation extent • Reduces inundation depth by up to 18 inches	None

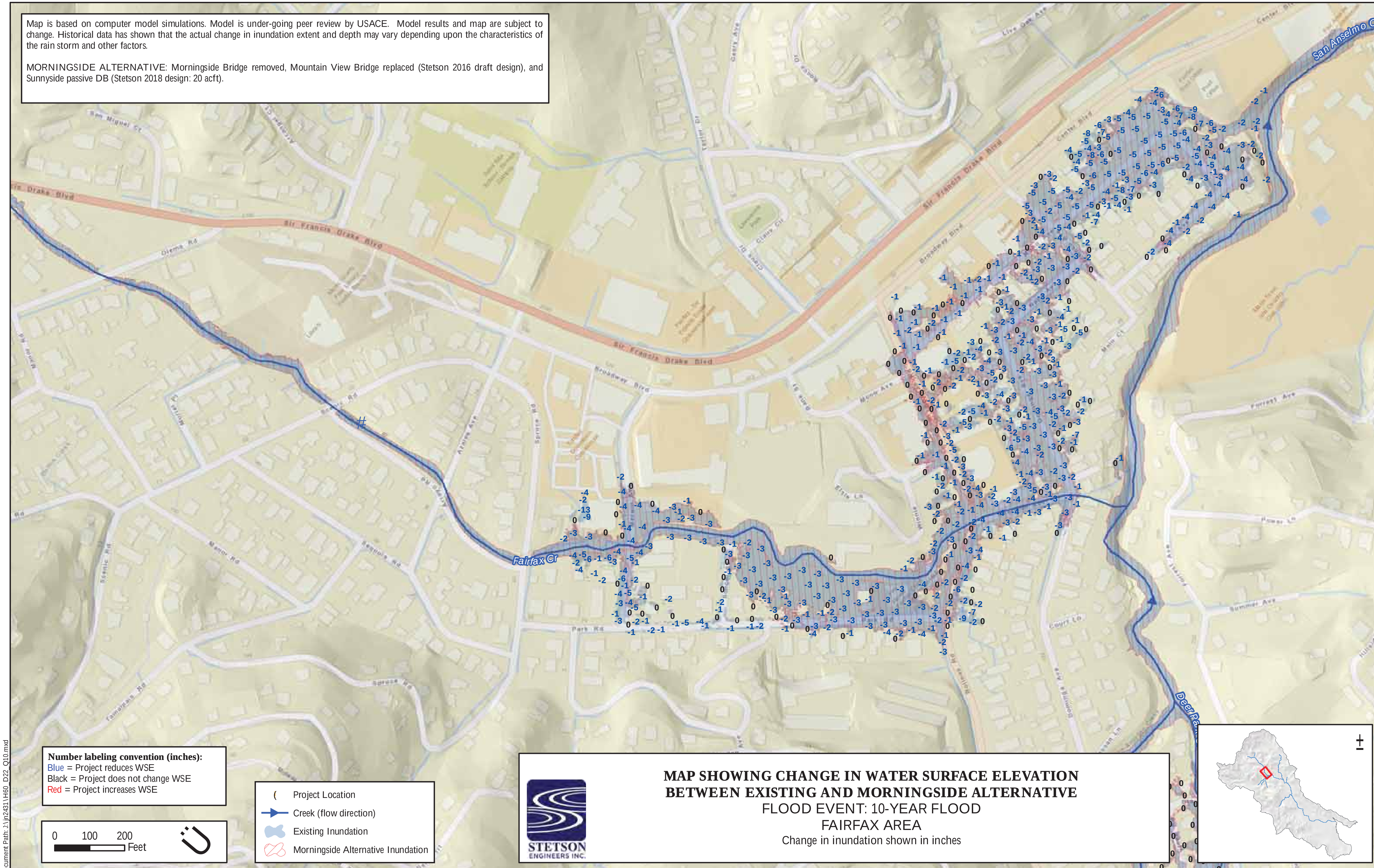
Results of Hydraulic Analysis in Terms of Channel Water Surface Level

Figures 7a to 7c compare the HEC-RAS model-simulated channel water surface profiles along Fairfax Creek for the 10-year flood, 25-year flood, and 100-year flood, respectively[3]. Similarly, Figures 8a to 8c compare the simulated channel water surface profiles along Sleepy Hollow Creek and Figures 9a to 9c compare the simulated channel water surface profiles along San Anselmo Creek. Each figure includes three water surface profiles: (1) existing condition, (2) after project construction, and (3) after project + Foreseeable Projects construction.

[3] The Fairfax water surface profile in the 1D in-channel model does not show the creek water surface onto and across Bolinas Ave and down to Sherman Ave. The water surface downstream of the entrance to the Sherman Ave culvert is shown in the 2D floodplain model results (see Figures 1a, 2a, 3a, 4a, 5a, and 6a). This is related to the 1D/2D model configuration. In this HEC-RAS 1D/2D model configuration, a single 2D Flow Area is used for the Fairfax Creek floodplain. This single 2D Flow Area covers the both the right and left floodplains of the creek as well as the ground above the Fairfax (Sherman Ave) culvert. Floodwaters in the right floodplain and left floodplain can have a direct connection/exchange as floodwaters flow over and above the culvert.

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 10-YEAR FLOOD
FAIRFAX AREA
Change in inundation shown in inches

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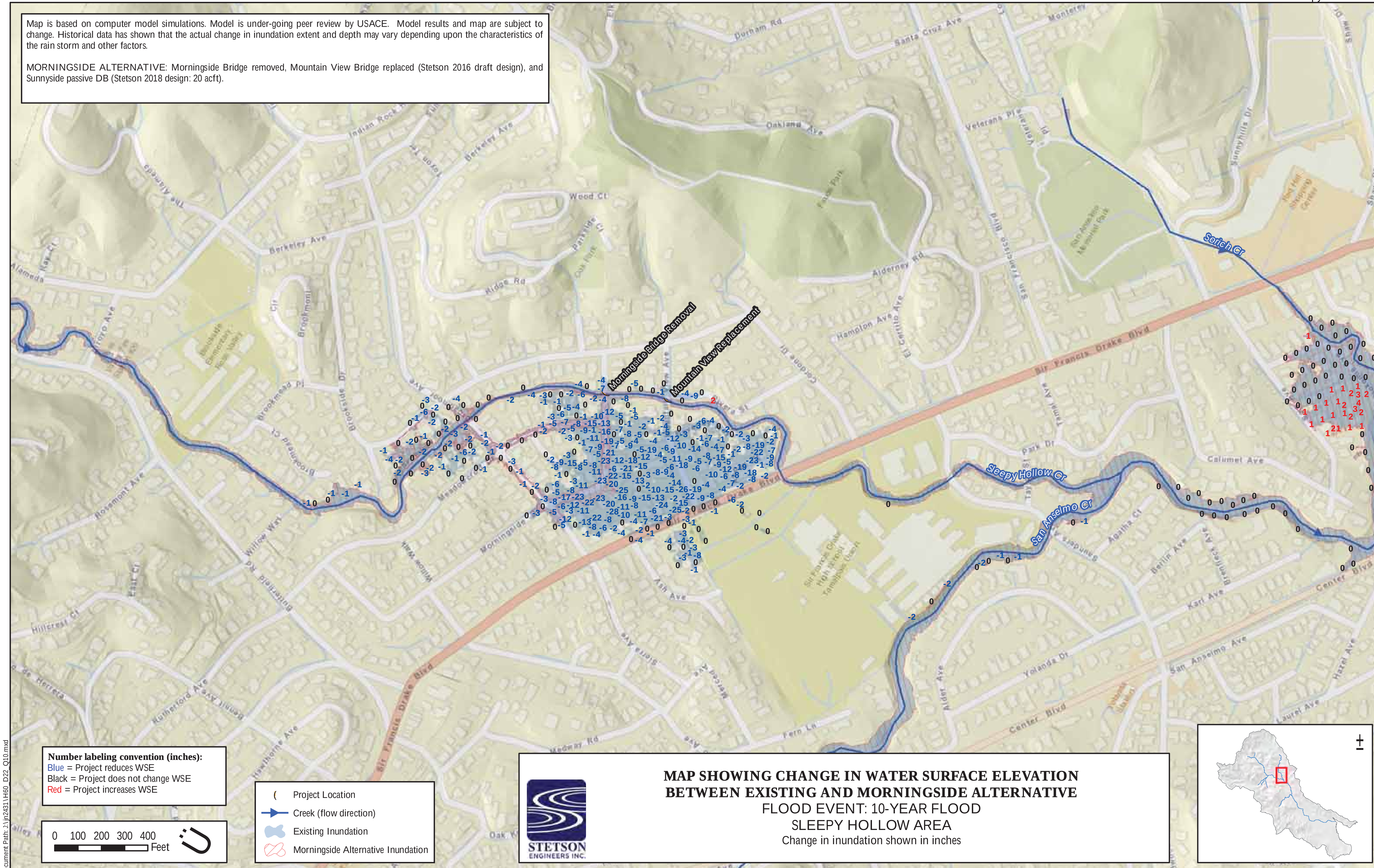
FIGURE 1b - Sleepy Hollow Area



Document Path: J:\jn2431\H60_D22_Q10.mxd

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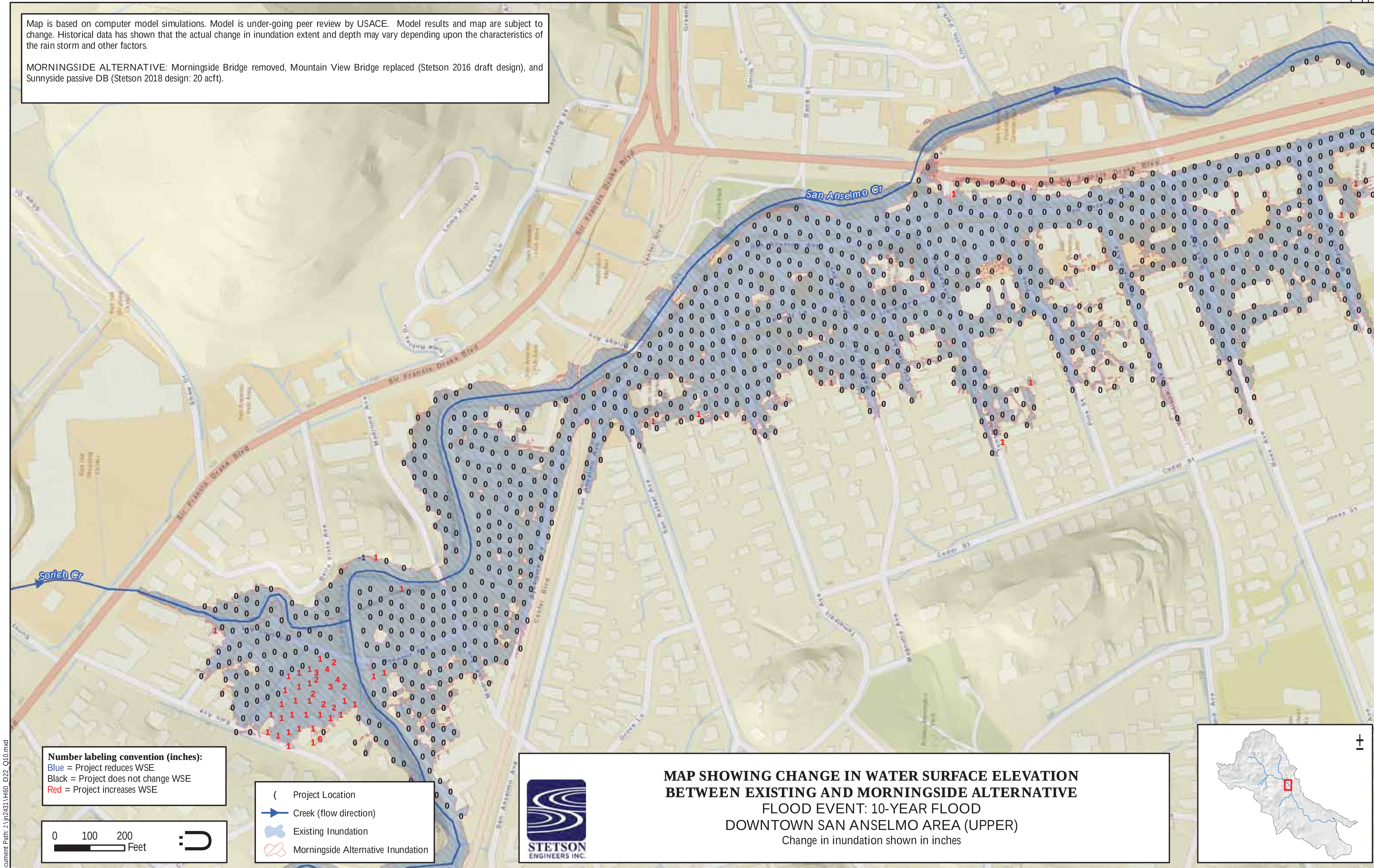

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H60_D22_Q10.mxd

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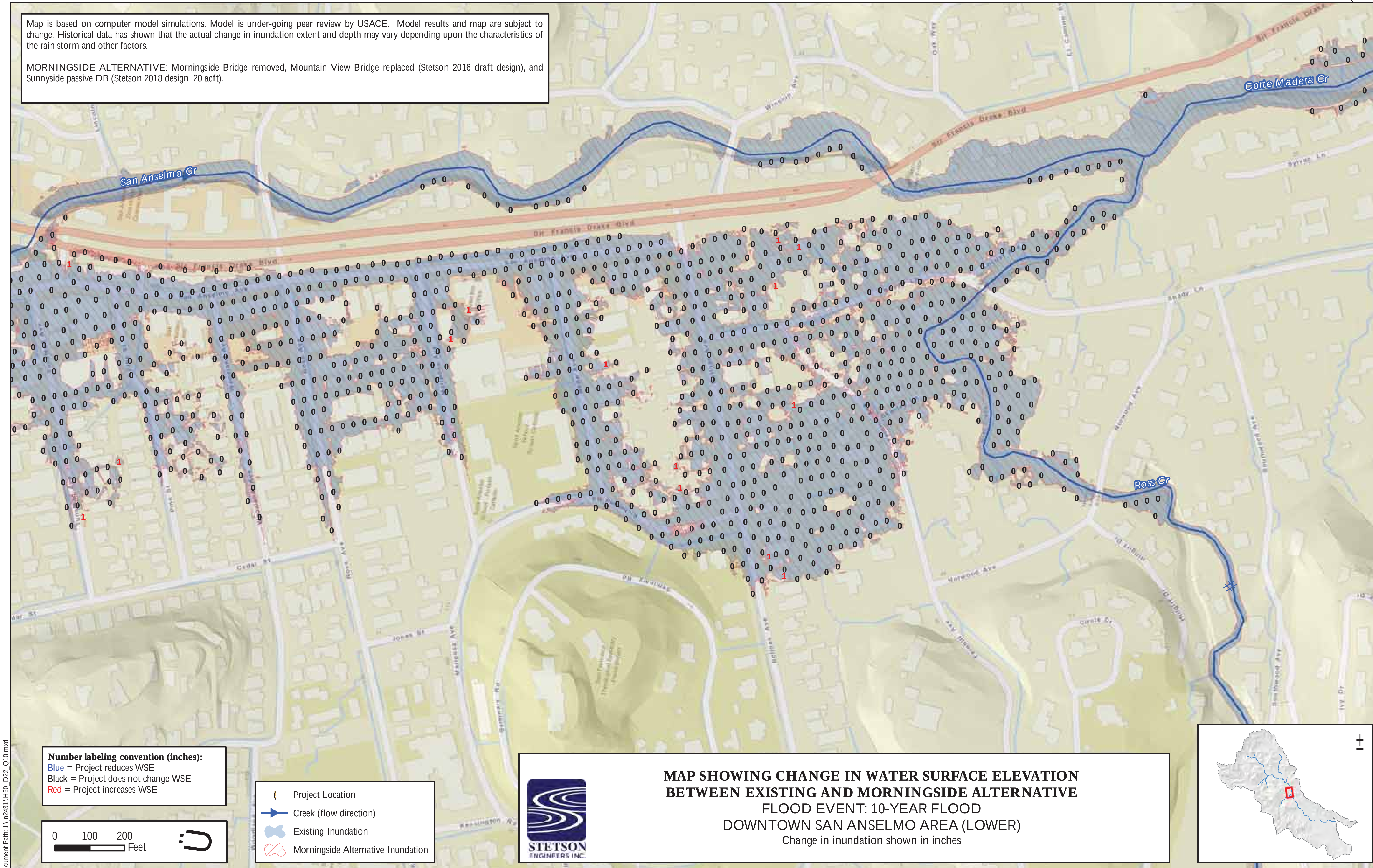


Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

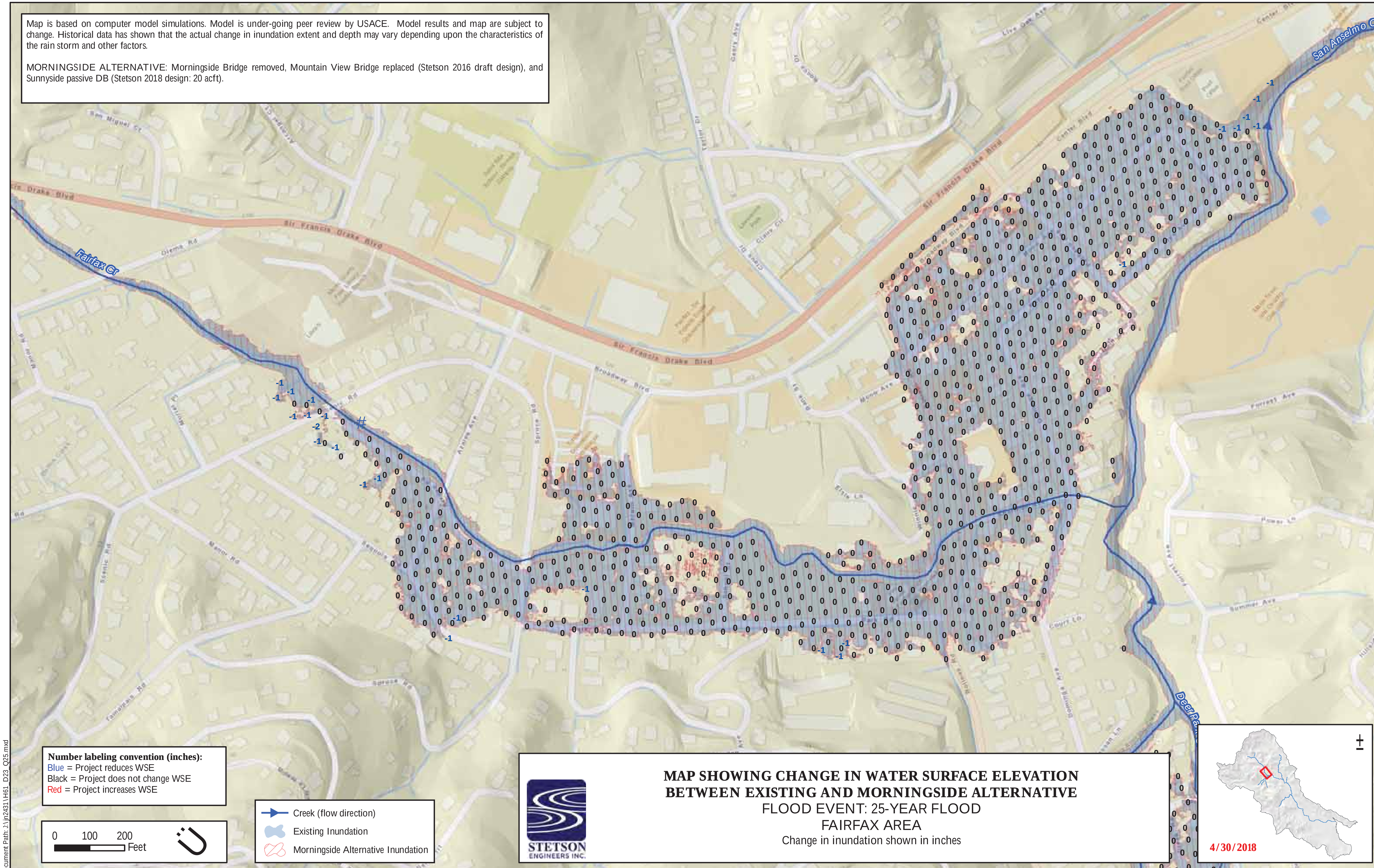
- Project Location
- Creek (flow direction)
- Existing Inundation
- Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H60_D22_Q10.mxd



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Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

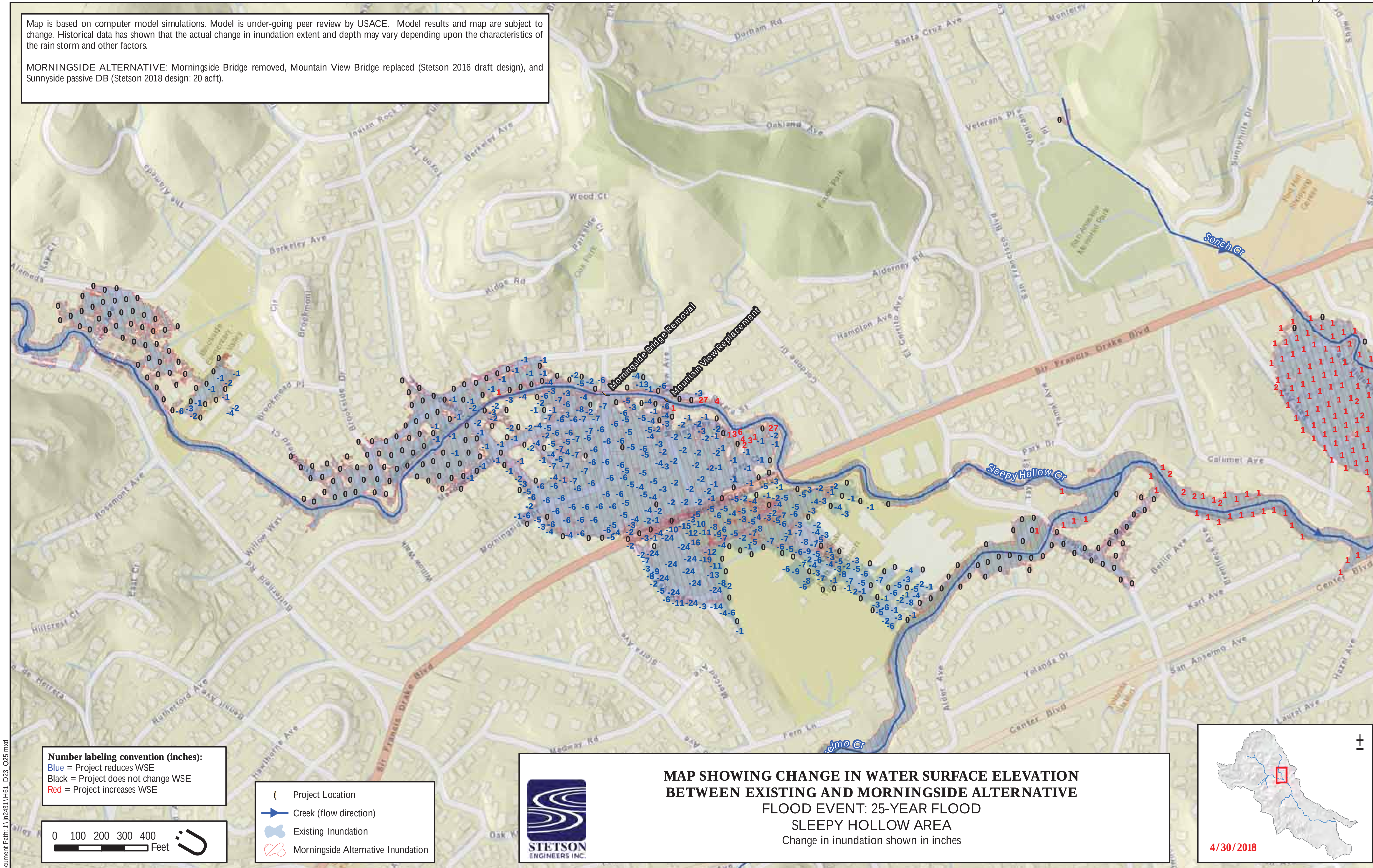
FLOOD EVENT: 25-YEAR FLOOD

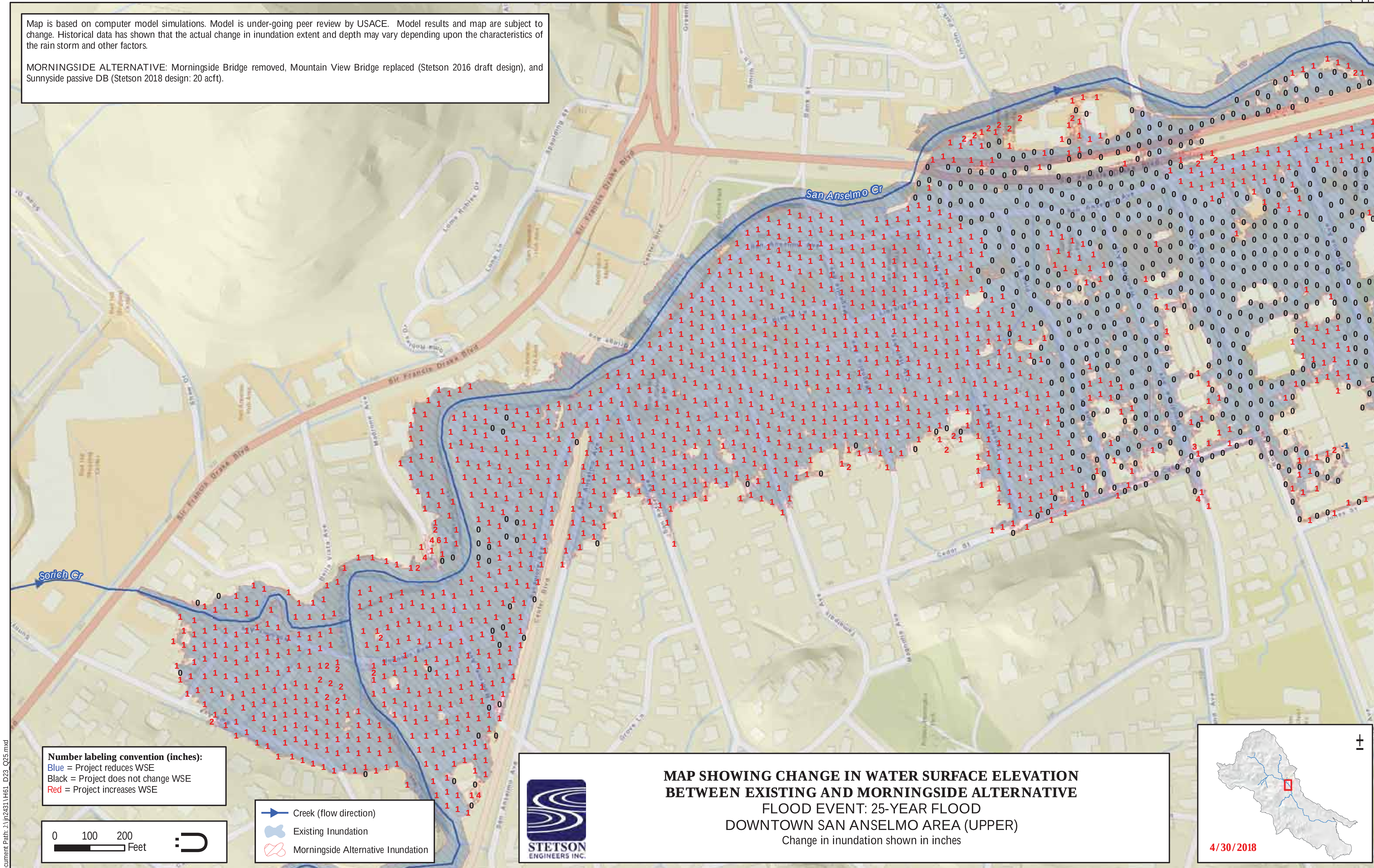
FAIRFAX AREA

Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd


Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).
Morningside Bridge Removal
Mountain View Replacement
Sleepy Hollow Cr
Sorich Cr
Sir Francis Drake Blvd
Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 100 200 300 400
Feet
Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation
MAP SHOWING CHANGE IN WATER SURFACE ELEVATION
BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 25-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches
STETSON
ENGINEERS INC.
4/30/2018
Document Path: J:\jn2431\H61_D23_Q25.mxd



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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 25-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd

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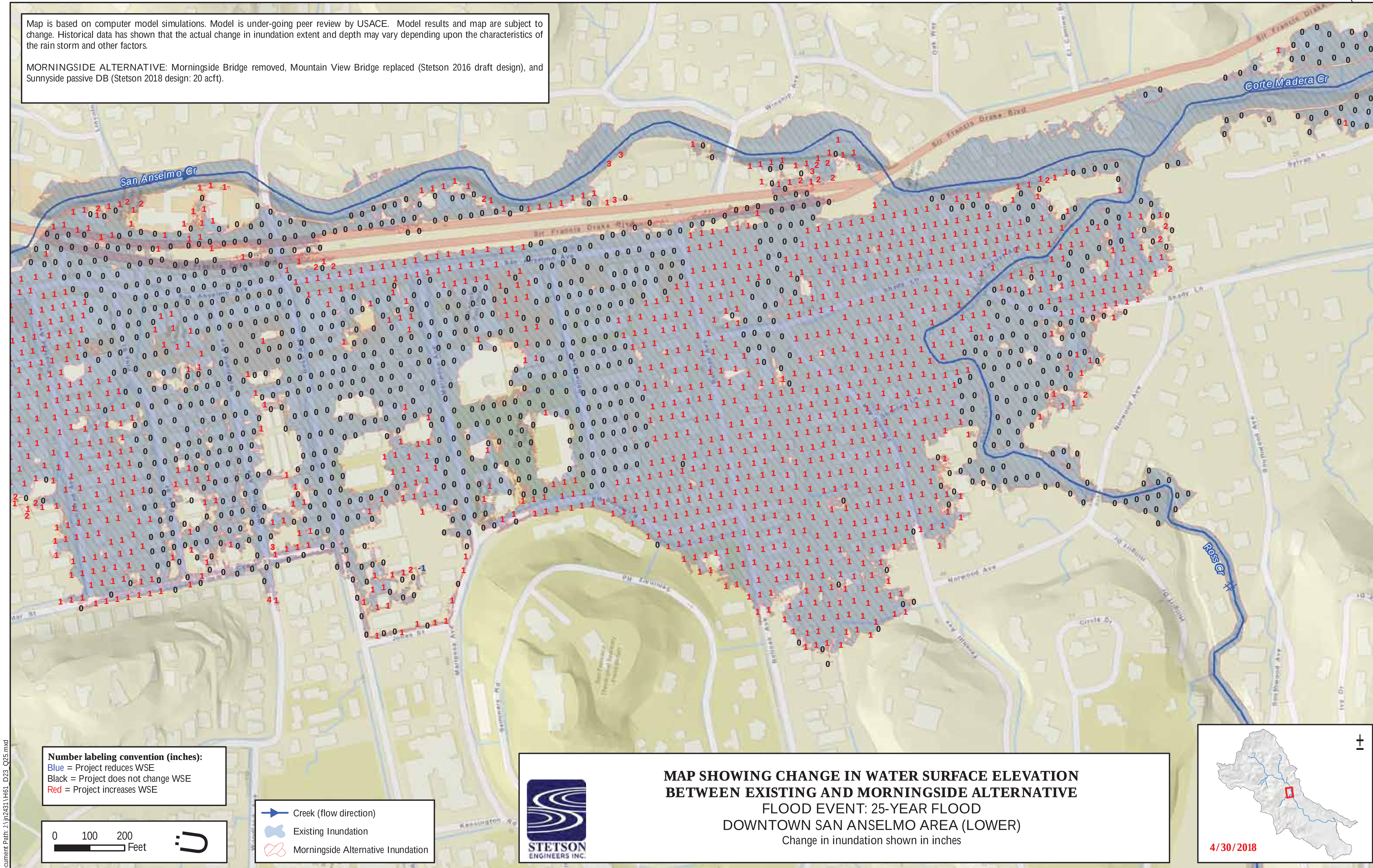

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 25-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd

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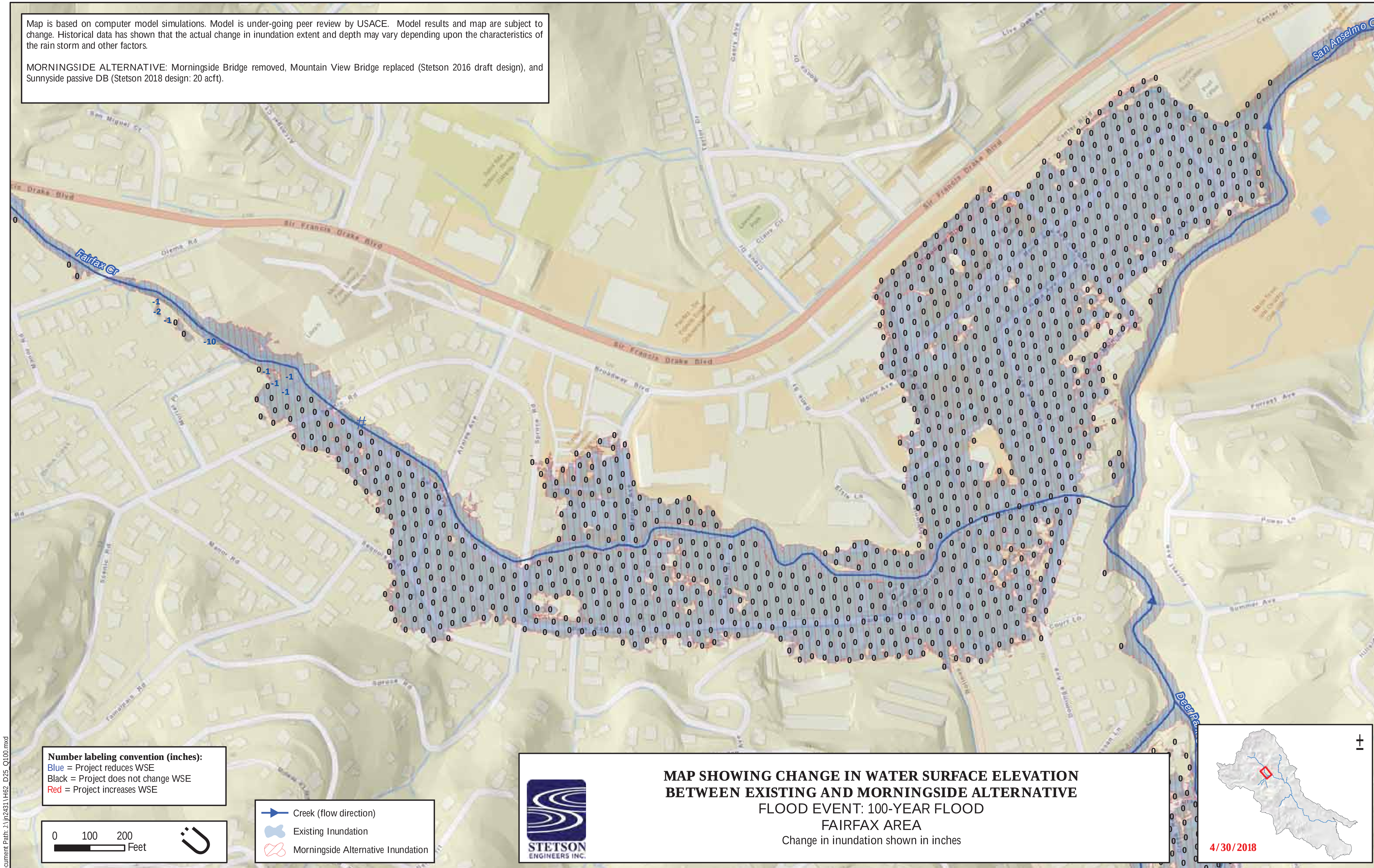

Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 100-YEAR FLOOD
FAIRFAX AREA
Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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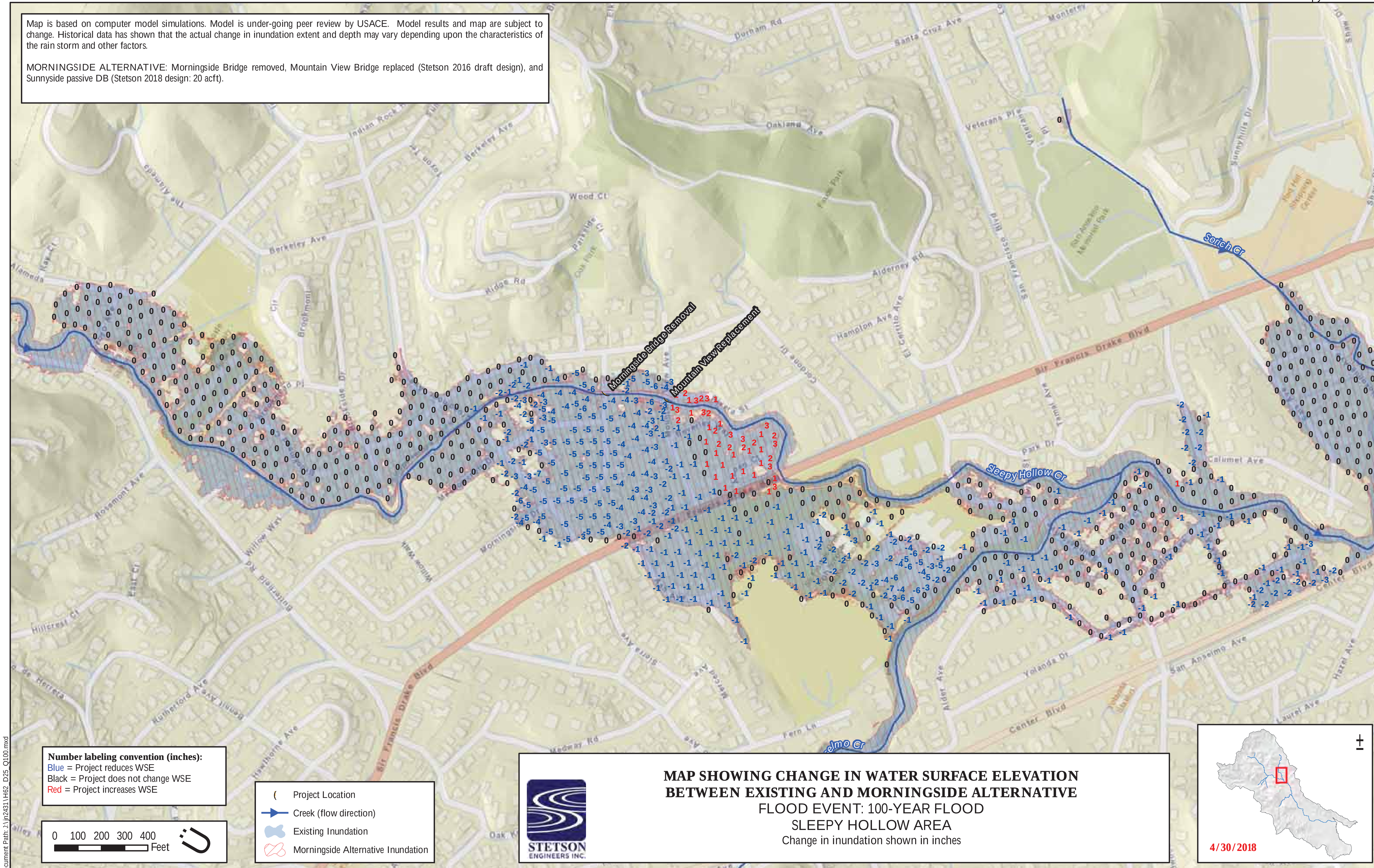

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

- Project Location
- Creek (flow direction)
- Existing Inundation
- Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 100-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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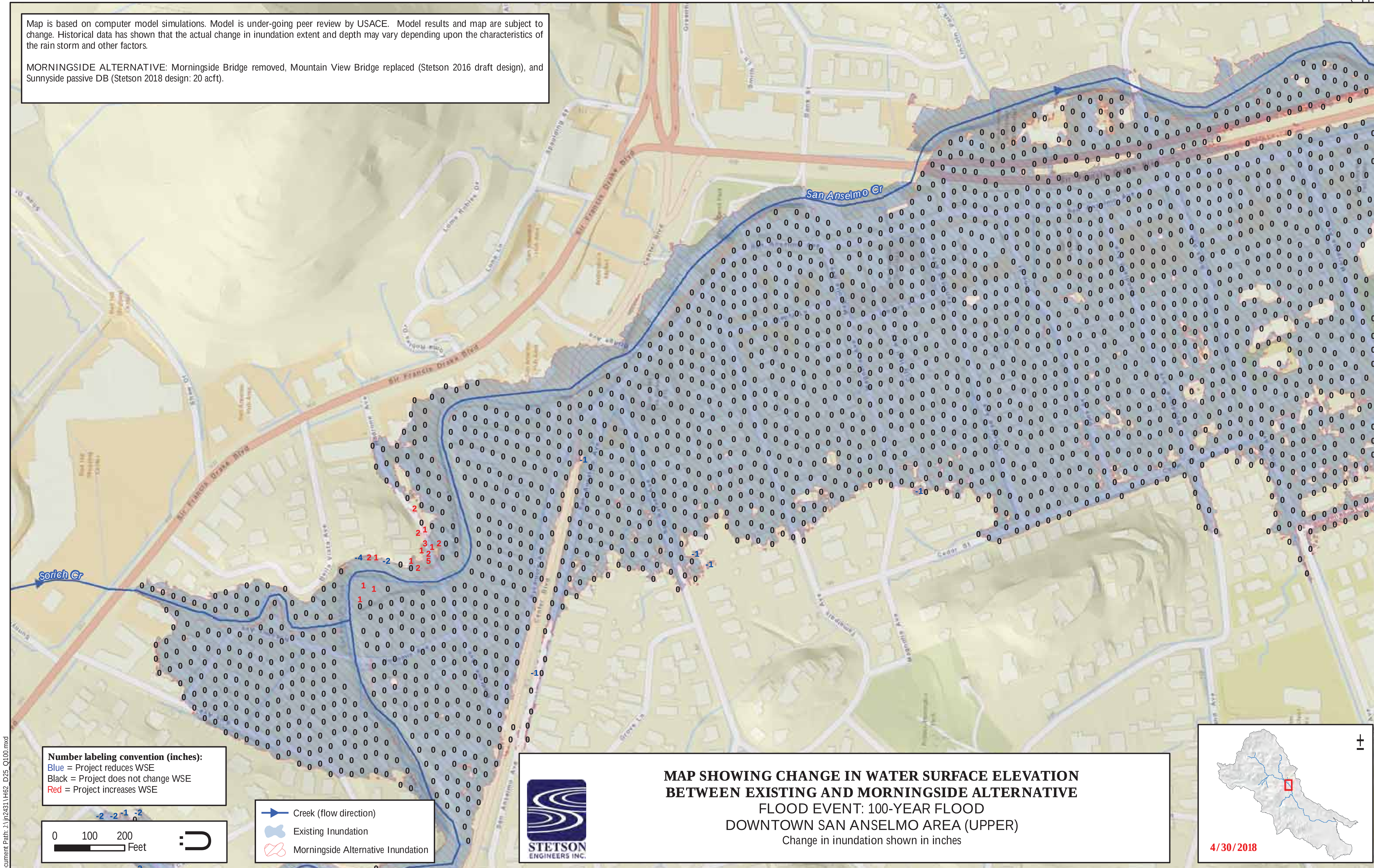

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 100-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

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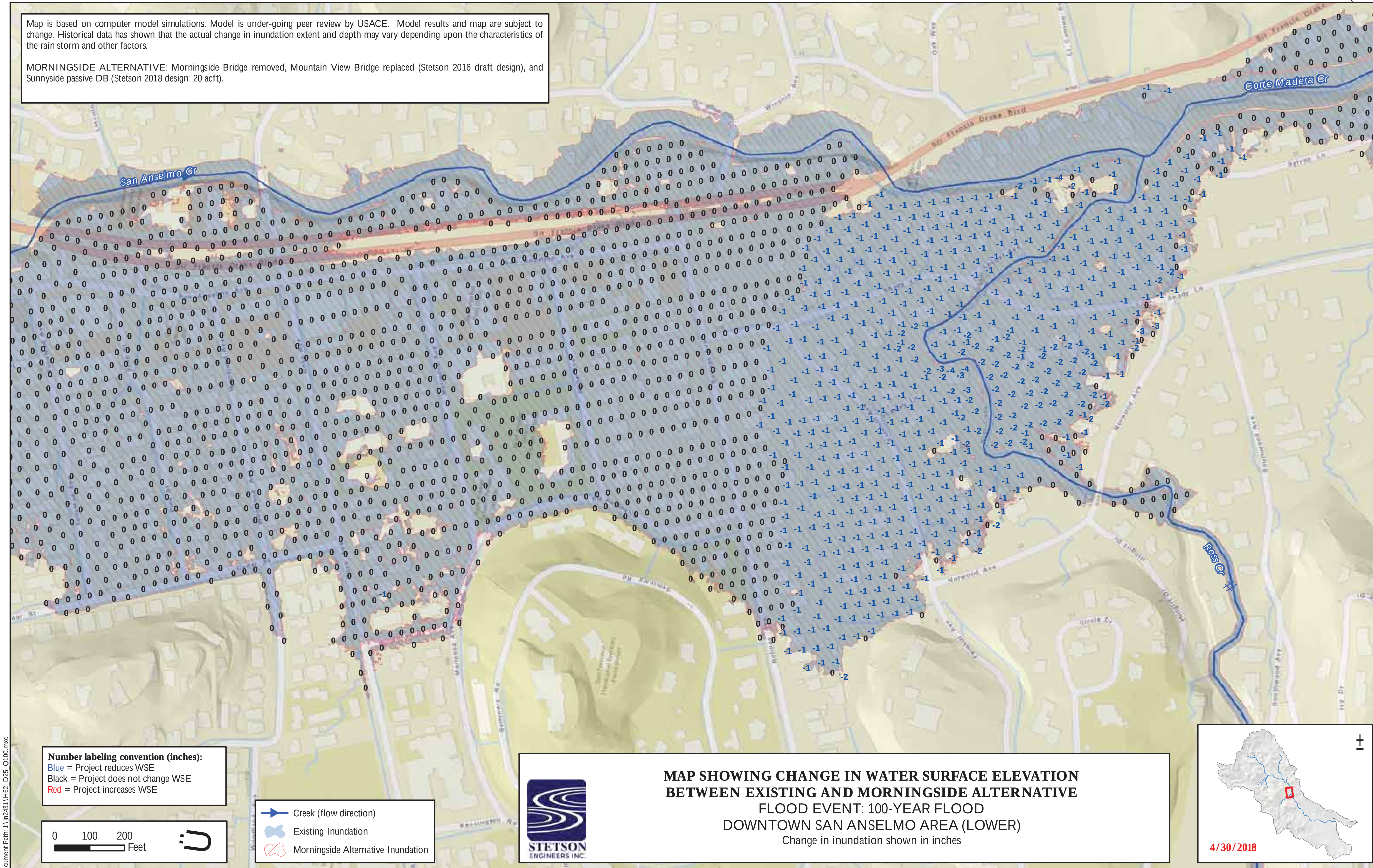

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 100-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

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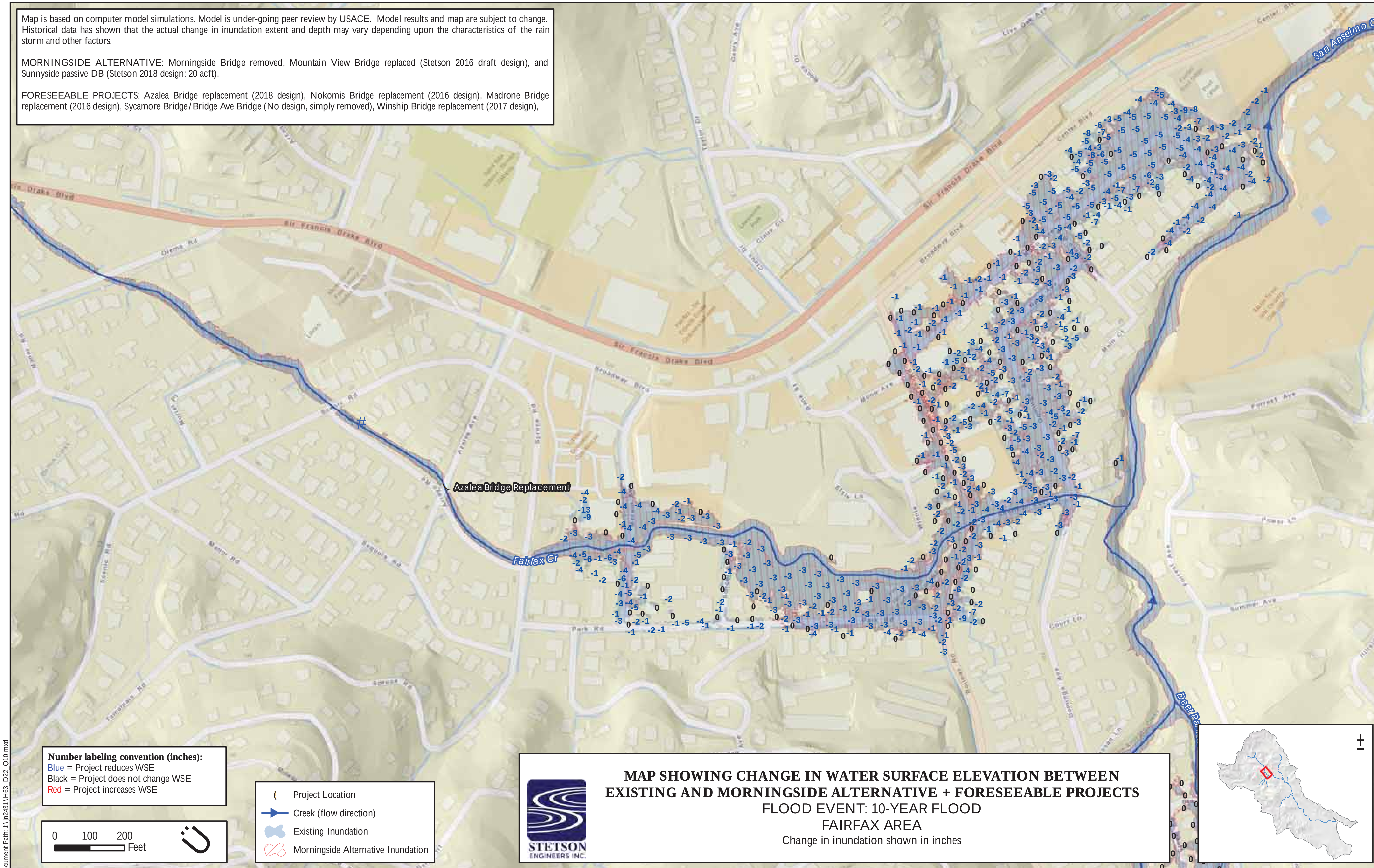
MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).

FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/ Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

Document Path: J:\jn2431\H63_D22_Q10.mxd

FIGURE 4b - Sleepy Hollow Area

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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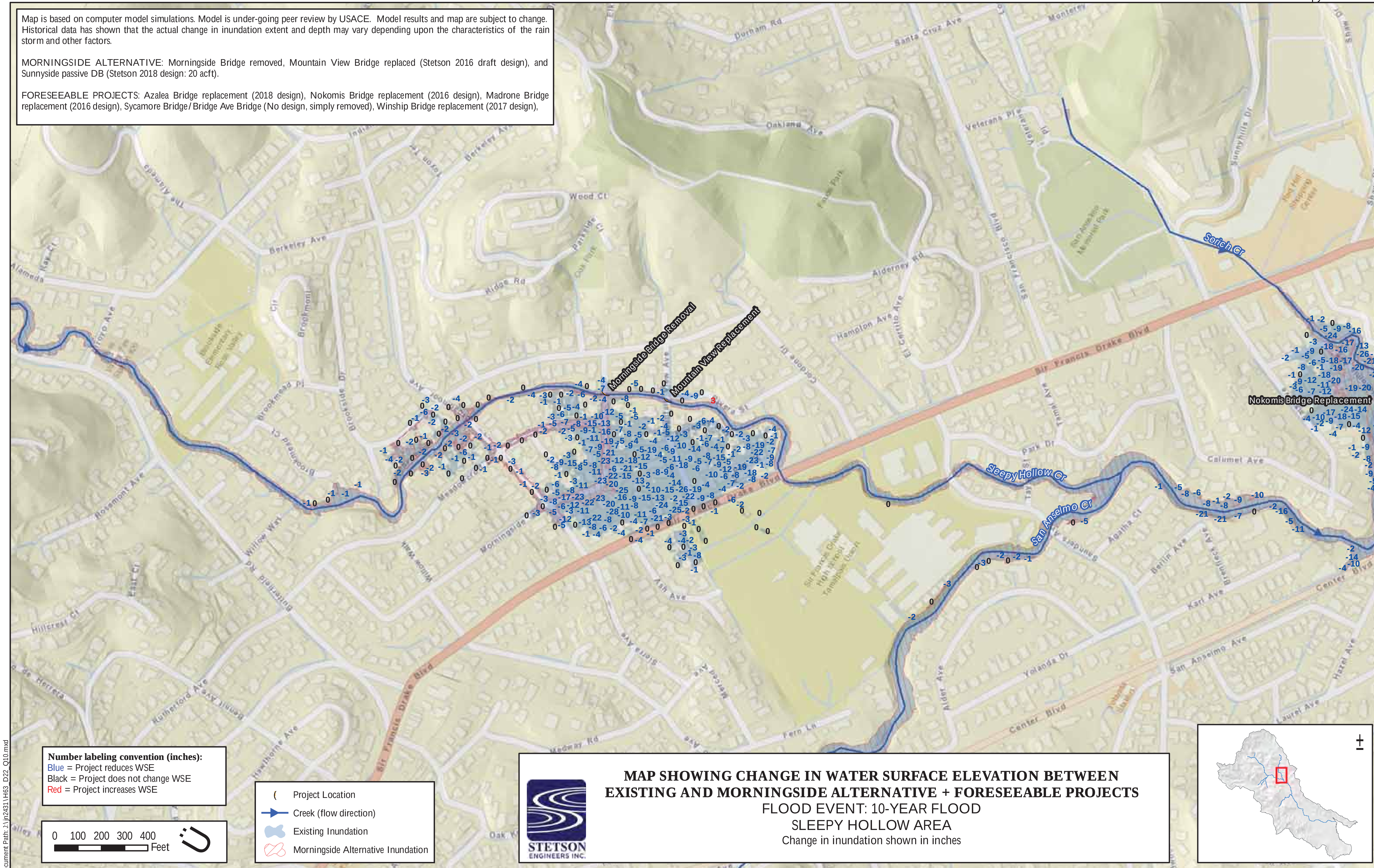

Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD

SLEEPY HOLLOW AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H63_D22_Q10.mxd

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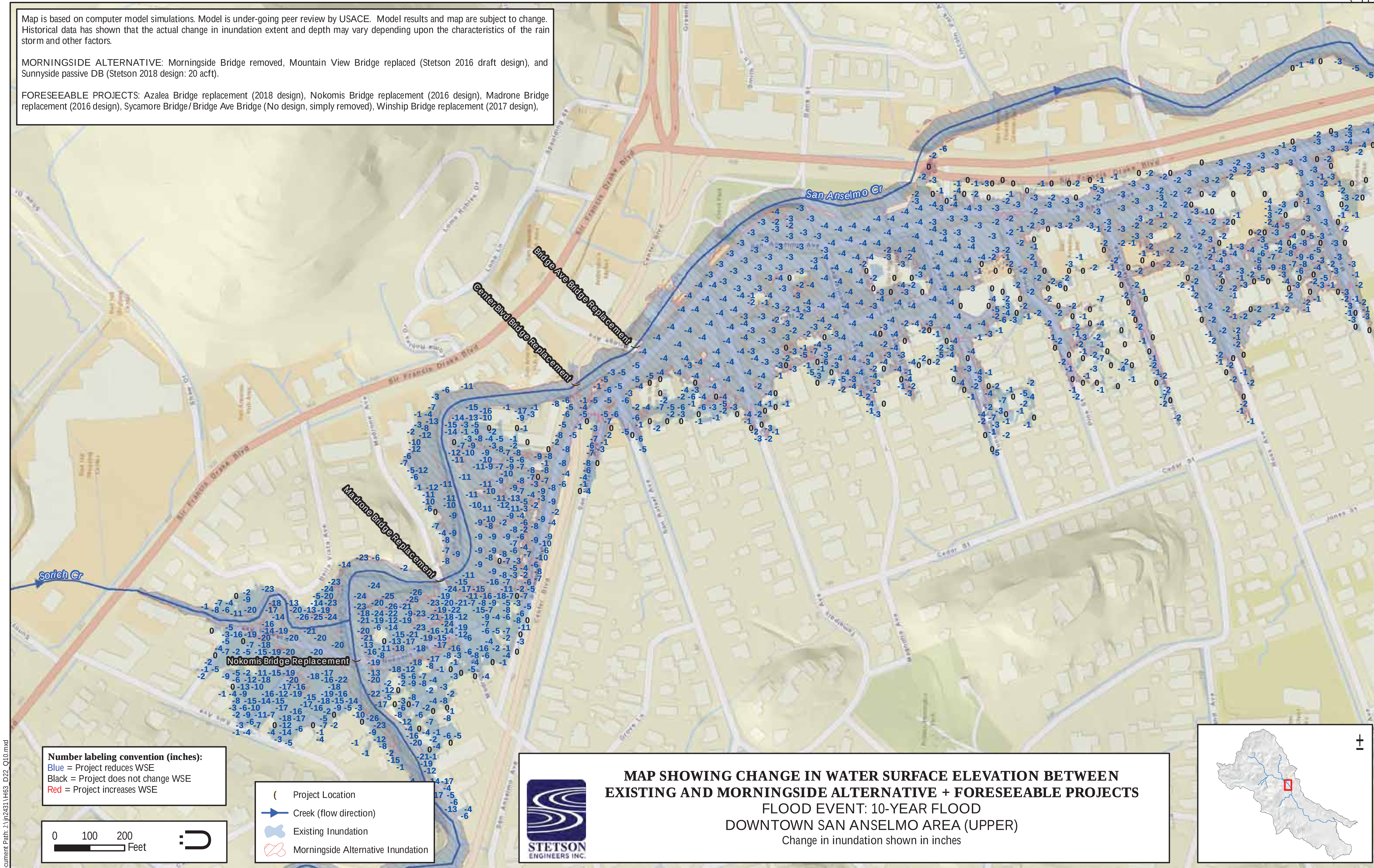

Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\H63_D22_Q10.mxd

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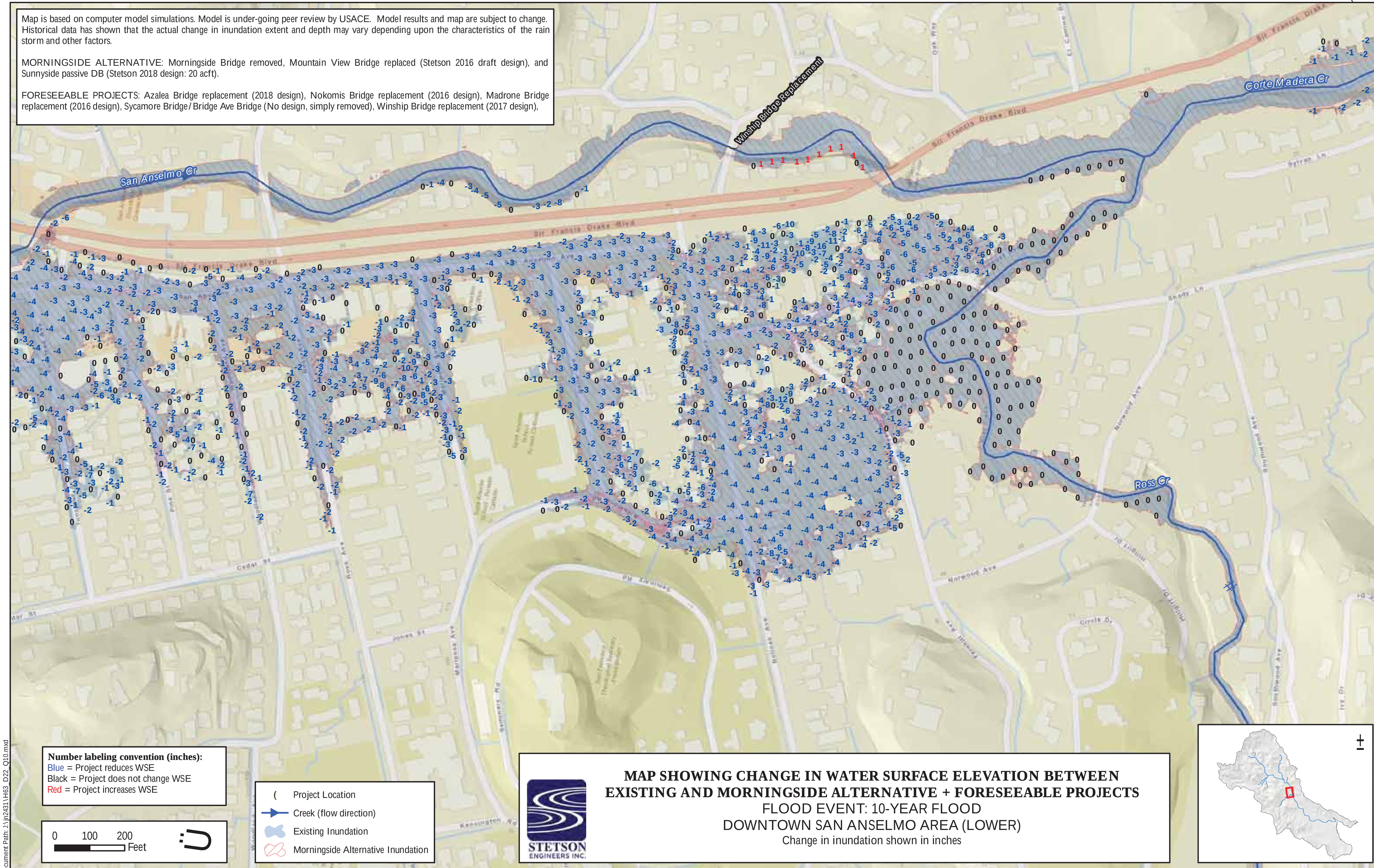

Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

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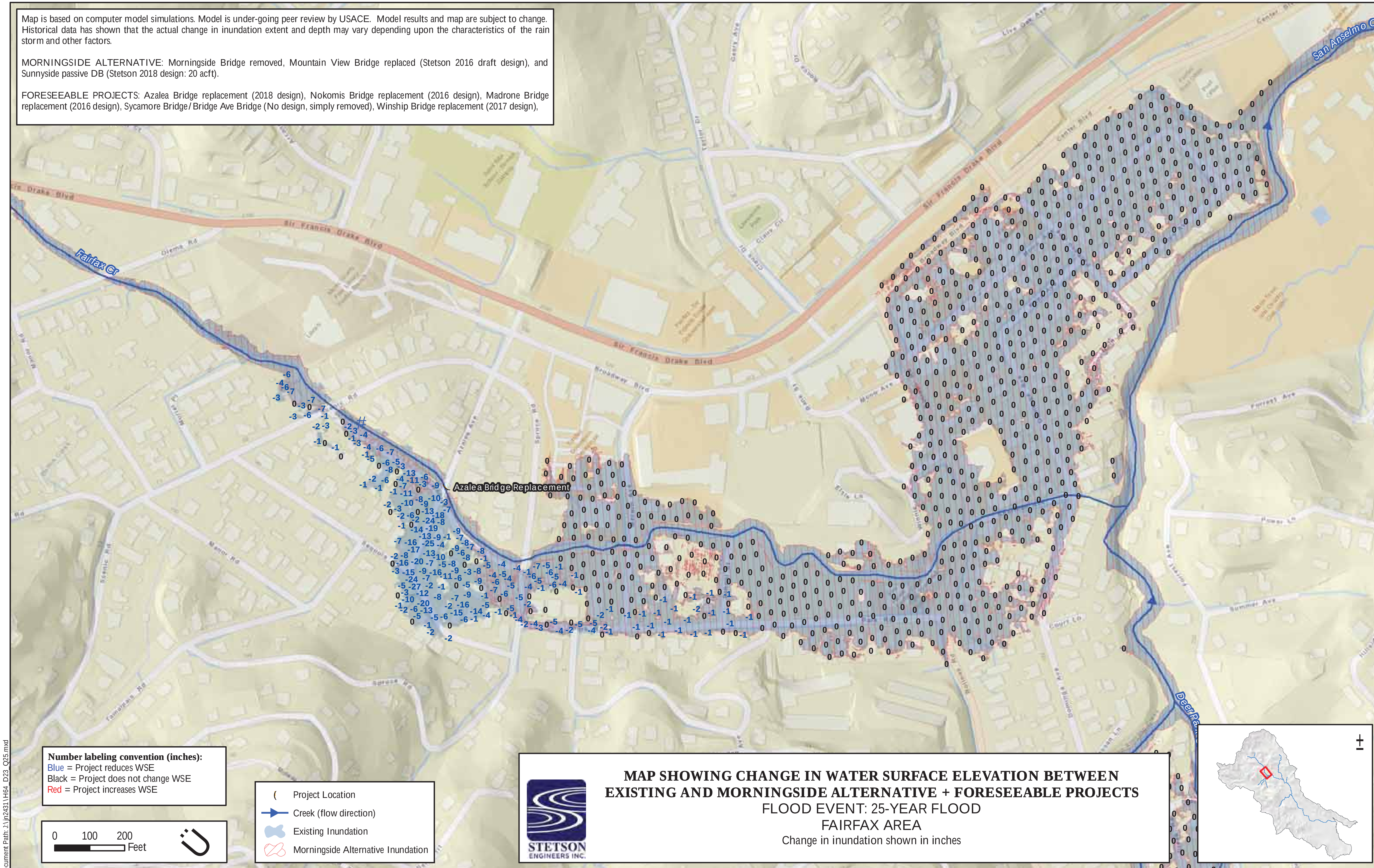

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H64_D23_Q25.mxd

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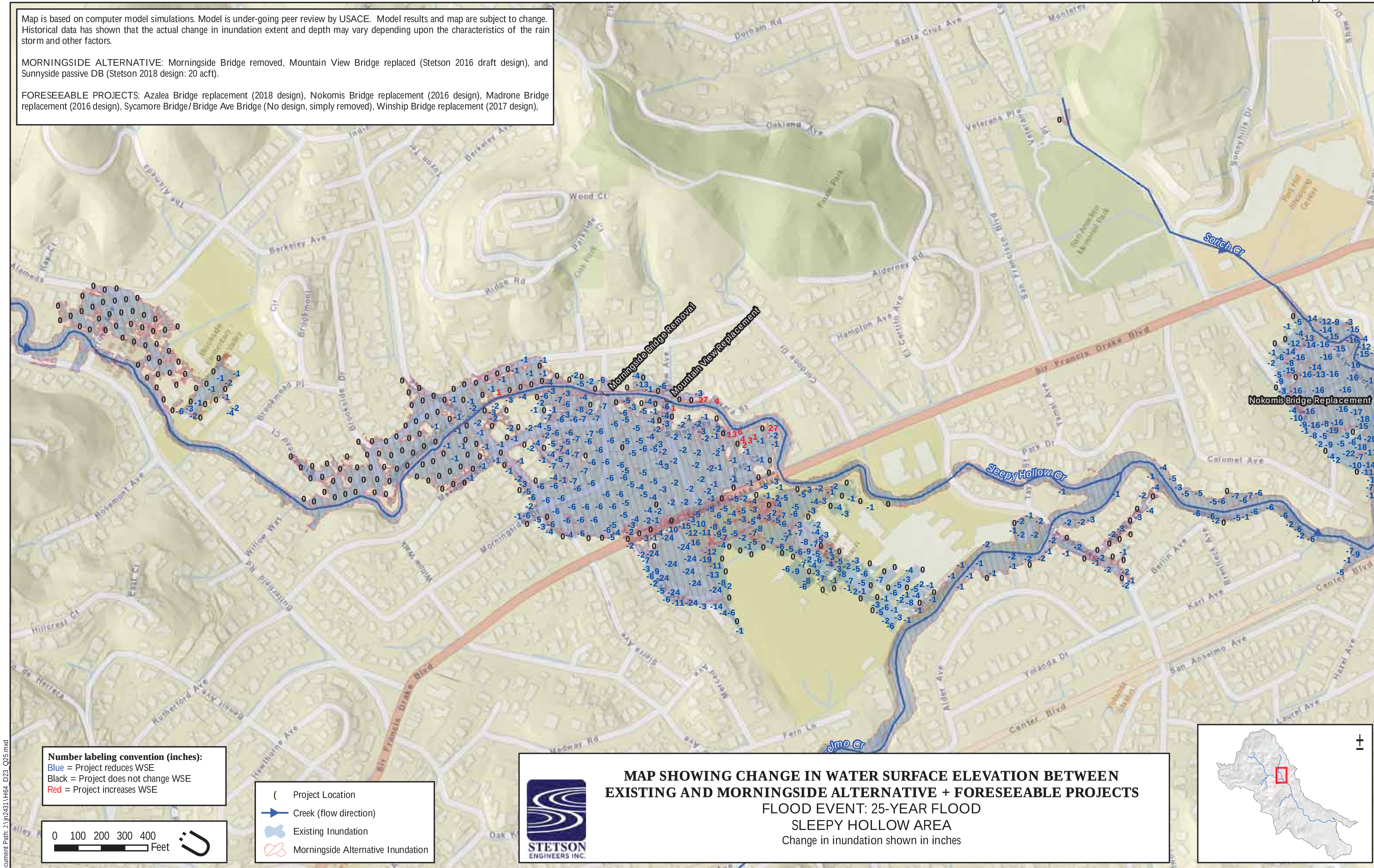

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

Document Path: J:\jn2431\H64_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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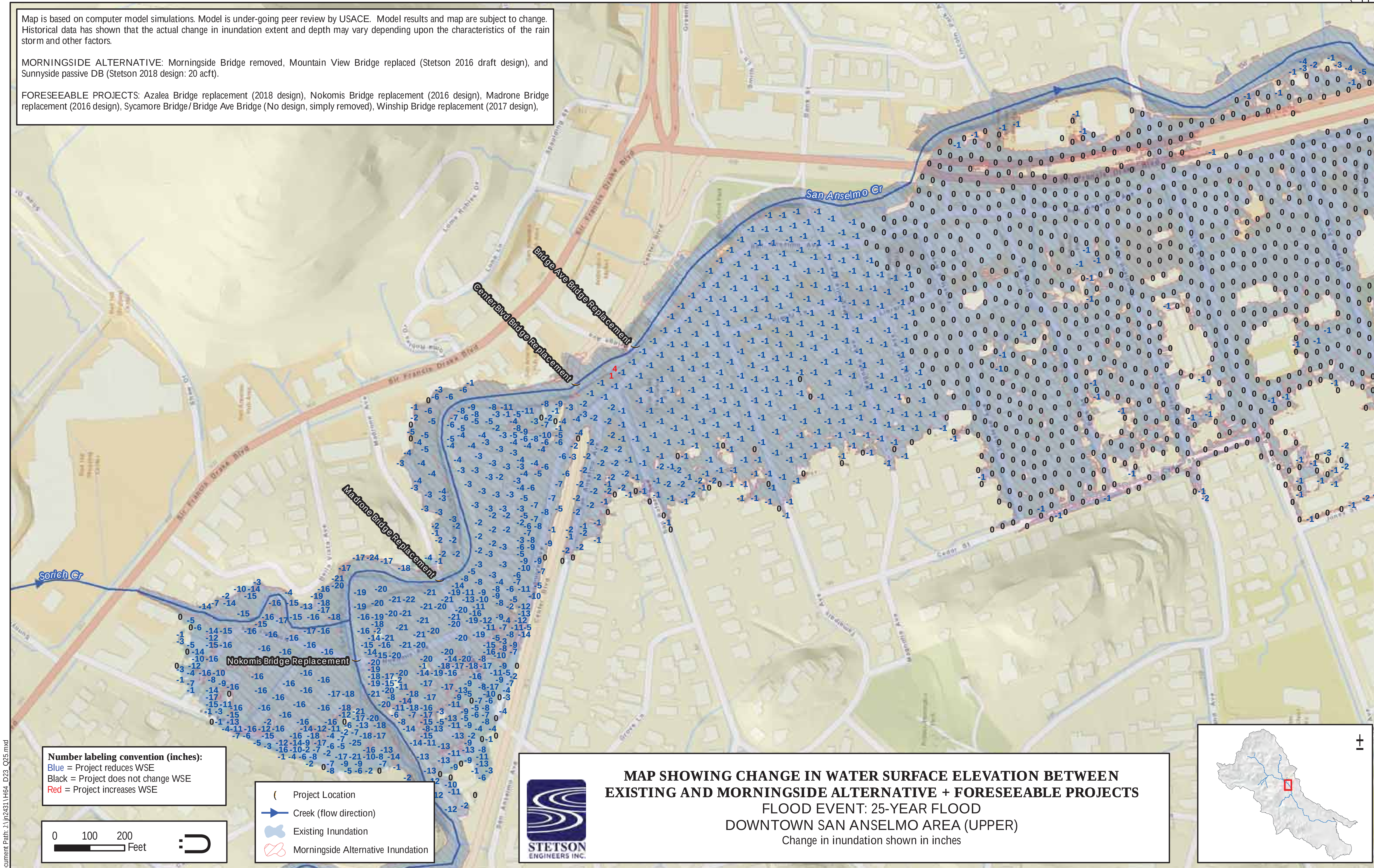
FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/ Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\H64_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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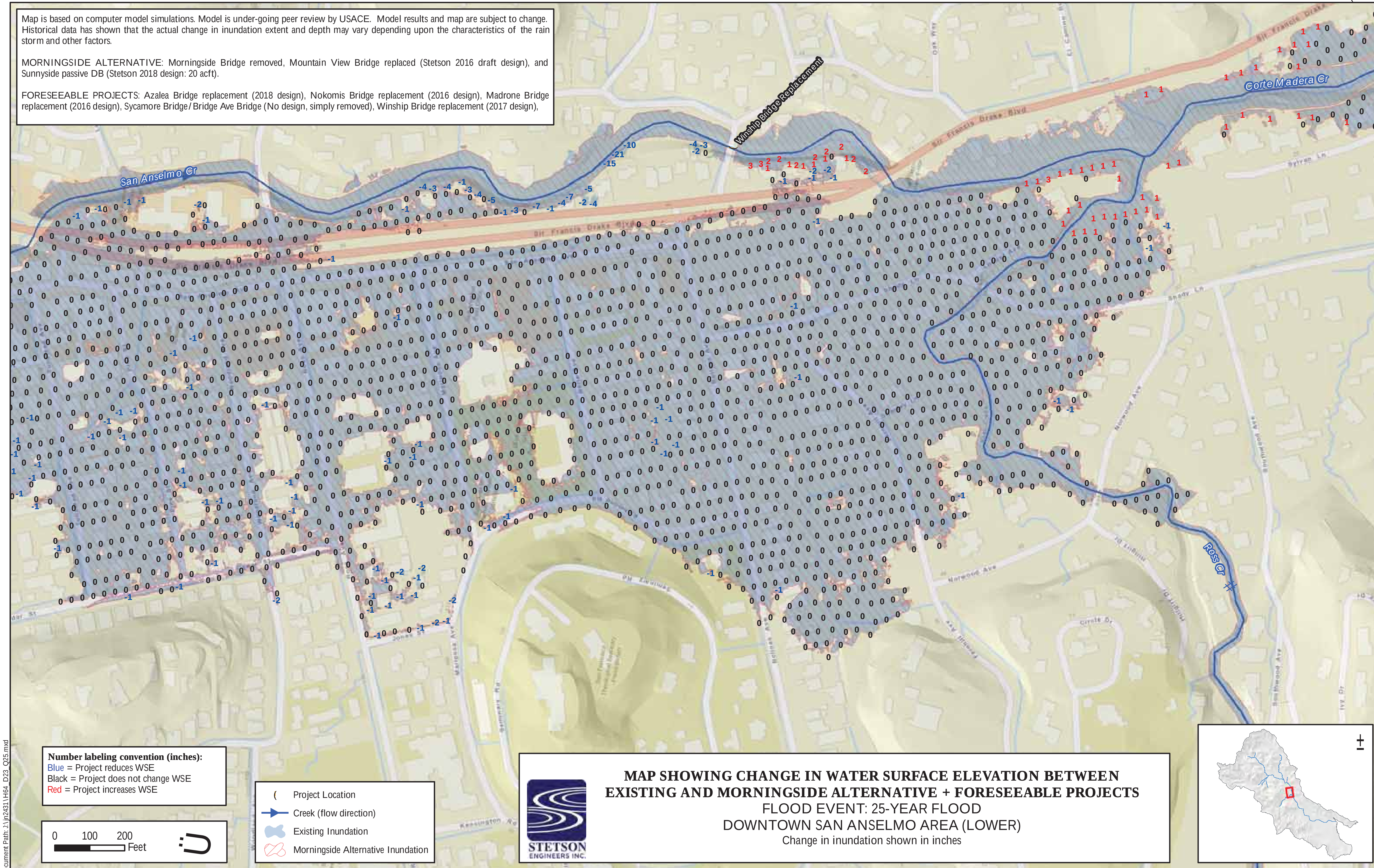
FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

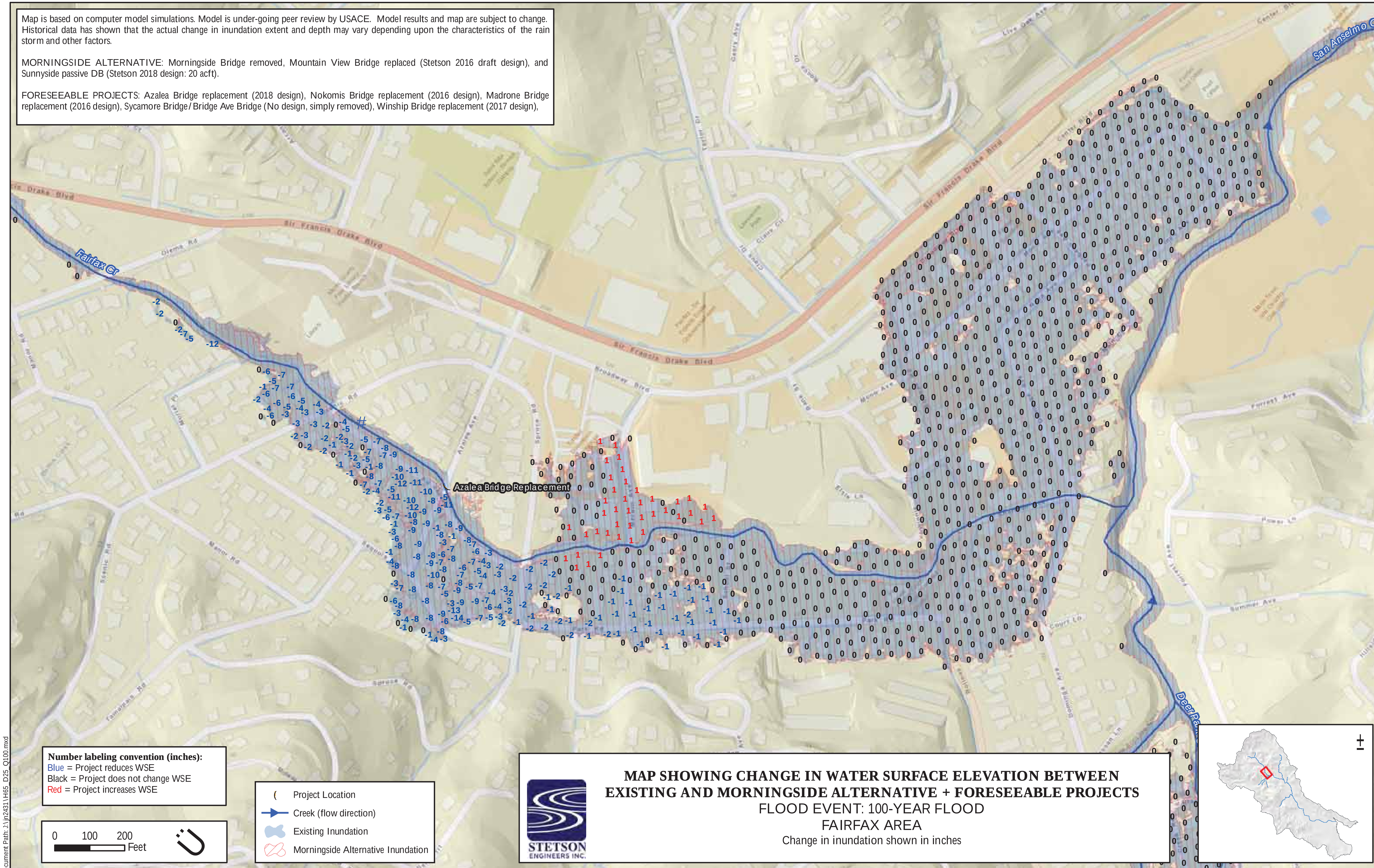
STETSON ENGINEERS INC.

Document Path: J:\jn2431\H64_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).

FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 100-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

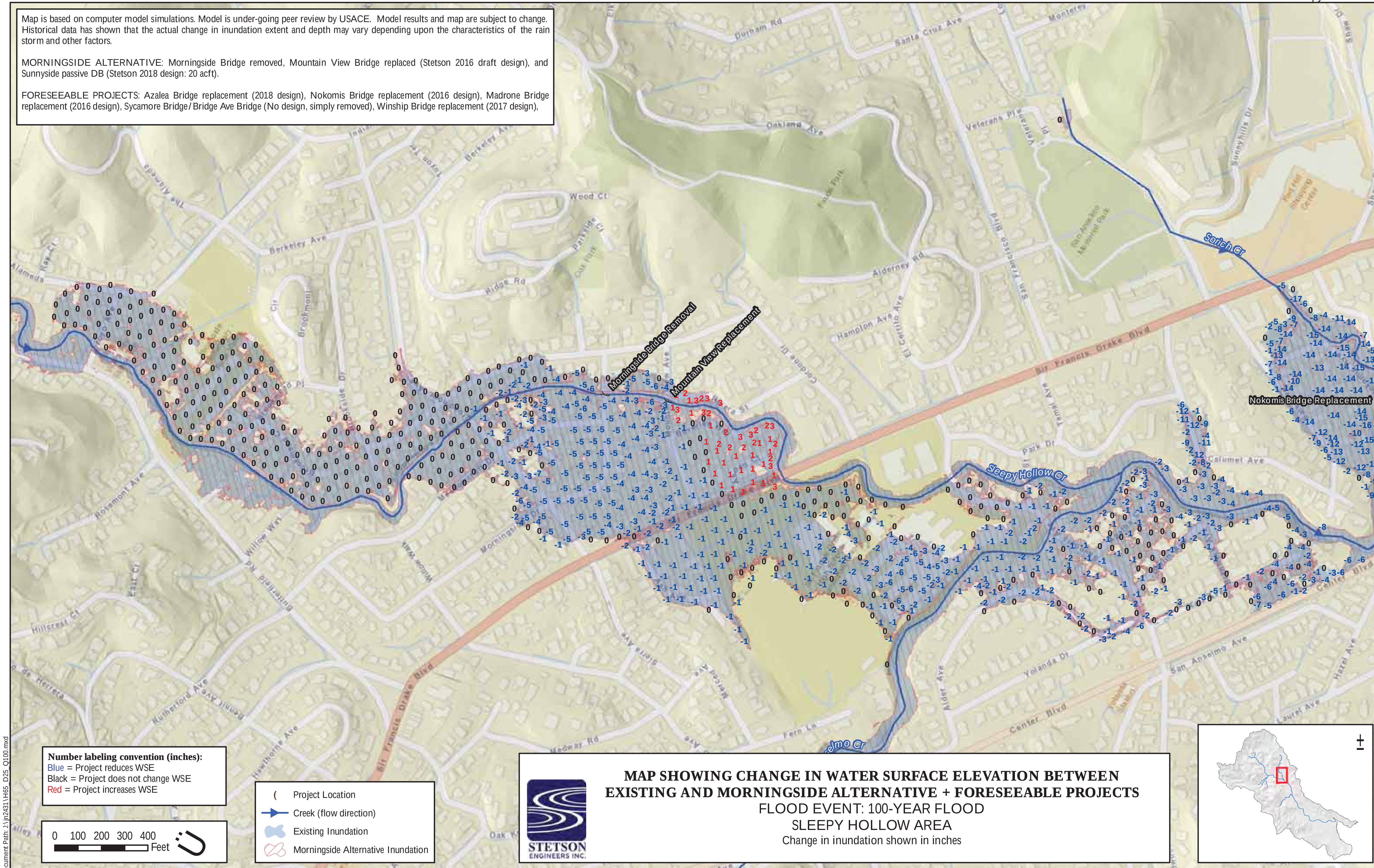
STETSON ENGINEERS INC.

Document Path: J:\jn2431\H65_D25_Q100.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).

FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/ Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 100-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.

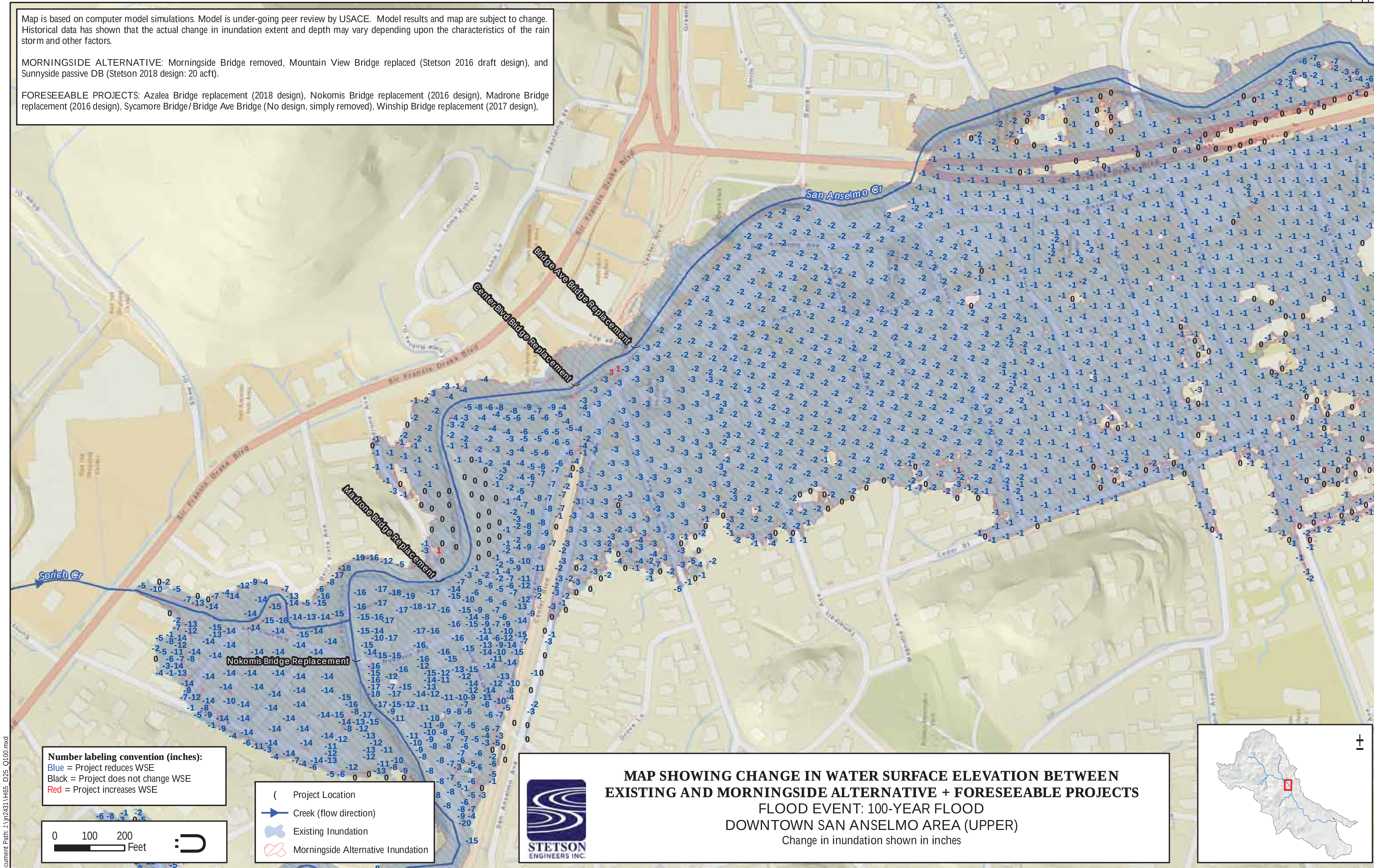
Document Path: J:\jn2431\H65_D25_Q100.mxd

FIGURE 6c - Downtown San Anselmo Area (Upper)

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).

FORESEEABLE PROJECTS: Azalea Bridge replacement (2018 design), Nokomis Bridge replacement (2016 design), Madrone Bridge replacement (2016 design), Sycamore Bridge/Bridge Ave Bridge (No design, simply removed), Winship Bridge replacement (2017 design),



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 100-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H65_D25_Q100.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

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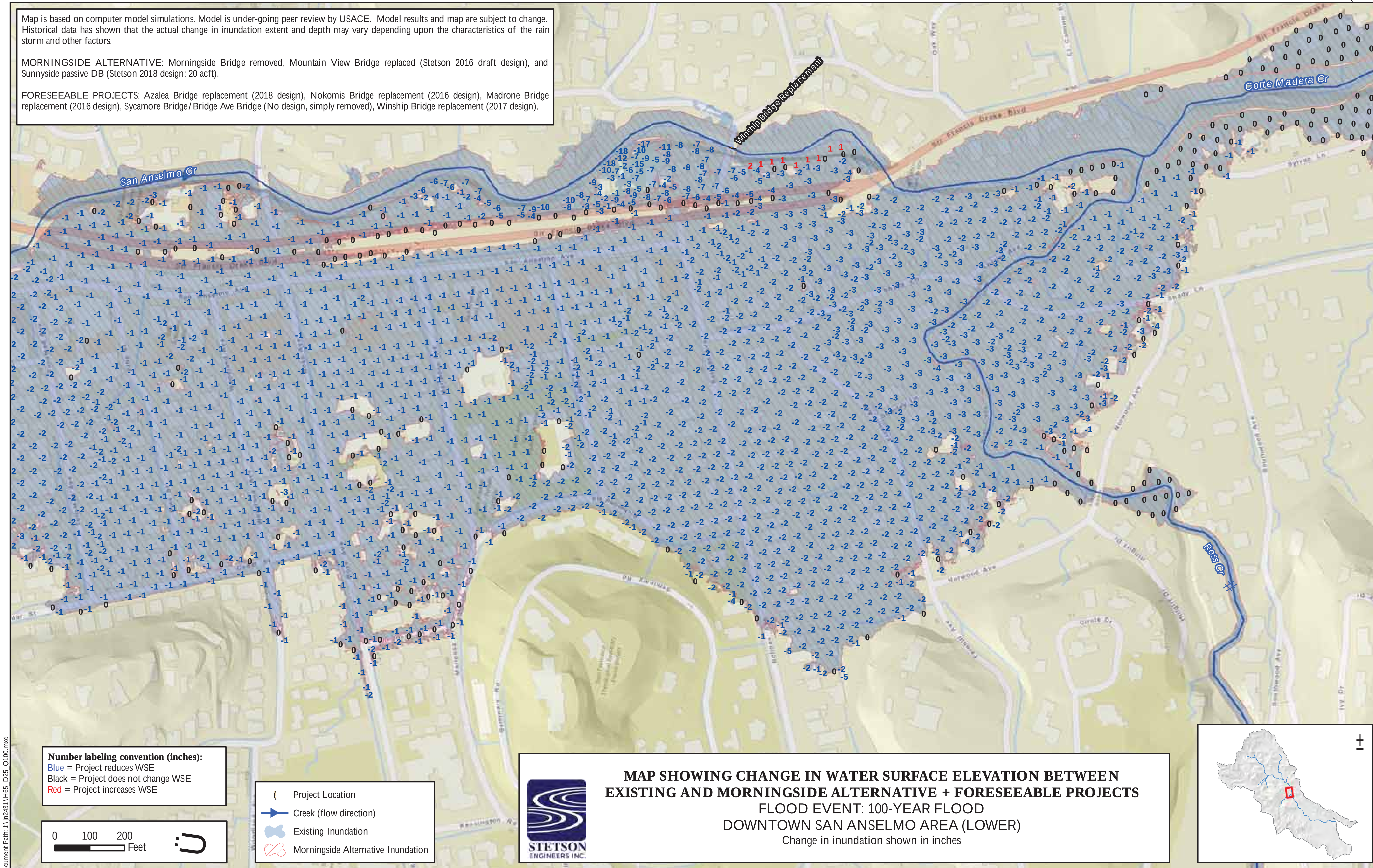


Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 100-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H65_D25_Q100.mxd

Figure 7a 10-Year Water Surface Profiles along Fairfax Creek

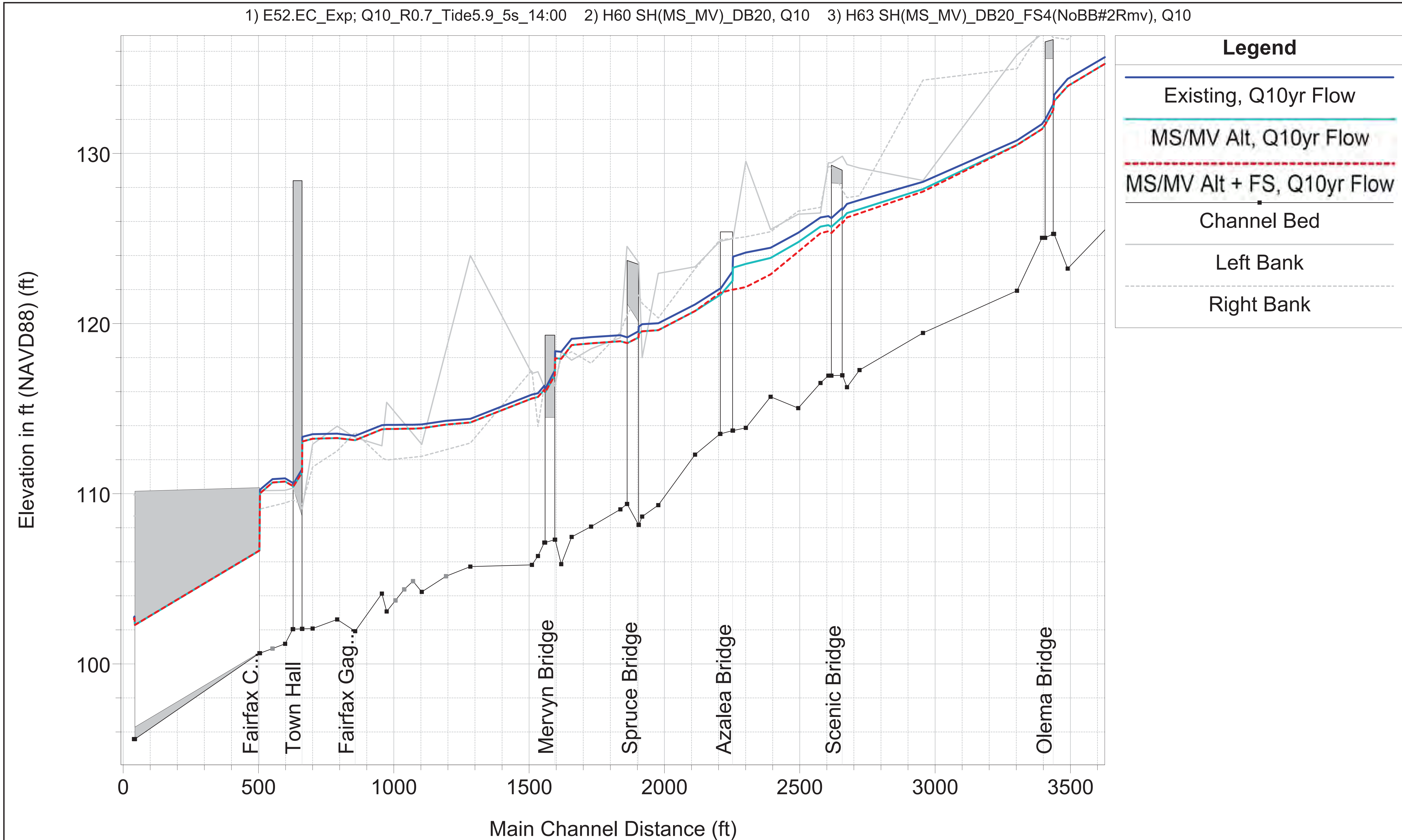


Figure 7b 25-Year Water Surface Profiles along Fairfax Creek

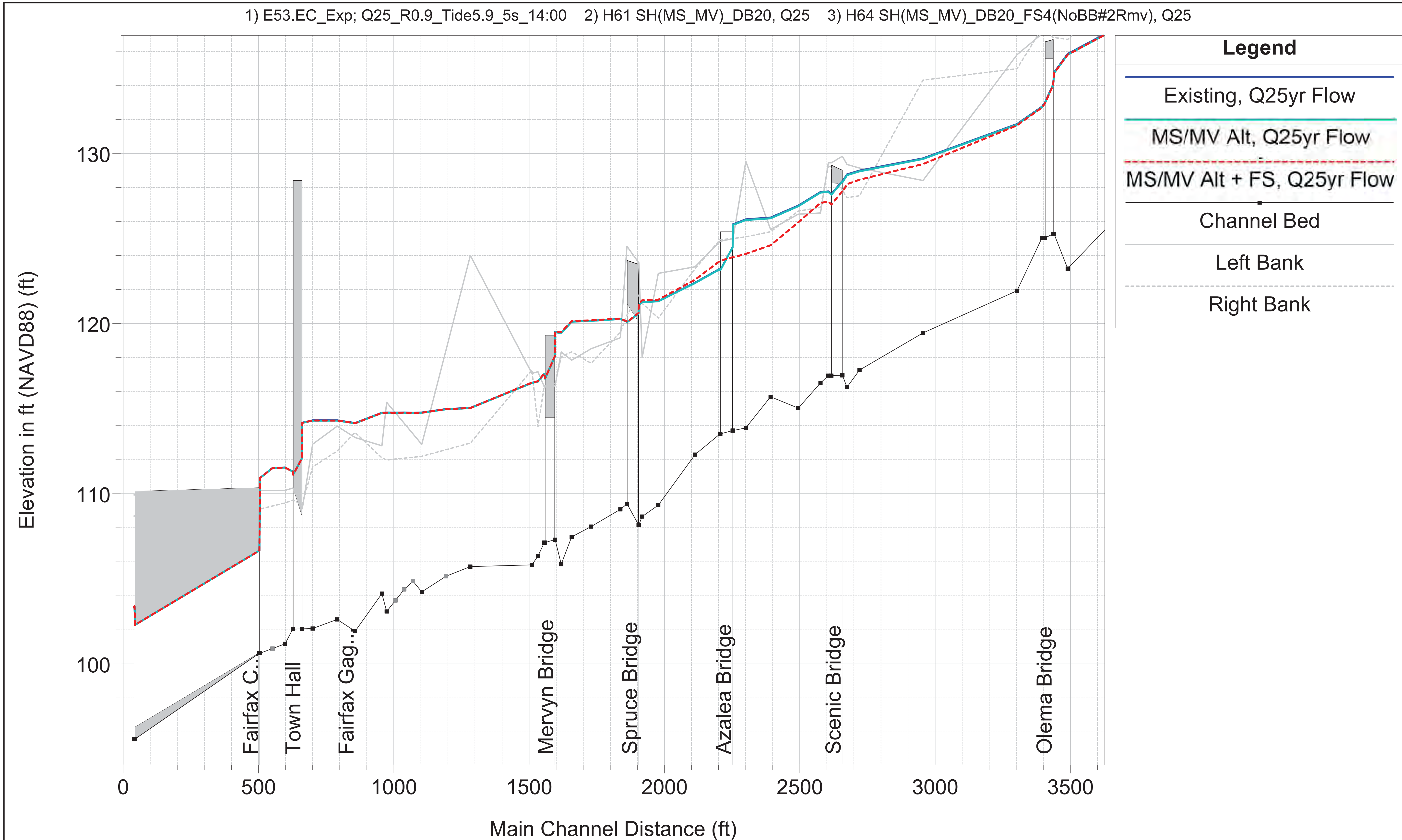


Figure 7c 100-Year Water Surface Profiles along Fairfax Creek

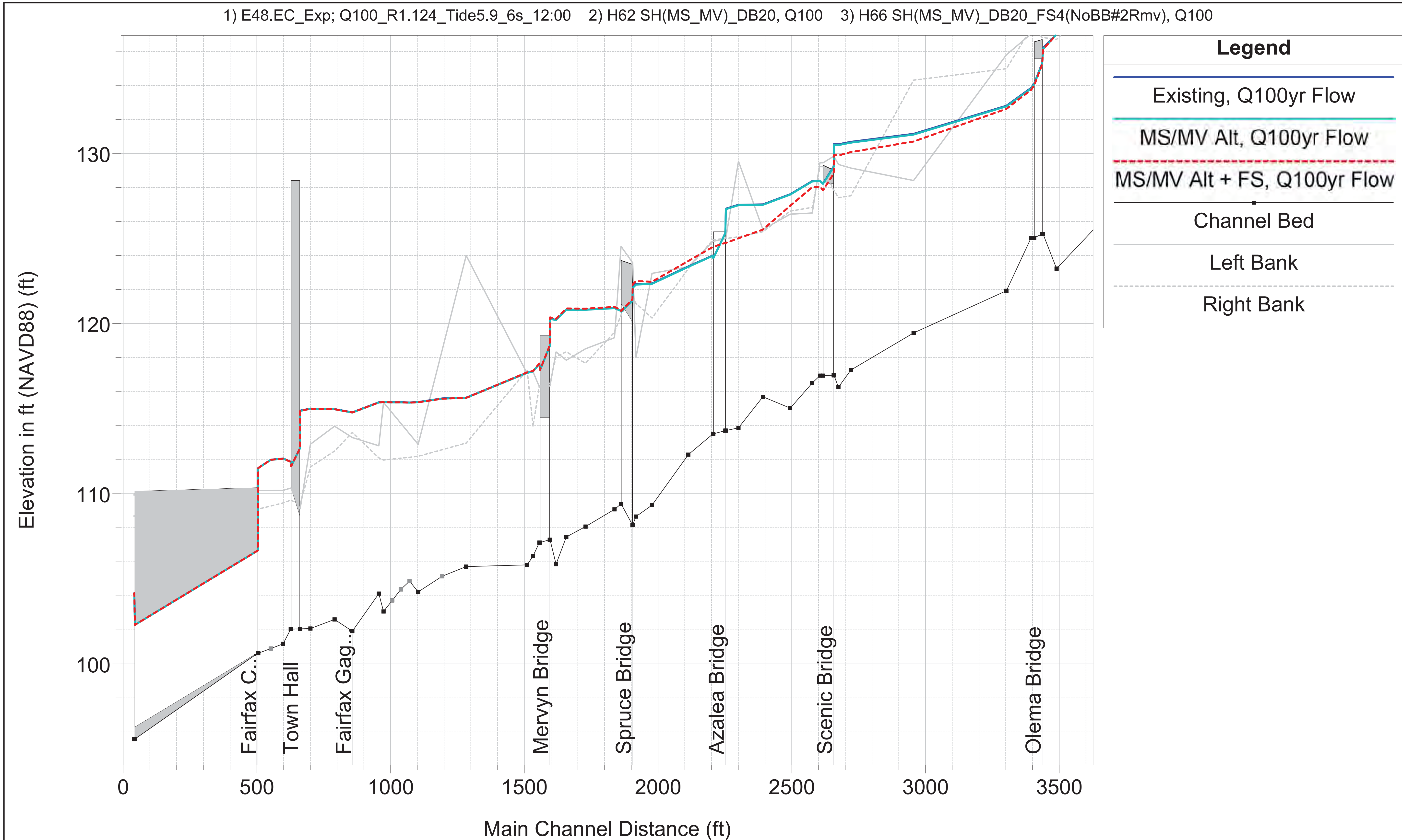


Figure 8a 10-Year Water Surface Profiles along Sleepy Hollow Creek

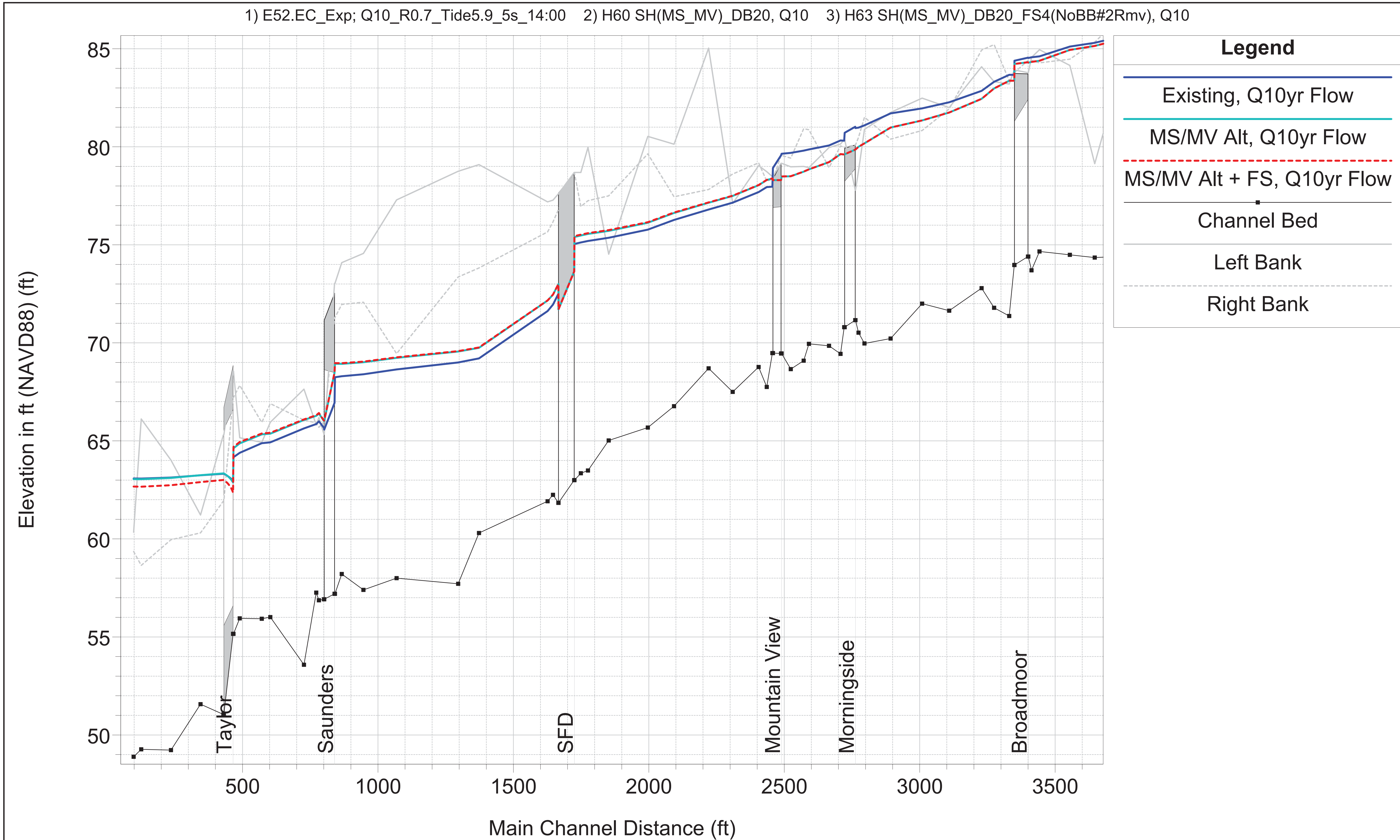


Figure 8b 25-Year Water Surface Profiles along Sleepy Hollow Creek

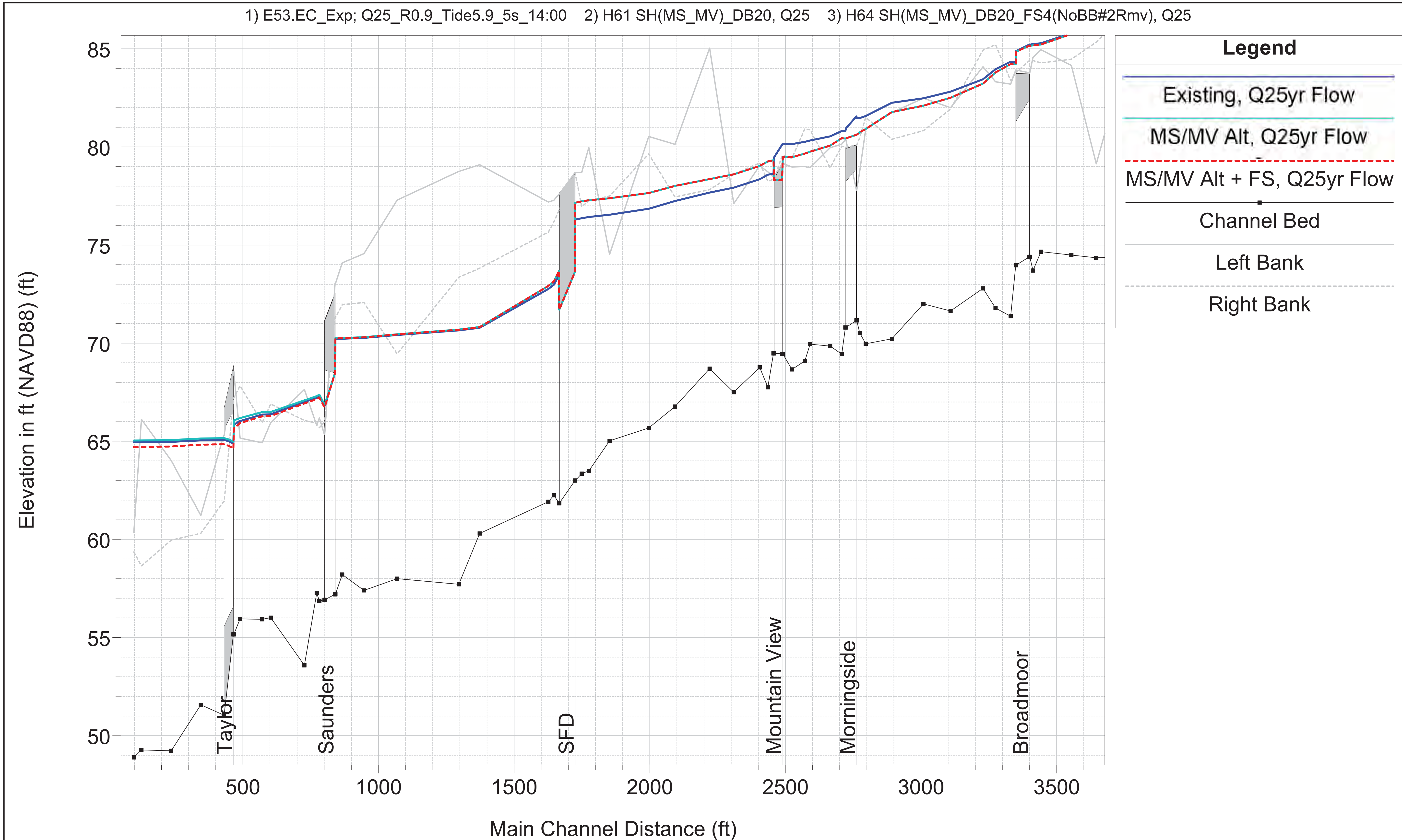


Figure 8c 100-Year Water Surface Profiles along Sleepy Hollow Creek

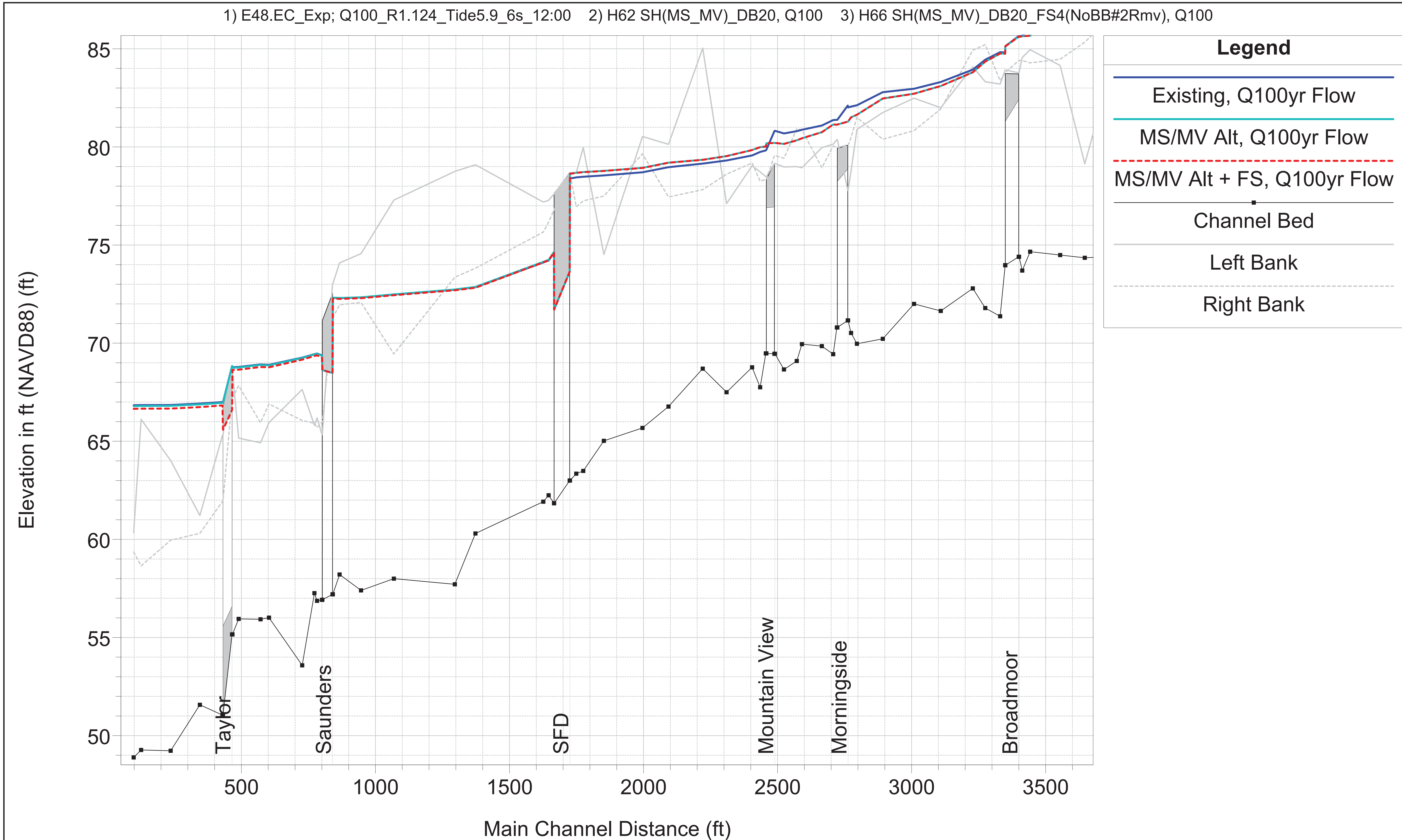
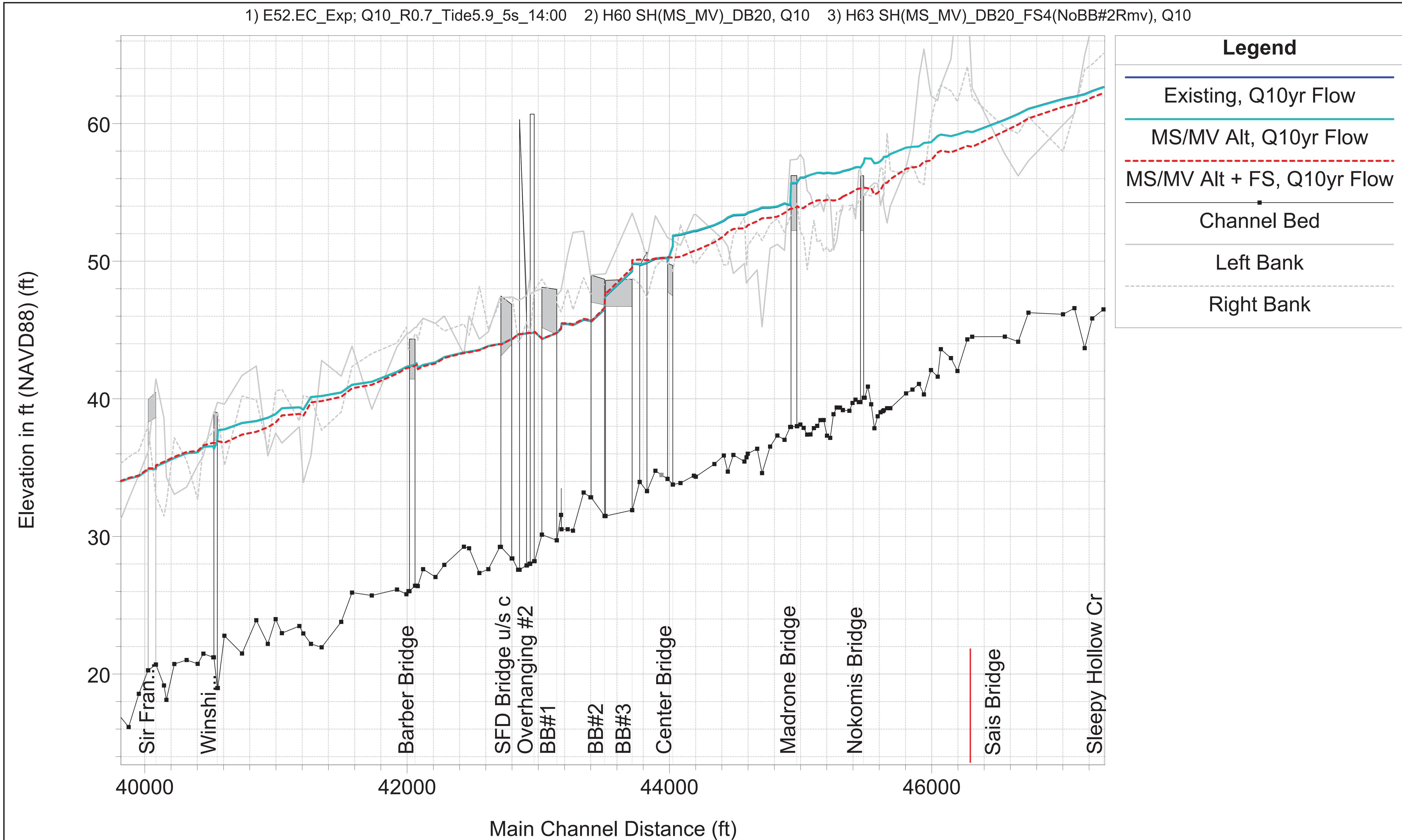
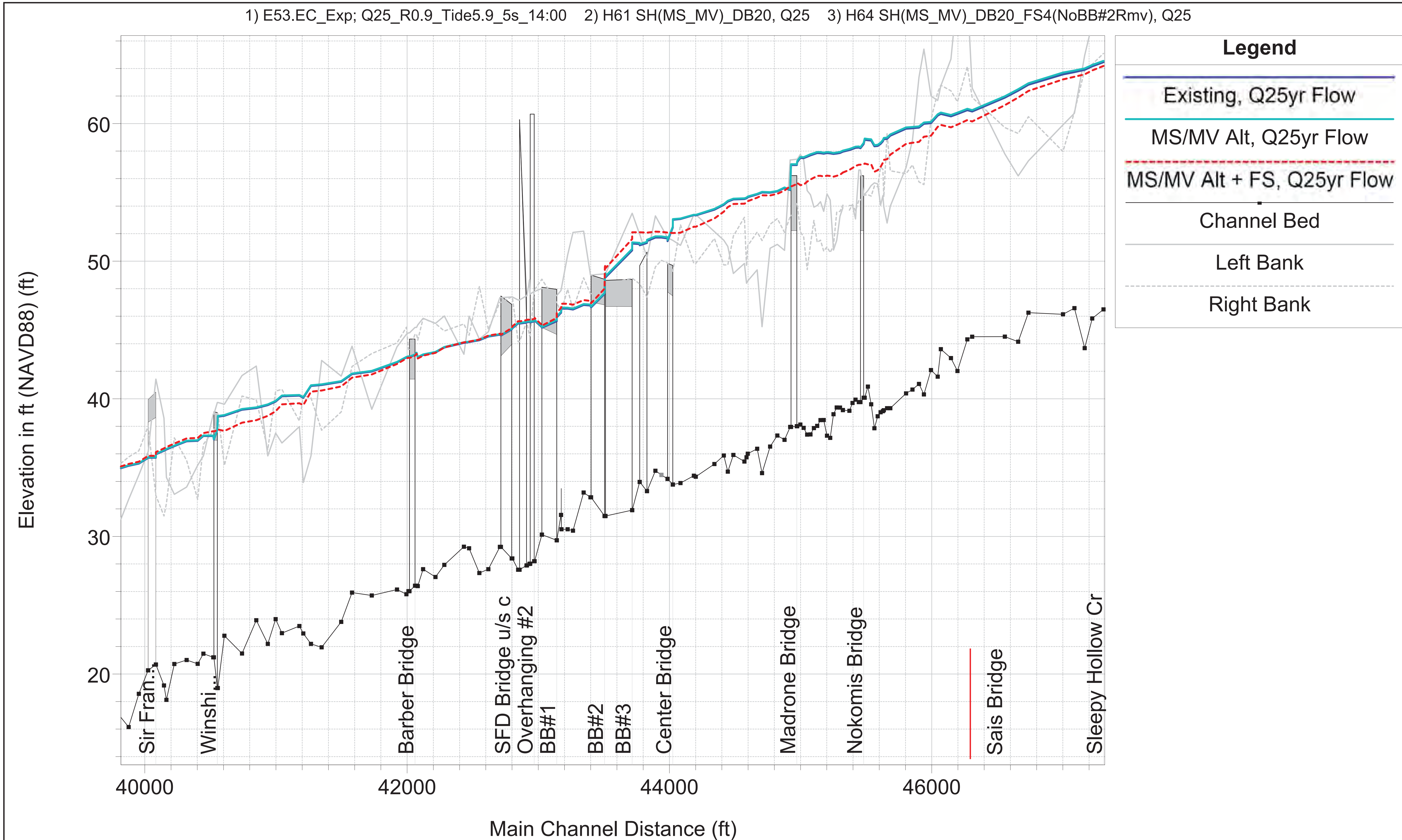


Figure 9a 10-Year Water Surface Profiles along San Anselmo Creek



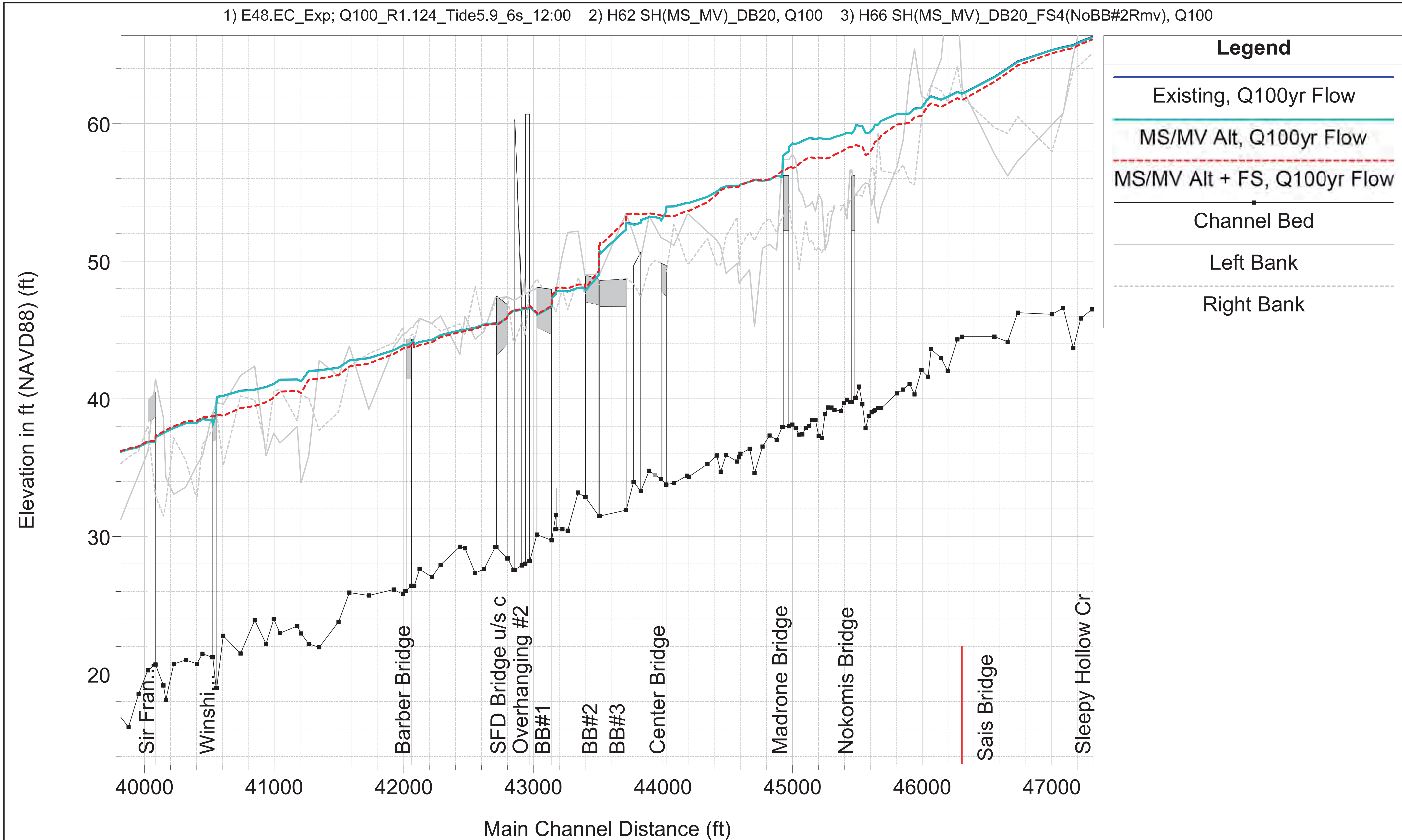
Note: The Sais Ave footbridge is not included in the model and not shown in the graph This bridge is high and above the creek water surface elevation and, thus, has no backwater effect. The relatively high top of bank elevations at the Sais Ave footbridge shown in the graph is an indication of the high elevation of the bridge.

Figure 9b 25-Year Water Surface Profiles along San Anselmo Creek



Note: The Sais Ave footbridge is not included in the model and not shown in the graph This bridge is high and above the creek water surface elevation and, thus, has no backwater effect. The relatively high top of bank elevations at the Sais Ave footbridge shown in the graph is an indication of the high elevation of the bridge.

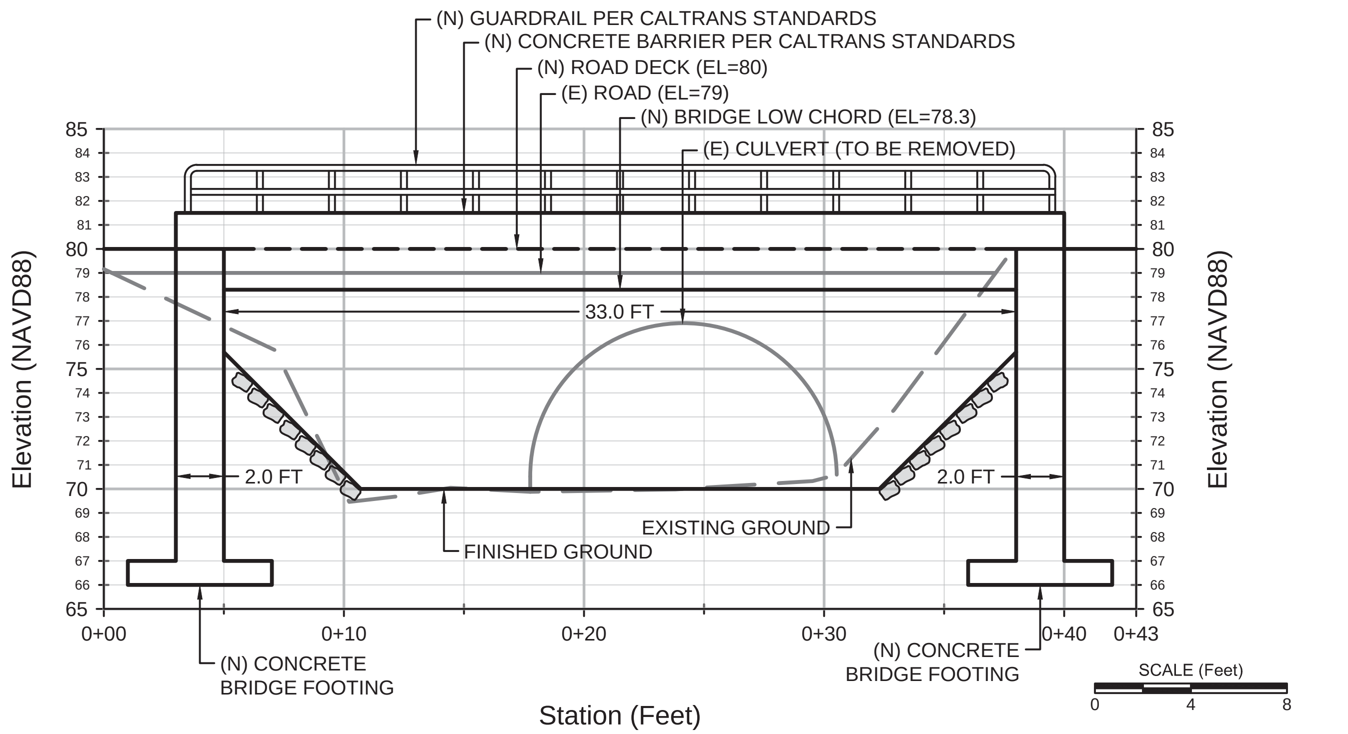
Figure 9c 100-Year Water Surface Profiles along San Anselmo Creek



Note: The Sais Ave footbridge is not included in the model and not shown in the graph This bridge is high and above the creek water surface elevation and, thus, has no backwater effect. The relatively high top of bank elevations at the Sais Ave footbridge shown in the graph is an indication of the high elevation of the bridge.

Attachment A

Conceptual Designs and Mountain View Replacement Bridge and Sunnyside Passive Detention Basin



LEGEND

REMOVE EXISTING SEWER

INSTALL NEW SEWER

SCALE (Feet)
0 8 16

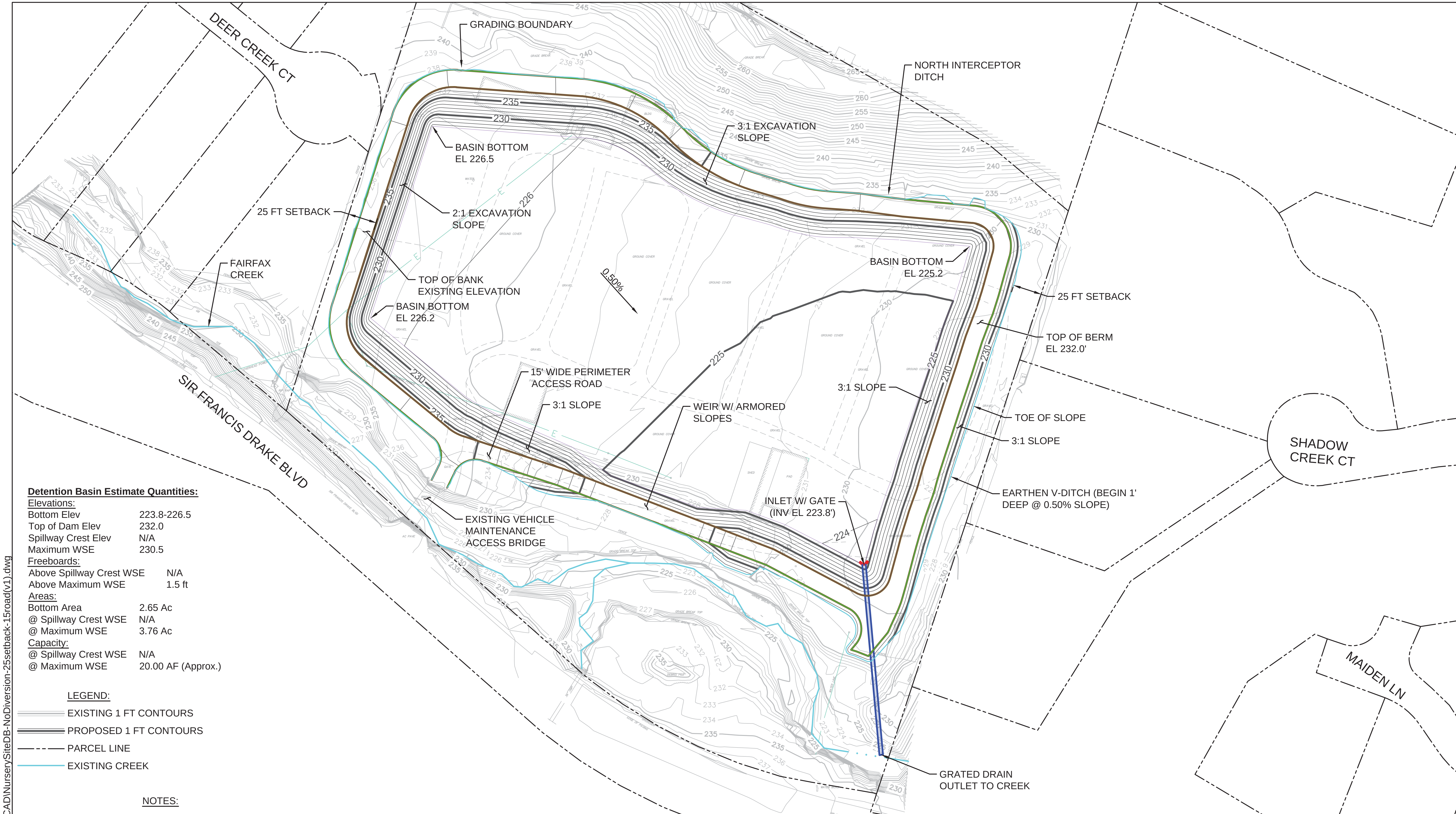
STETSON
ENGINEERS INC.

DATE: NOVEMBER 30, 2016

JN: 2431-16-1

MOUNTAIN VIEW AVE BRIDGE REPLACEMENT

F:\DATA\2431\AutoCAD\Sleepy Hollow\ConceptDesign.dwg



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	223.8-226.5
Top of Dam Elev	232.0
Spillway Crest Elev	N/A
Maximum WSE	230.5
Freeboards:	
Above Spillway Crest WSE	N/A
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.65 Ac
@ Spillway Crest WSE	N/A
@ Maximum WSE	3.76 Ac
Capacity:	
@ Spillway Crest WSE	N/A
@ Maximum WSE	20.00 AF (Approx.)

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

N
W E
S

SCALE (FEET)
0 40 80

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

F:\DATA\2431\17-16\AutoCAD\NurserySiteDB-NoDiversion-25setback-15road(v1).dwg

STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - PASSIVE BASIN

NO CREEK DIVERSION DETENTION BASIN OPTION WITH 25' SETBACK AND 15' PERIMETER ROAD

D-3 Supplemental Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A: Hydraulic Analysis of Complete Removal of Building Bridge #2

Supplemental Report

on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A:

Hydraulic Analysis of Complete Removal of Building Bridge #2

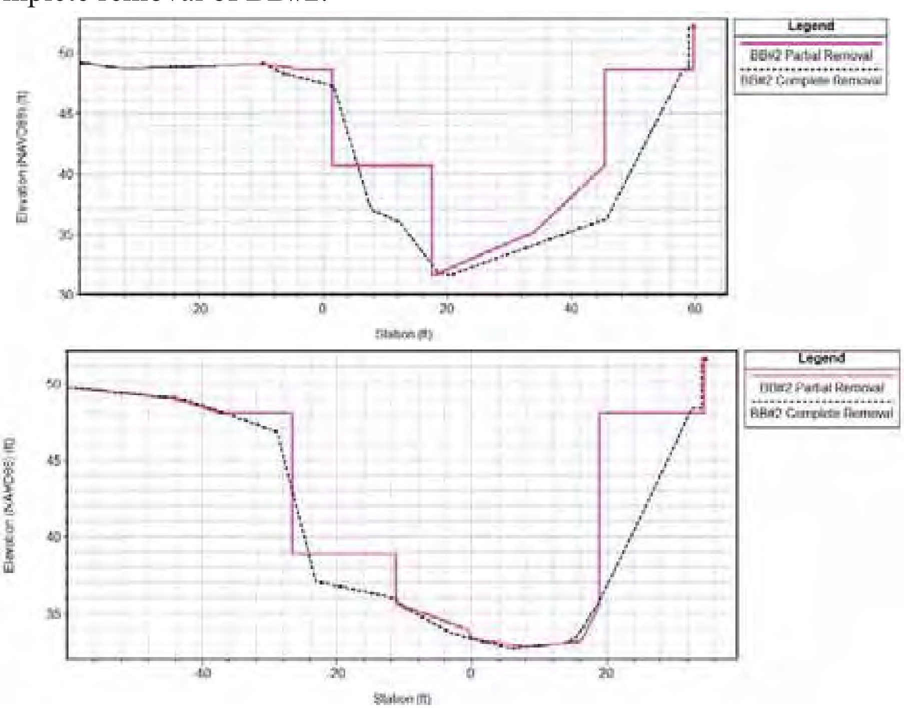
Stetson Engineers Inc.
September 15, 2017

Introduction

The “Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A” dated August 23, 2017 documented the hydraulic analysis of Option 2A which consists of partial removal of Building Bridge #2 (BB#2) and the Sunnyside Nursery detention basin. The report also included an assessment of both project effects and cumulative effects in conjunction with other foreseeable projects with regard to flooding.

This supplemental report documents the same hydraulic analysis and assessment, except that the partial removal of BB#2 in Option 2A is changed to complete removal of BB#2.

Stetson prepared a conceptual design for the complete removal of BB #2 in June 2014. In the conceptual design (attached), the building structure crossing the creek and all concrete foundation and retailing walls would be removed. Creek restoration measures would be implemented. For comparison, the concrete foundation and retailing walls would remain in the conceptual design for the partial removal of BB#2. The graph below compares cross sections for partial and complete removal of BB#2.



Comparison of Cross Sections between Partial Removal and Complete Removal of BB#2
(Top: upstream cross section at station 43507; Bottom: downstream cross section at station 43397)

Supplemental Hydraulic Modeling for Option 2A (Complete Removal of BB#2)

Stetson performed supplemental hydraulic modeling to assess the project effects and cumulative effects of Option 2A (complete removal of BB#2) with regard to flooding. The supplemental analysis used the same combined HEC-RAS1D/2D unsteady-flow model that was used in the hydraulic analysis of the partial removal of BB#2.

Similar to the hydraulic analysis of the partial removal of BB#2, the following three scenarios were analyzed:

- Existing Conditions (EC), to serve as the “Baseline” basis for comparison
- EC + Option 2A (complete removal of BB#2), to assess “Project” effects
- EC + Option 2A (complete removal of BB#2) + Foreseeable Projects, to assess “cumulative” effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 and 1/4/82 floods
- Q25, moderate, infrequent flood
- Q10, minor, less infrequent flood

<u>Results of Hydraulic Analysis in Terms of Floodplain Inundation</u>

In terms of comparison to partial removal of BB#2, results of modeling complete removal of BB#2 only show differences in floodplain inundation in the Downtown San Anselmo area. Therefore, only the results for the Downtown San Anselmo area are shown in this supplemental report. The results for other areas (i.e., Fairfax, Sleepy Hollow, and Ross/Kentfield) are the same as those under partial removal and, therefore, are not shown in this supplemental report. For easier comparison of the results for partial removal and complete removal, the same figure numbering used in the 8/23/2017 report for partial removal was applied in this supplemental report. For example, in both the 8/23/2017 report and this supplemental report, Figure 2c shows the 10-year floodplain inundation results for the Downtown San Anselmo Area (Upper).

Figures 2c and 2d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (complete removal of BB#2) and existing conditions for the 10-year flood for the Downtown San Anselmo area. Similarly, Figures 3c and 3d show the model-simulated results for the 25-year flood, and Figures 4c and 4d for the 100-year flood.

Figures 5c and 5d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (complete removal of BB#2) + Foreseeable Projects and existing conditions for the 10-year flood in the Downtown San Anselmo area. Similarly, Figures 6c and 6d show the model-simulated results for the 25-year flood, and Figures 7c and 7d for the 100-year flood.

In general, complete removal of BB#2 has the similar floodplain inundation extent as partial removal of BB#2 under the three different flood conditions (10-year, 25-year, and 100-year). Complete removal of BB#2 would reduce floodplain inundation depth just slightly more than partial removal of BB#2 by up to 0.1 ft.

Option 2A (complete removal of Building Bridge #2) would slightly increase flooding in the area between Winship and Barber Bridges during the 25-year and 100-year floods (see Figures 3d and 4d). This increase is similar to the increase resulting from partial removal of BB#2. Option 2A (complete removal of Building Bridge #2) + the Foreseeable Projects would mitigate for the slight increase in flooding caused by Option 2A alone.

Results of Hydraulic Analysis in Terms of Channel Water Surface Level

Figures 8 to 10 compare the HEC-RAS model-simulated in-channel water surface profiles along the San Anselmo Creek for partial removal with complete removal of BB#2 for the 10-year flood, 25-year flood, and 100-year flood, respectively, under the Option 2A condition.

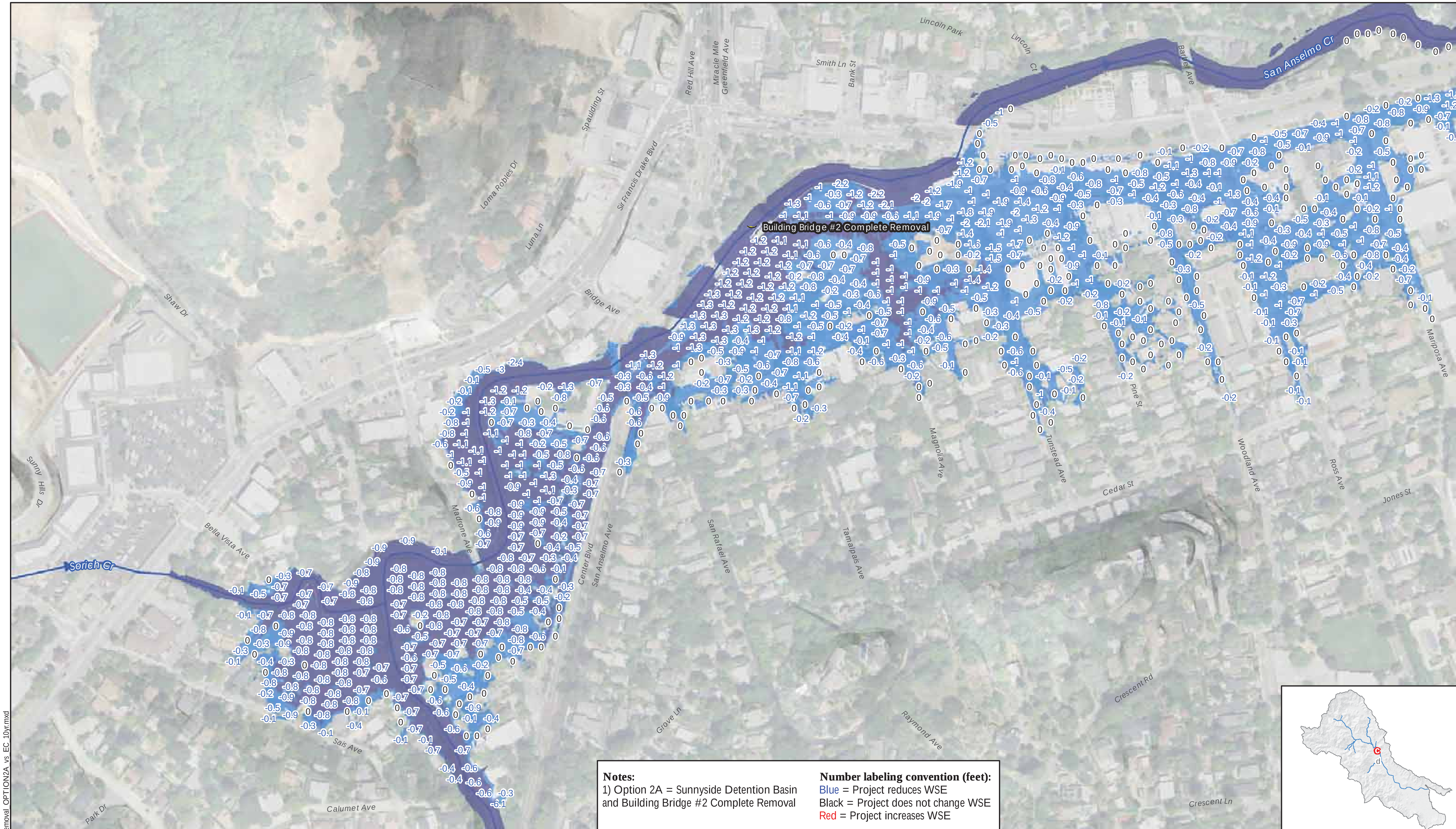
Similarly, Figures 11 to 13 compare the simulated in-channel water surface profiles along the San Anselmo Creek for partial removal with complete removal of BB#2 under the Option 2A + Foreseeable Projects condition.

Complete removal of BB#2 would lower the in-channel water surface elevation at the upstream face of BB#2 slightly more than partial removal of BB#2 by up to 0.1 ft.

Results of Hydraulic Analysis in Terms of Channel Hydraulic Capacity

Compared to partial removal of BB#2, complete removal of BB#2 provides negligible increase in channel hydraulic capacity because its lowering of the in-channel water surface elevation is minimal.

FIGURE 2c



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)
Option 2A Project

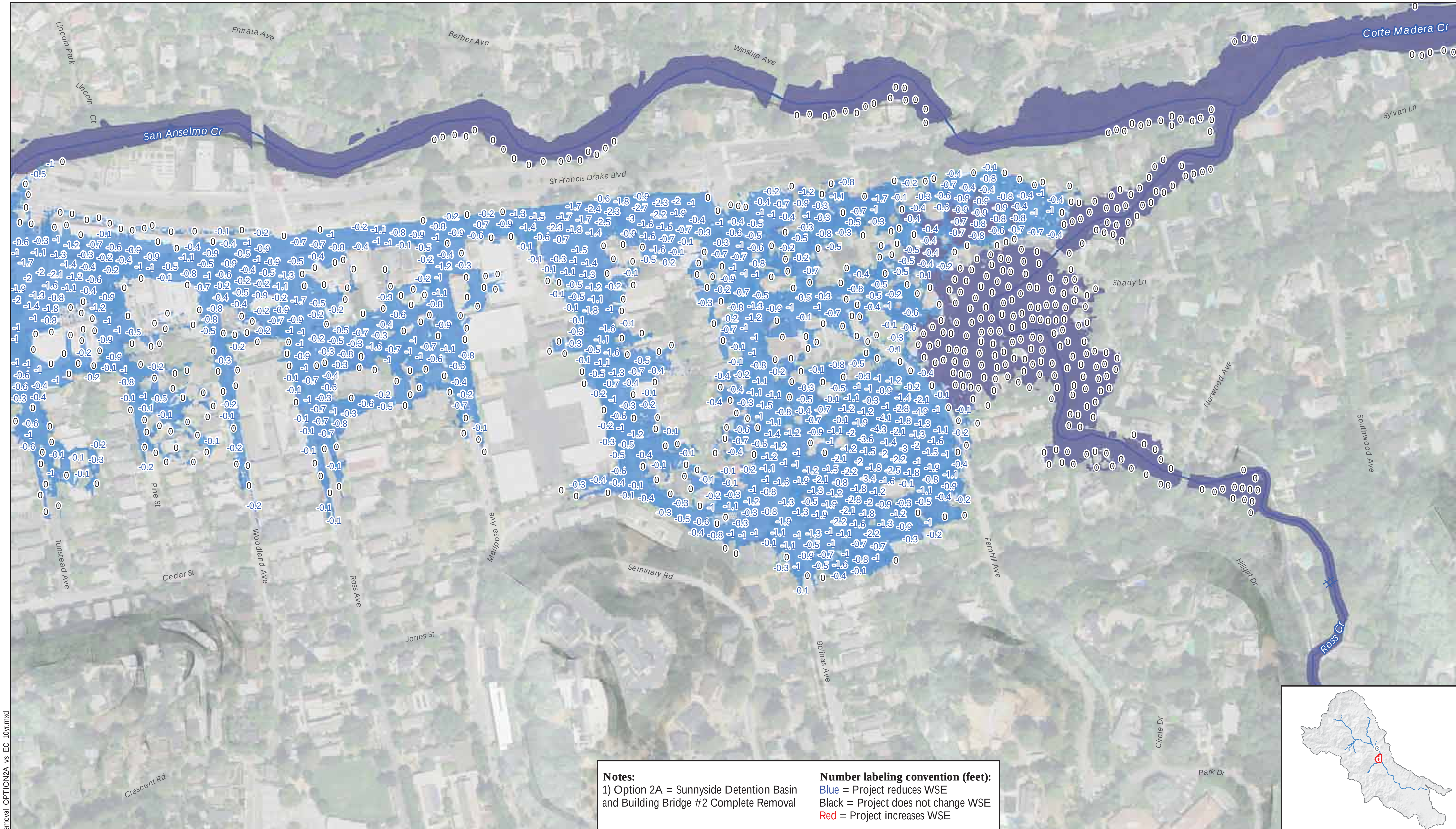
STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_10yr.mxd

FIGURE 2d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

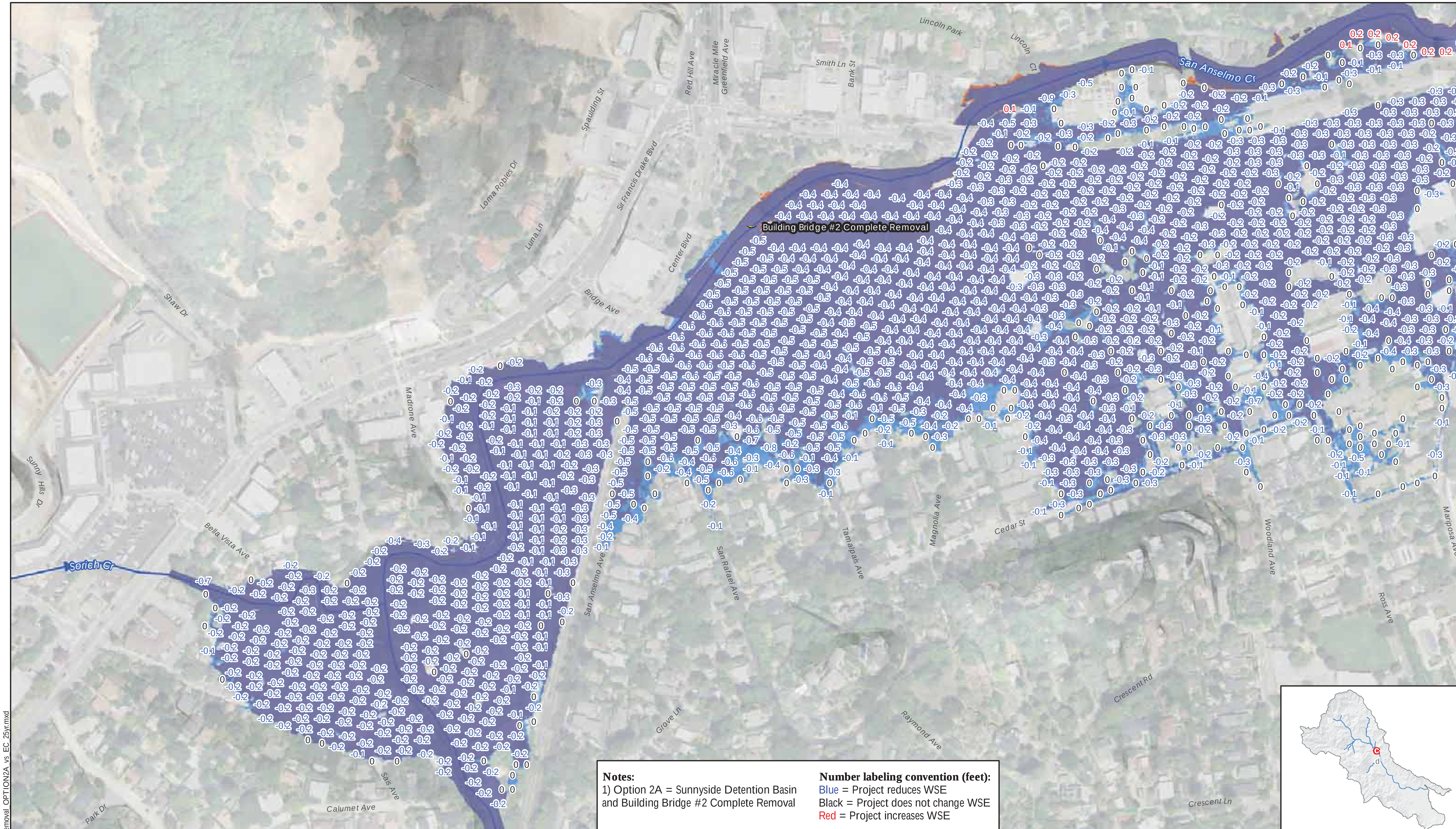
STETSON ENGINEERS INC.

Existing Inundation
Creek (flow direction)
Option 2A Inundation
Existing Inundation & Option 2A Inundation

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_10yr.mxd



Existing Inundation

Option 2A Inundation

Existing Inundation & Option 2A Inundation

Creek (flow direction)

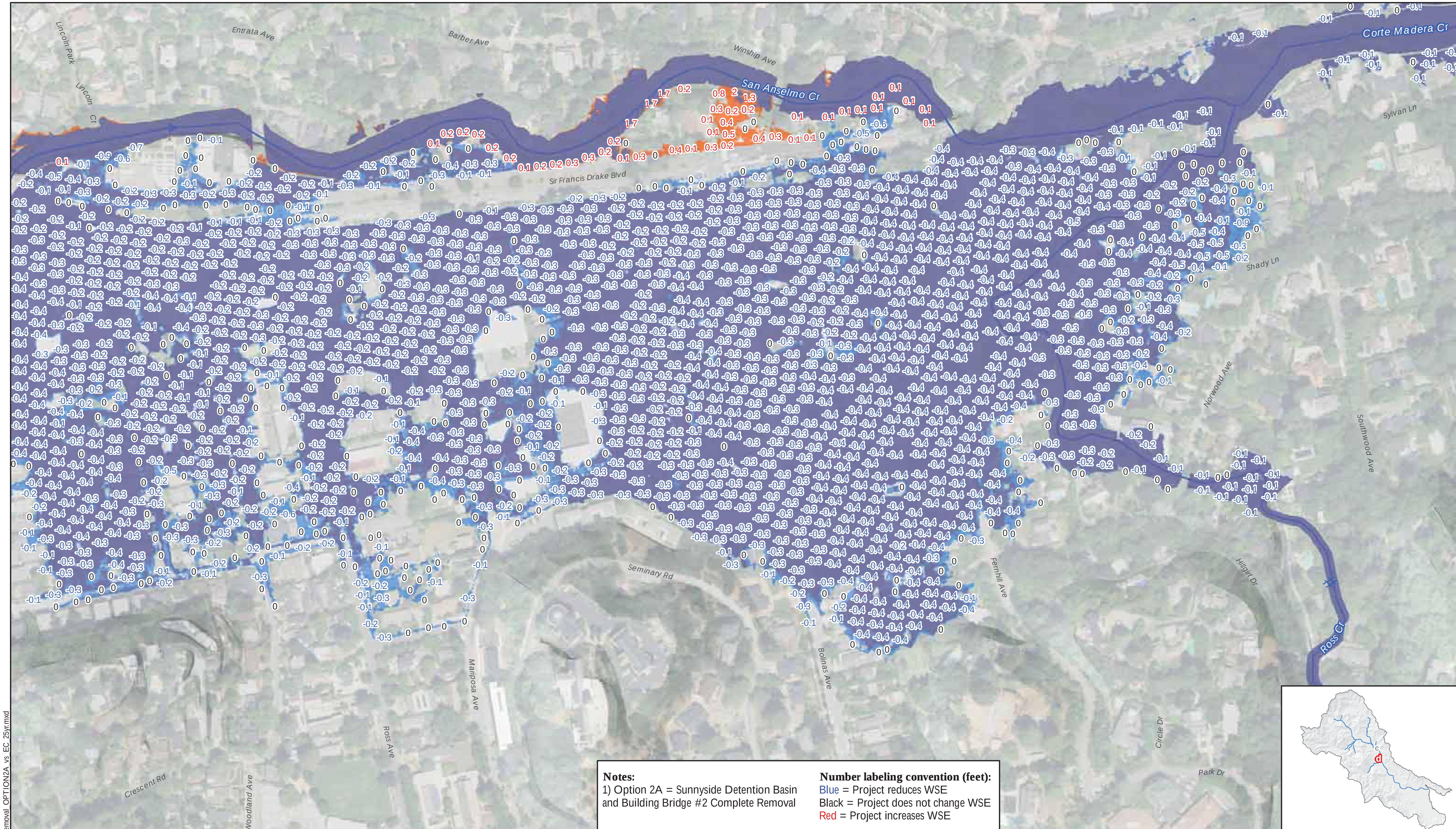
Option 2A Project

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_25yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_25yr.mxd

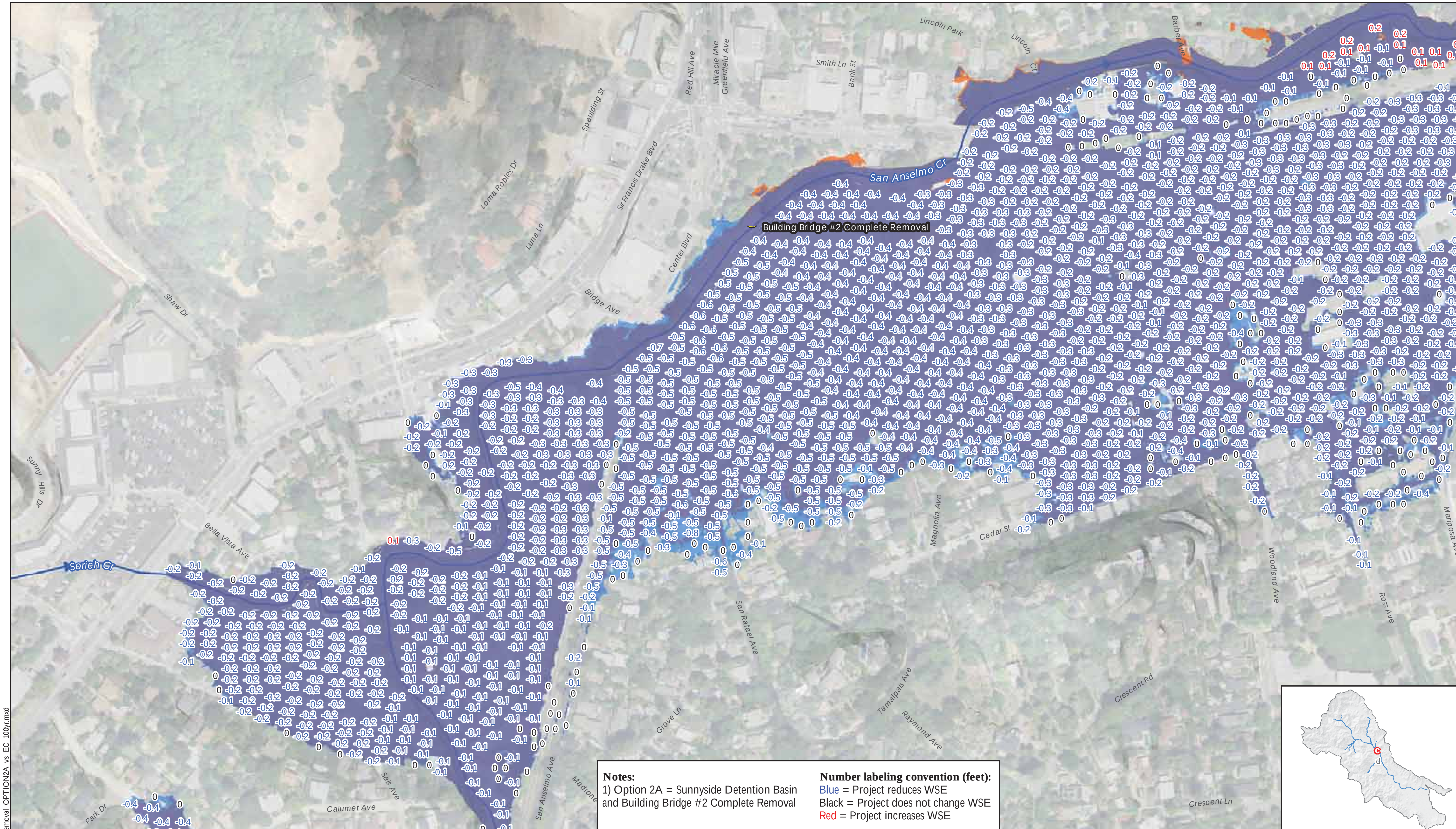
STETSON ENGINEERS INC.

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200
Feet

FIGURE 4c



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

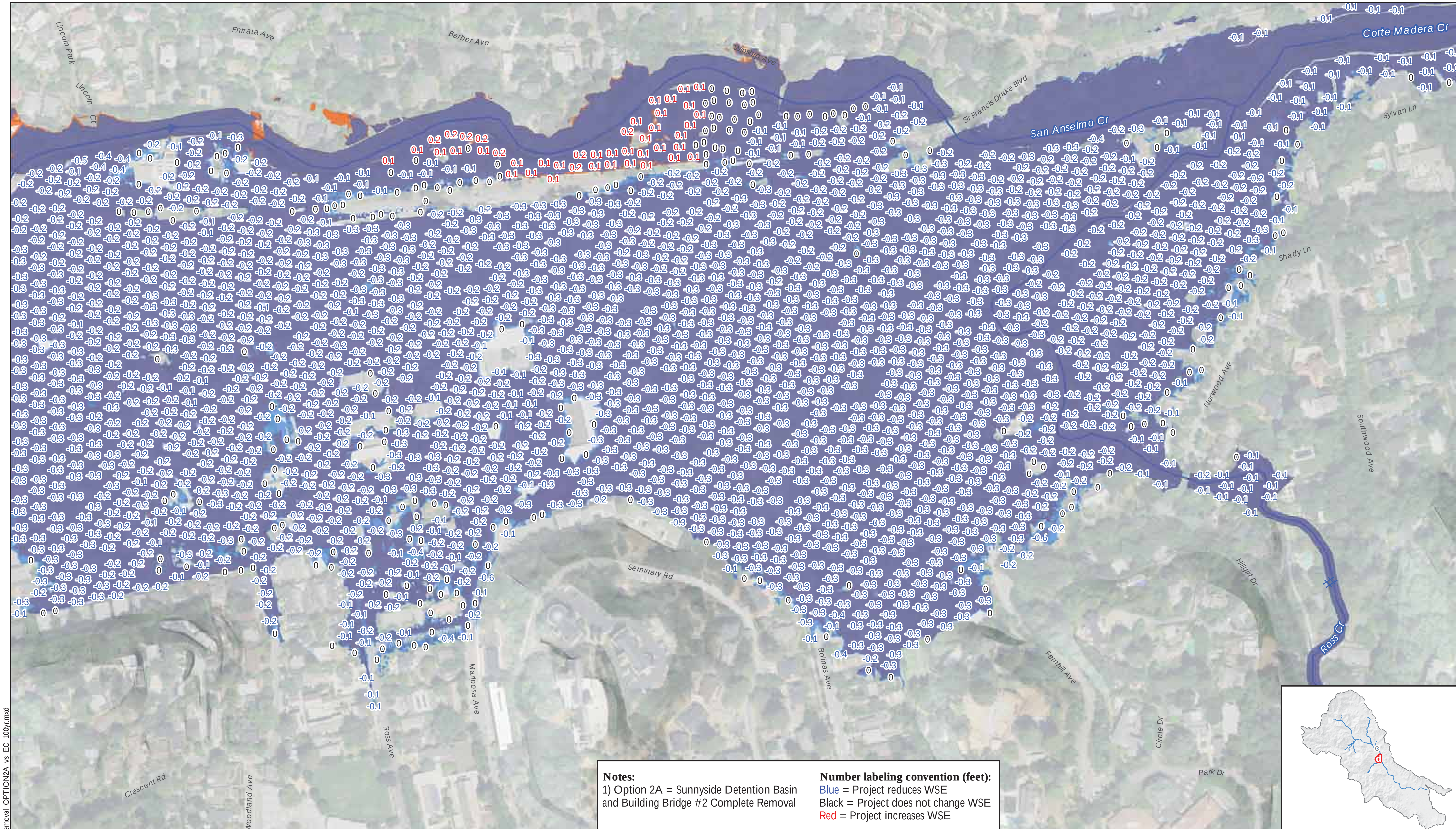
STETSON ENGINEERS INC.

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)
Option 2A Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_100yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

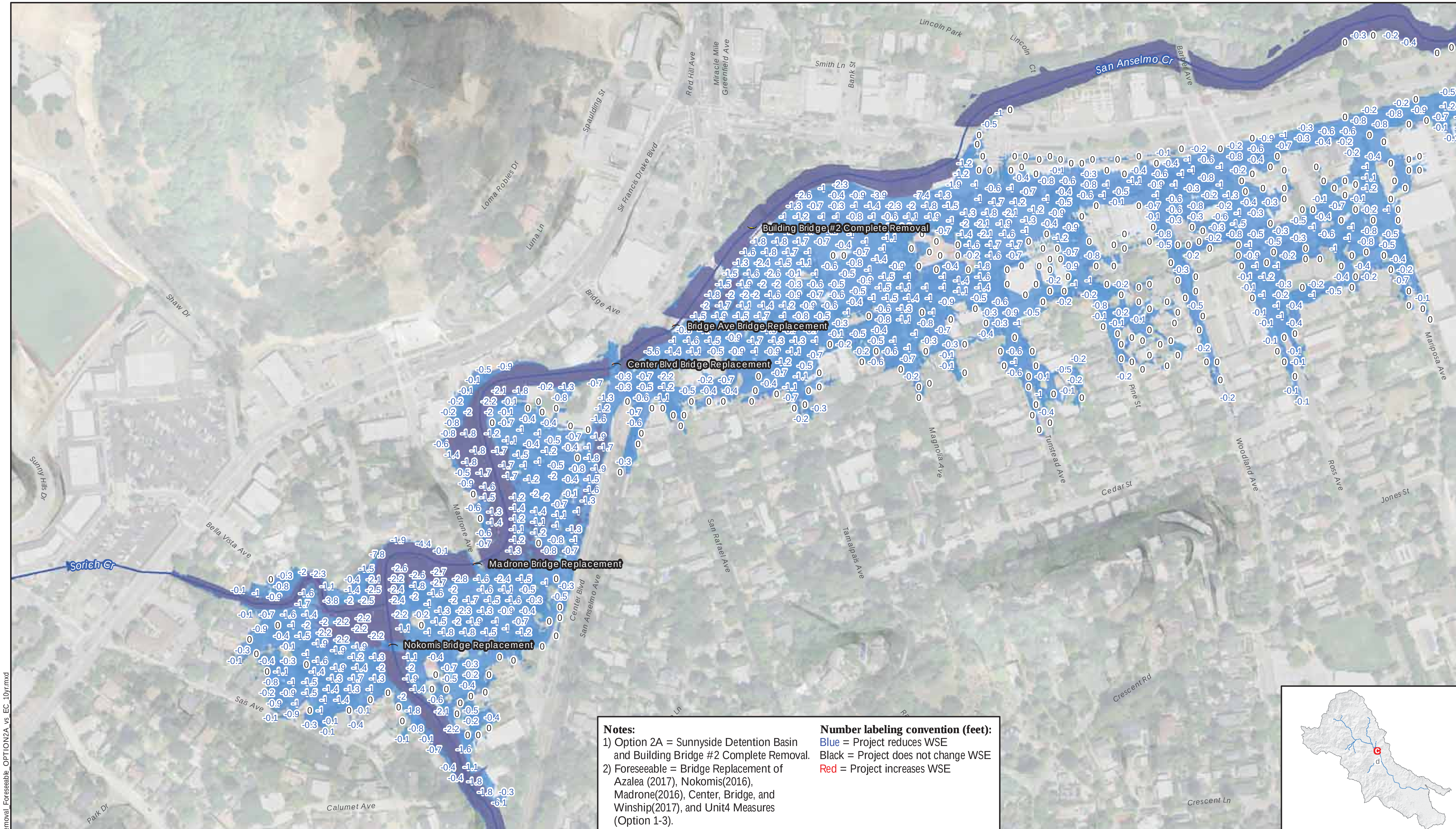
Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_100yr.mxd

STETSON ENGINEERS INC.

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200
Feet



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

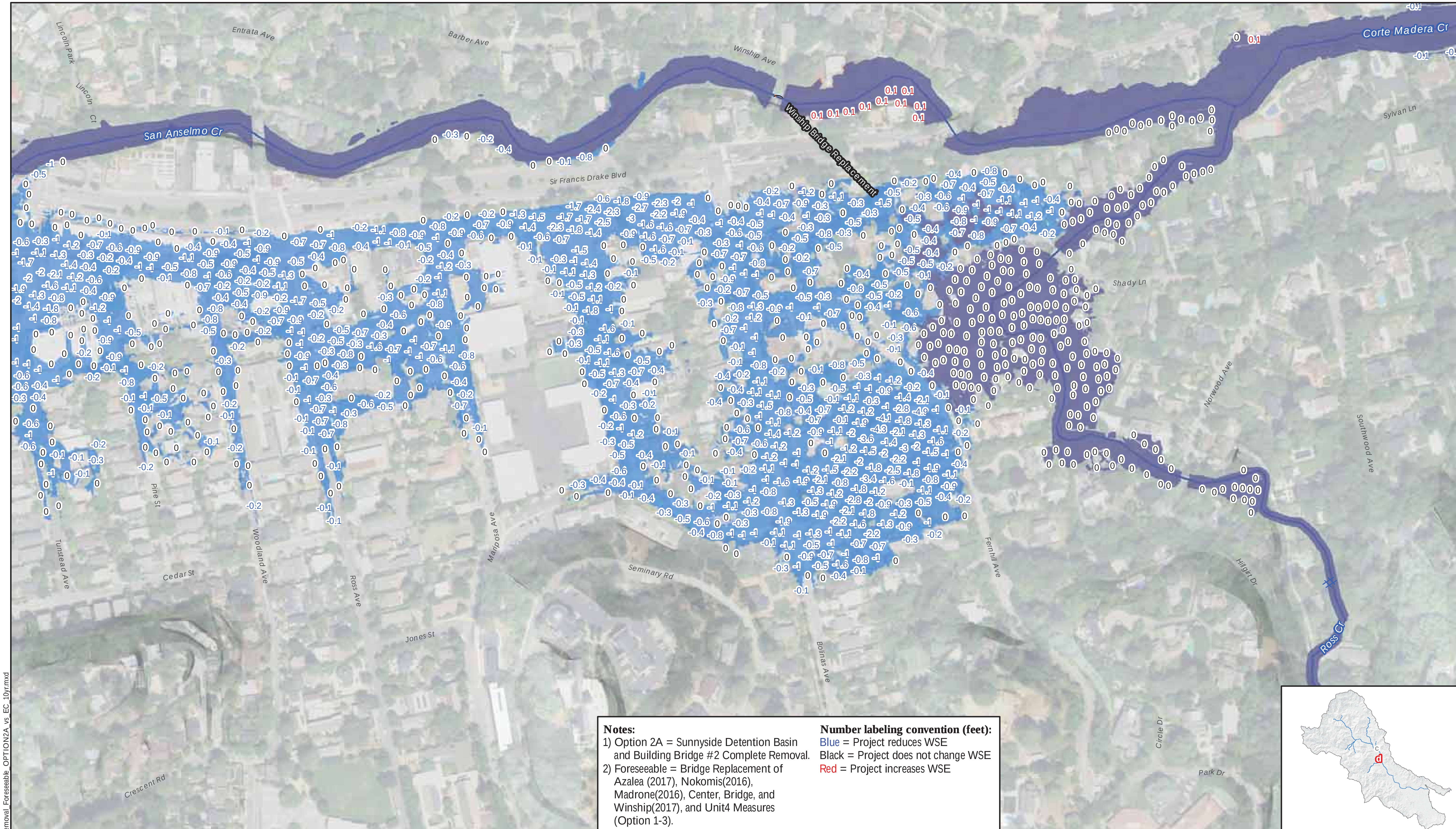
STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_10yr.mxd

FIGURE 5d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

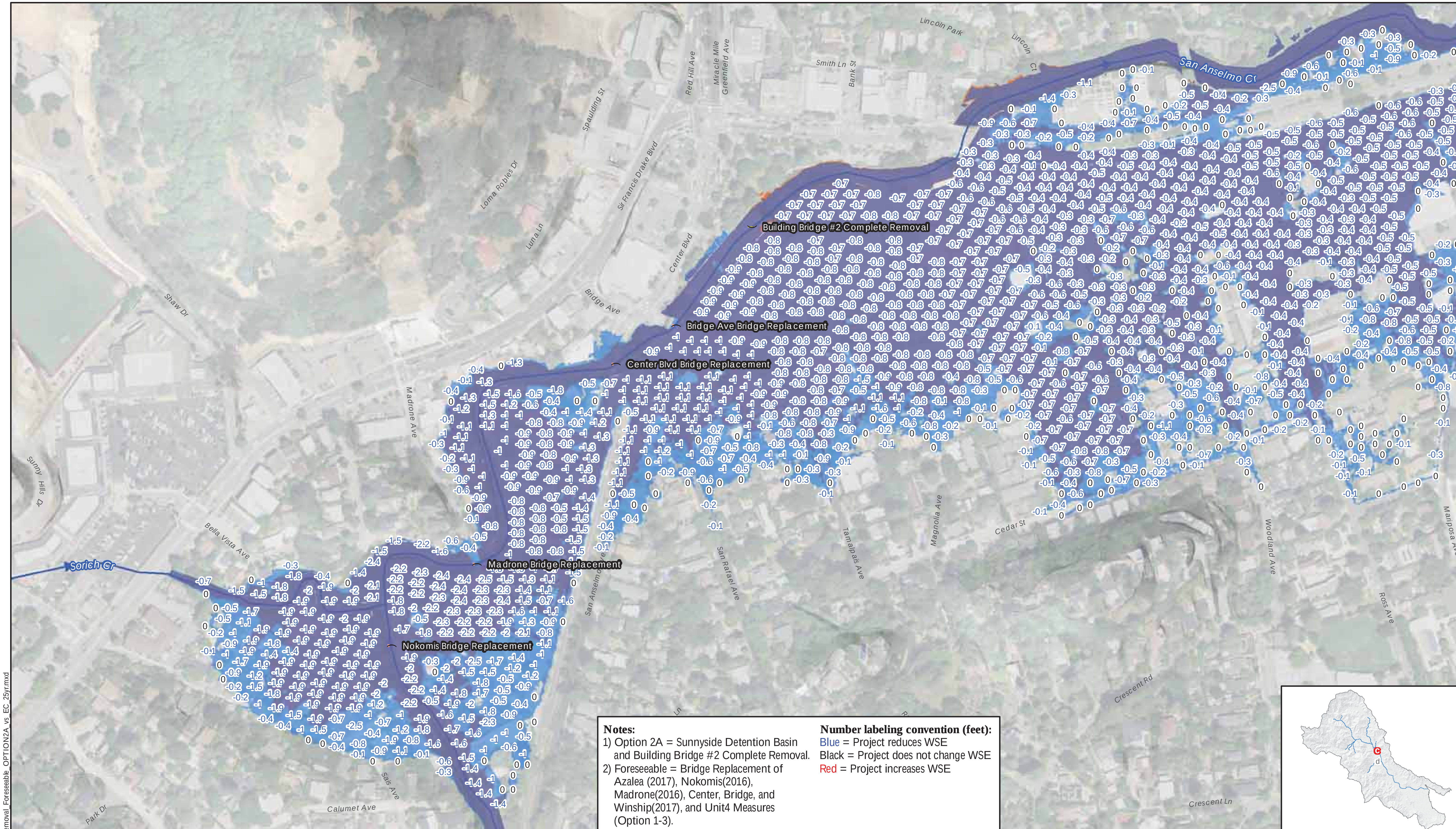
STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_10yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

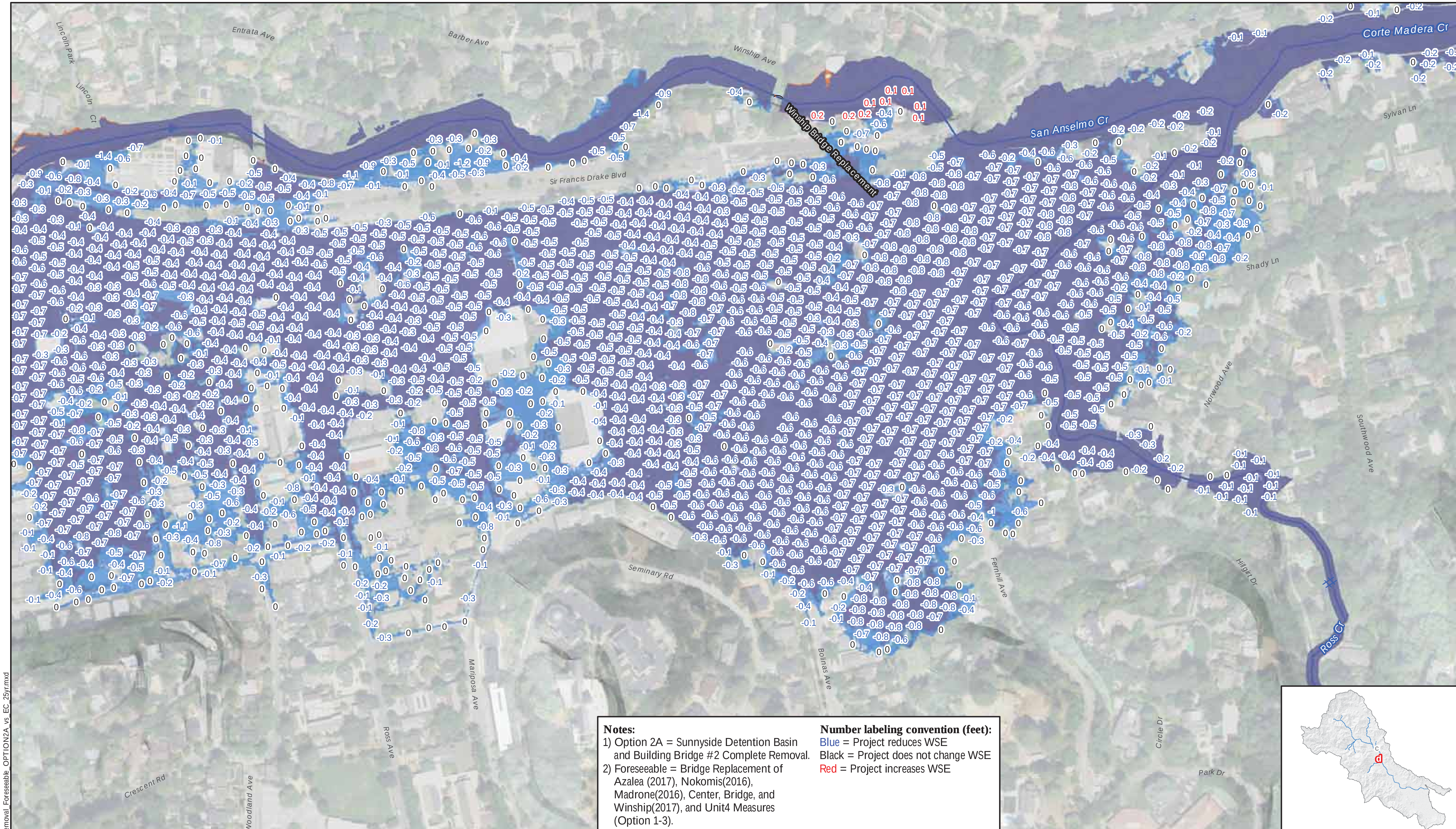
STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_25yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_25yr.mxd

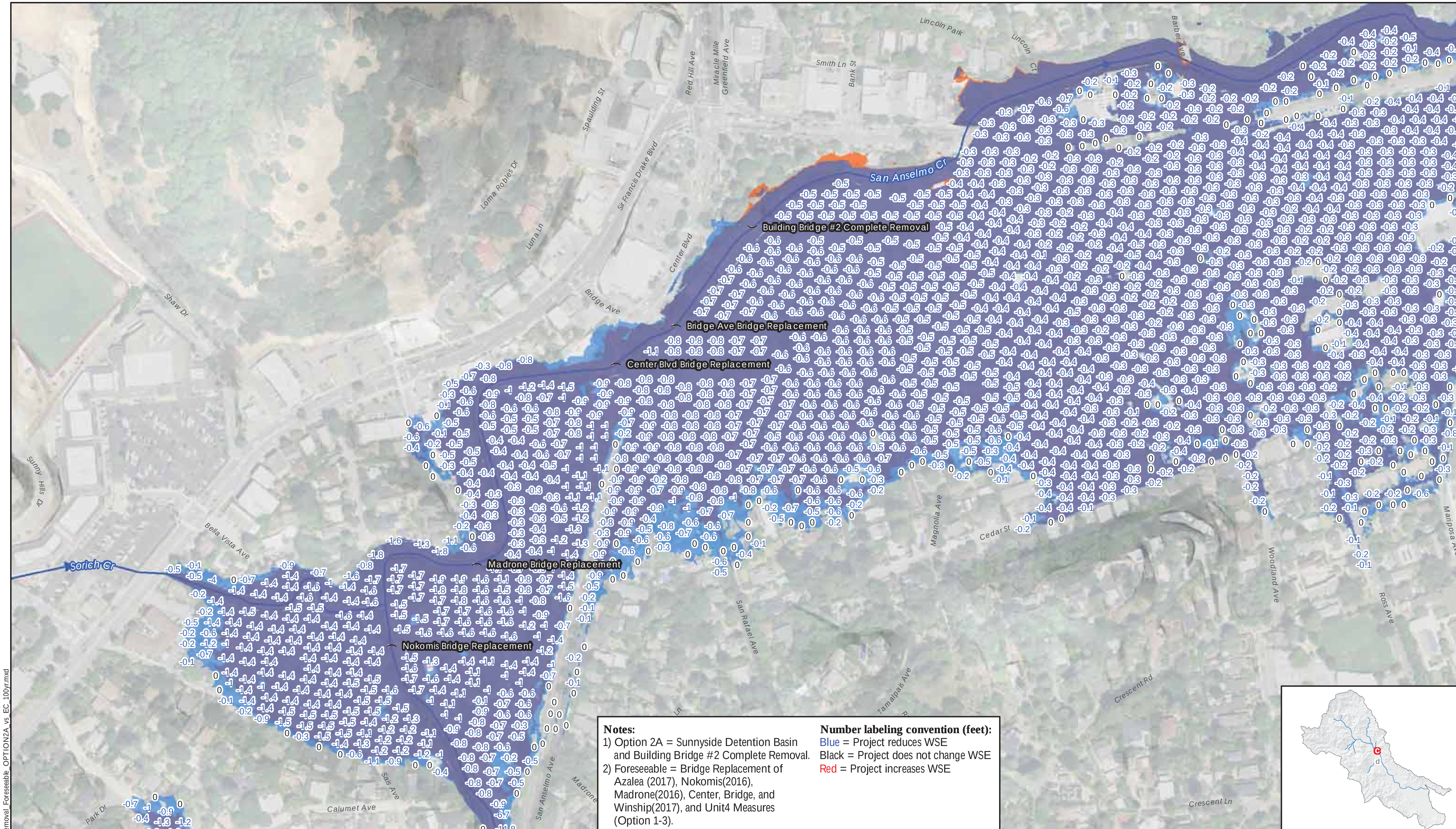
STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

FIGURE 7c



Notes:

1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.

2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):

Blue = Project reduces WSE

Black = Project does not change WSE

Red = Project increases WSE

STETSON ENGINEERS INC.

Existing Inundation

Option 2A + Foreseeable Inundation

Existing Inundation & Option 2A + Foreseeable Inundation

Creek (flow direction)

Option 2A Project

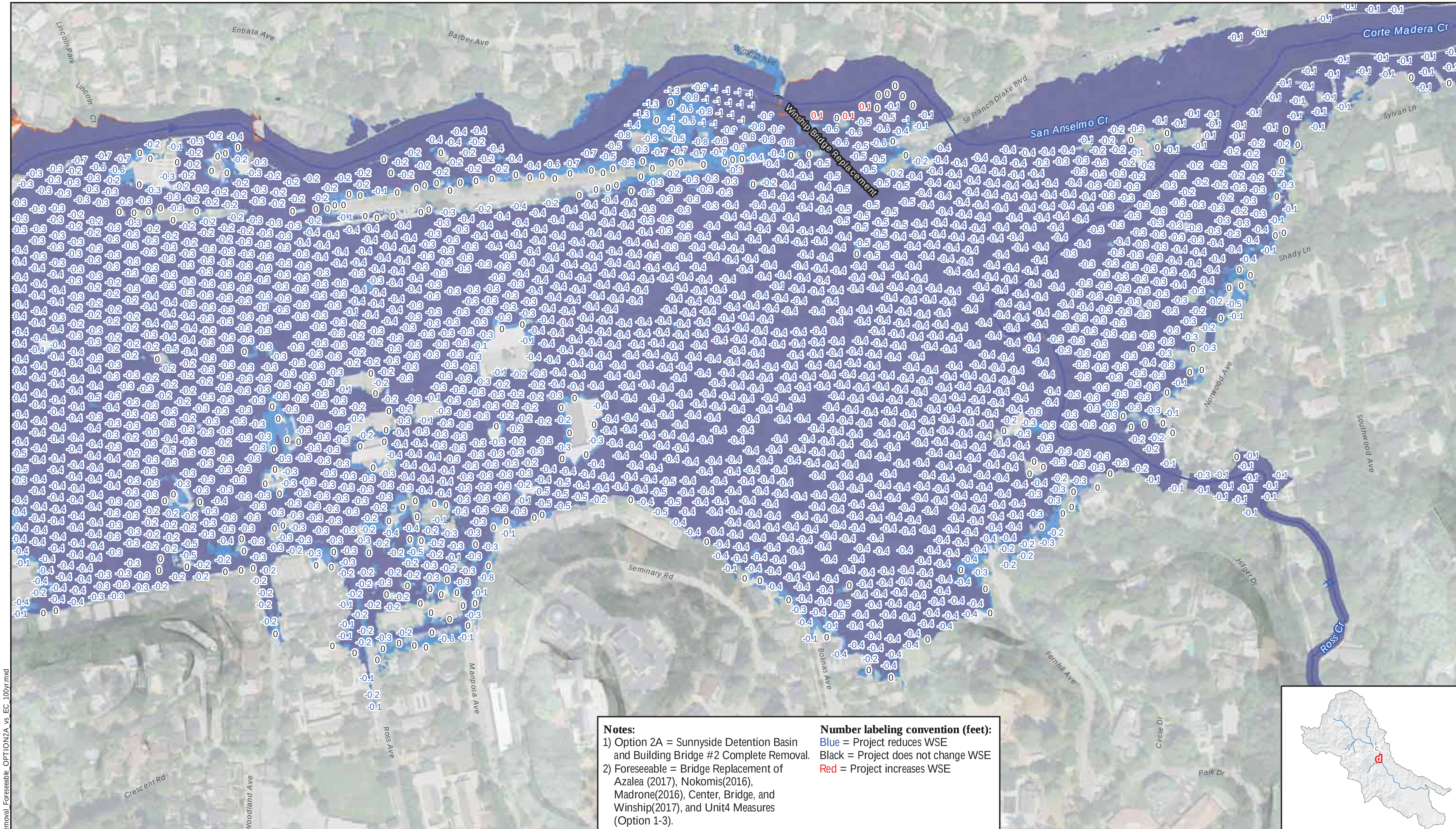
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_100yr.mxd

FIGURE 7d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_100yr.mxd

Figure 8 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 10-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

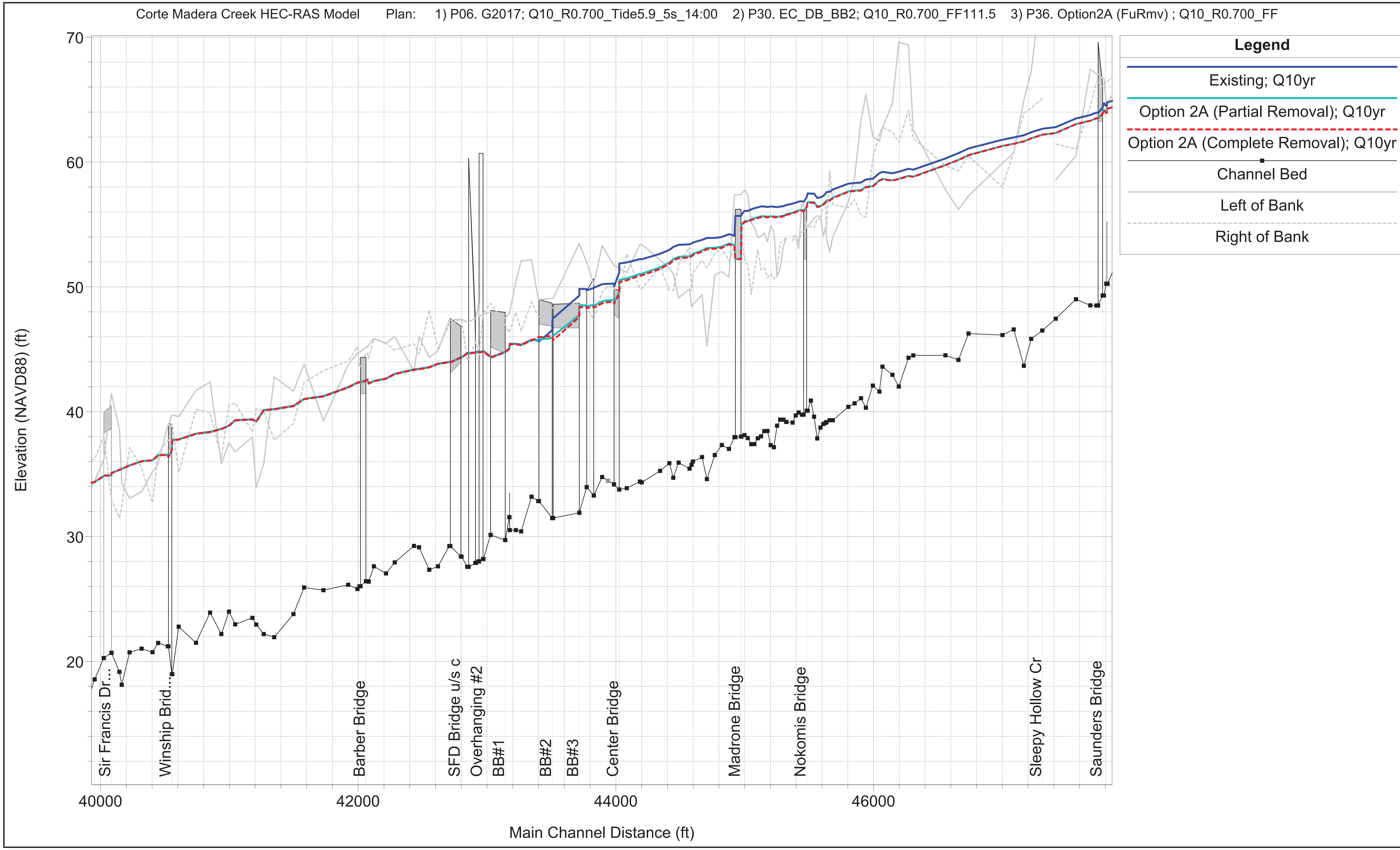


Figure 9 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 25-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

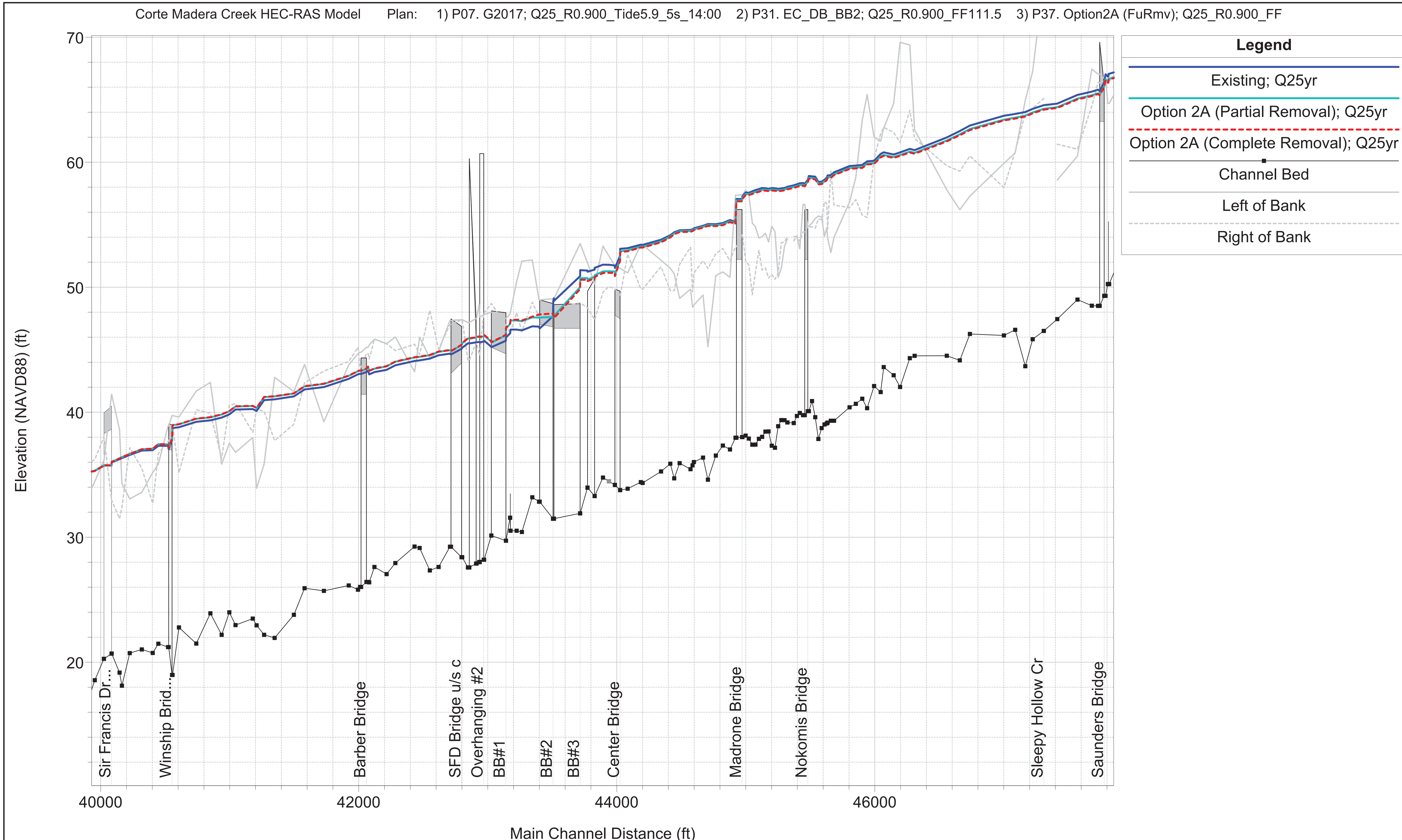


Figure 10 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 100-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

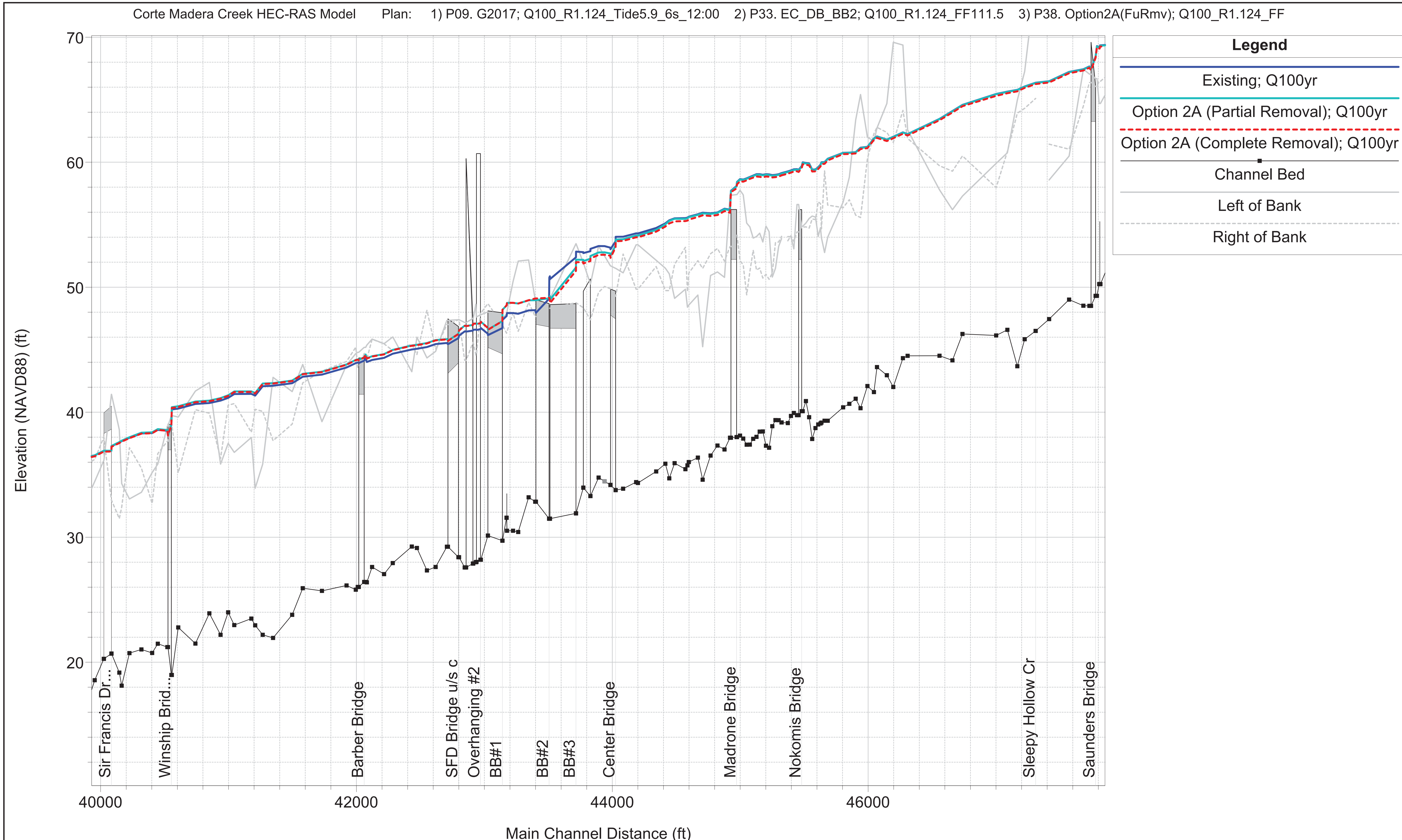


Figure 11 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 10-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**

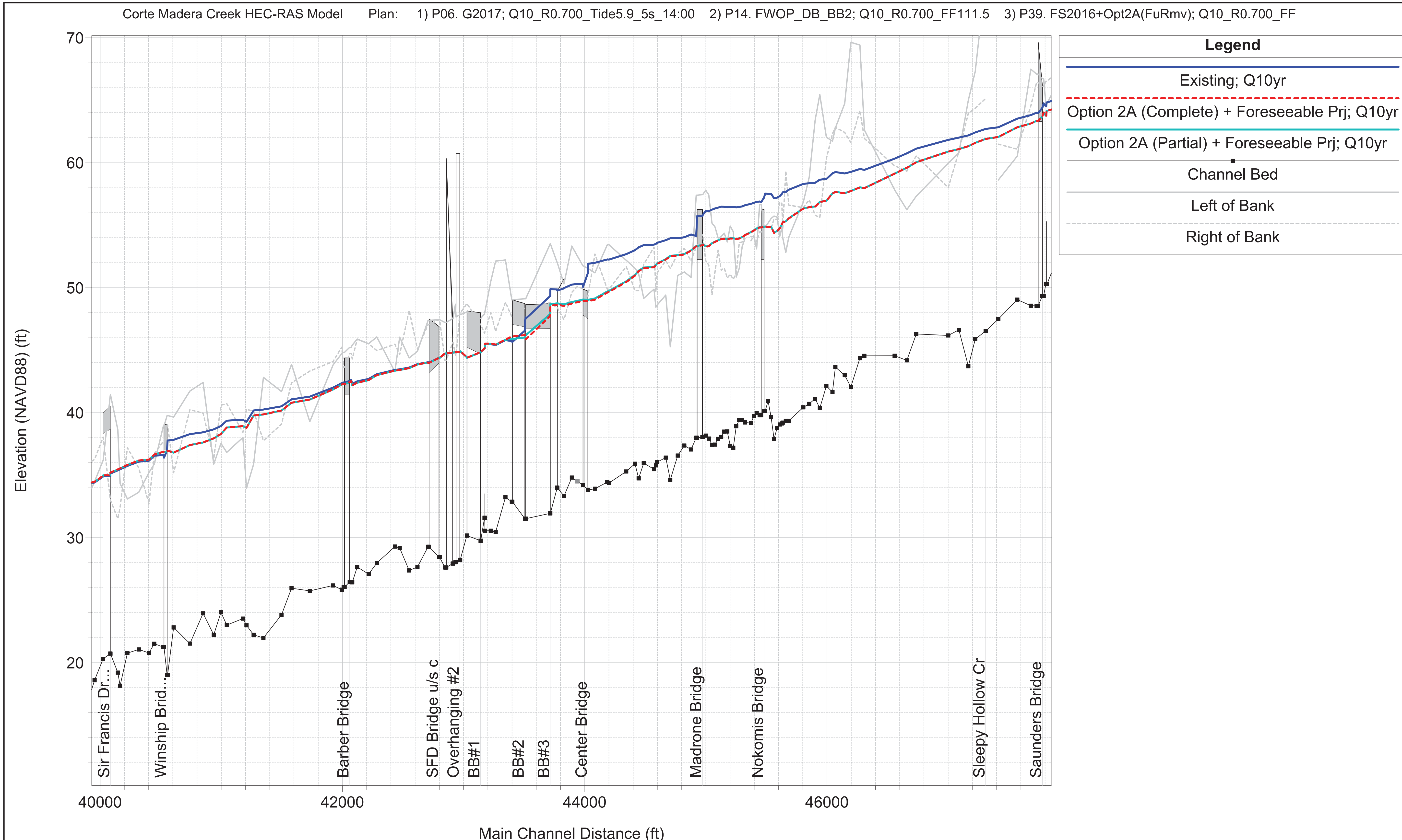


Figure 12 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 25-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**

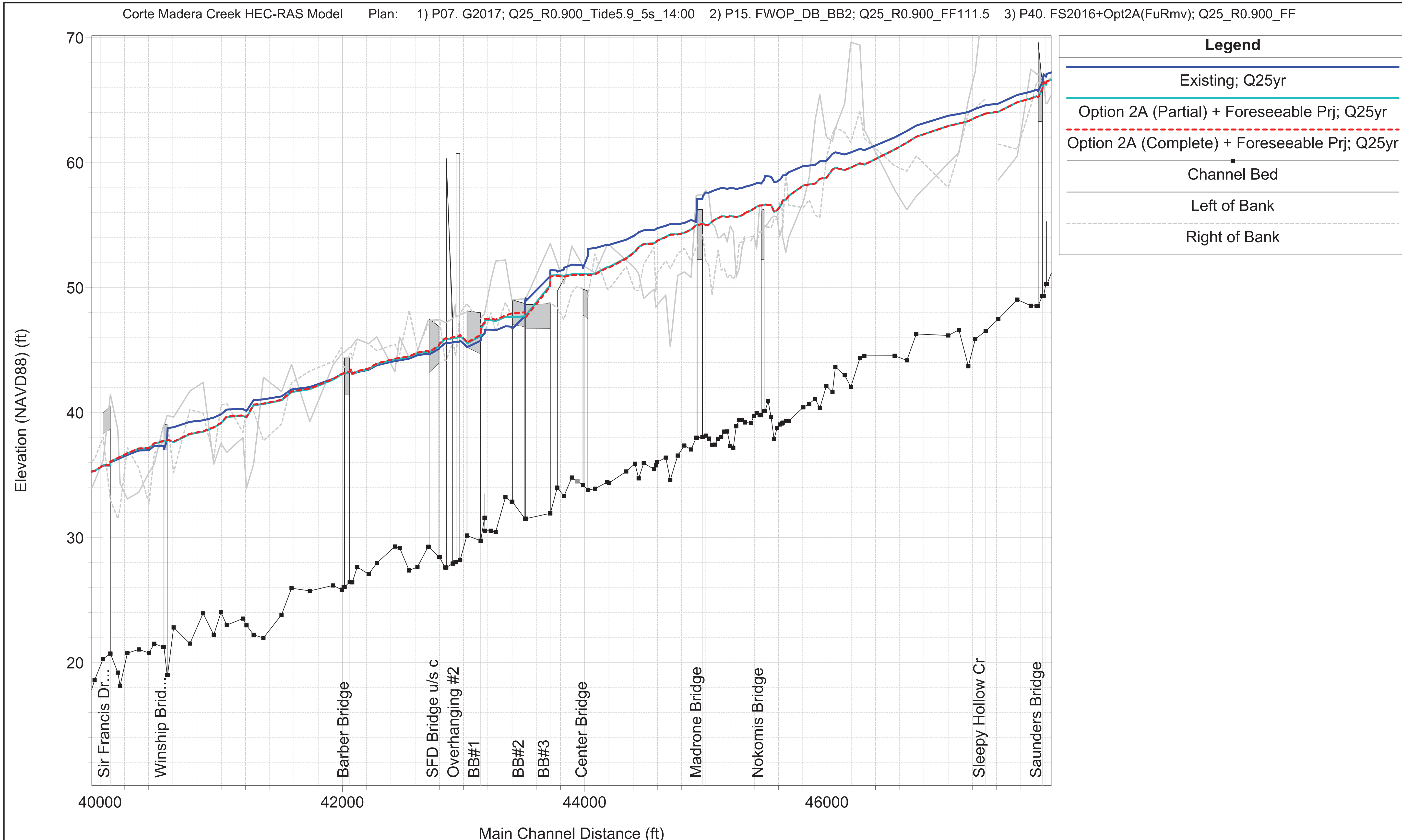
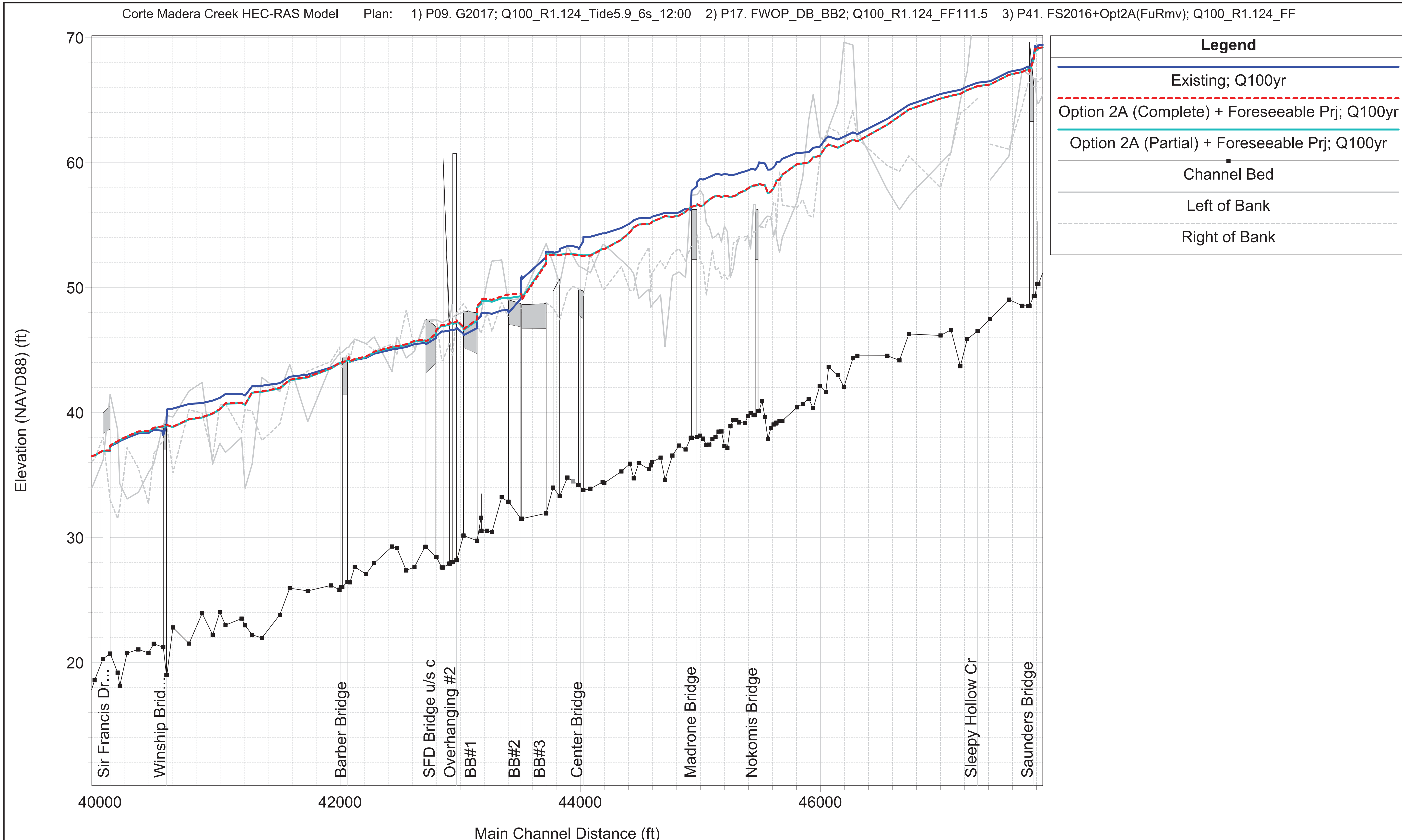
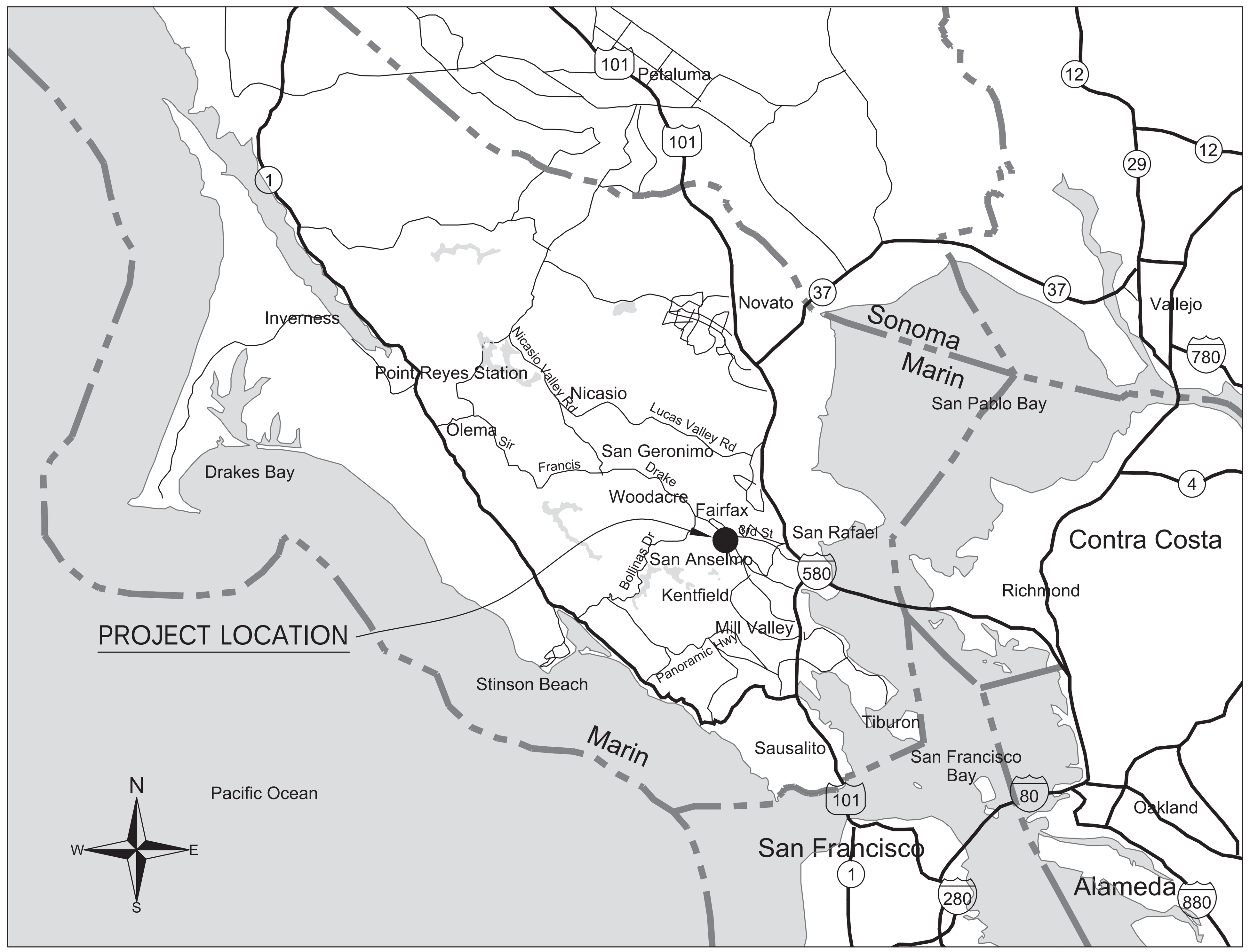


Figure 13 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 100-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**



TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA



VICINITY MAP

AGENCY NAME: TOWN OF SAN ANSELMO
LAND OWNER: MR. GEOFFREY KOBLICK
SITE ADDRESS: 634 - 636 SAN ANSELMO AVE.
SAN ANSELMO, CA. 94960
CIVIL ENGINEER: JAMES REILLY PE.
STETSON ENGINEERS INC.
2171 E. FRANCISCO BLVD., SUITE K
SAN RAFAEL, CA. 94901
MAP PREPARER: GUSTAVO TRINIDAD PE.
DATE: JUNE 10, 2014

LOCATION MAP

SCALE (Feet)
0 200 400

LEGEND
CREEK
PARCEL LINE
PROJECT SITE

SHEET INDEX

SHEET No.	DESCRIPTION
1	TITLE SHEET AND LOCATION MAP
2	SITE PLAN VIEW
3	SITE CROSS-SECTIONS AND DETAIL

ABBREVIATIONS

APPROX	APPROXIMATE
AVE	AVENUE
CY	CUBIC YARD
DIA	DIAMETER
(E)	EXISTING
ELEV	ELEVATION
FL	FLOW LINE
FT	FEET
IN	INCHES
H	HORIZONTAL
HWY	HIGHWAY
LN	LINE
LT	LIGHT
MAX	MAXIMUM
MIN	MINIMUM
(N)	NEW
No	NUMBER
O.C	ON CENTER
PSI	POUNDS PER SQUARE INCH
RD	ROAD
SF	SQUARE FEET
ST	STREET
STA	STATION
TYP	TYPICAL
V	VERTICAL
#	NUMBER
'	FEET
"	INCHES

I:\DATA\2482\AutoCAD\Grant Application\Title&Location.dwg

DESIGNED:	G. Trinidad	No.	DATE	REVISION	BY	APPROVED
DRAFTED:	G. Trinidad					
CHECKED:	J. Reilly					

STETSON ENGINEERS INC.

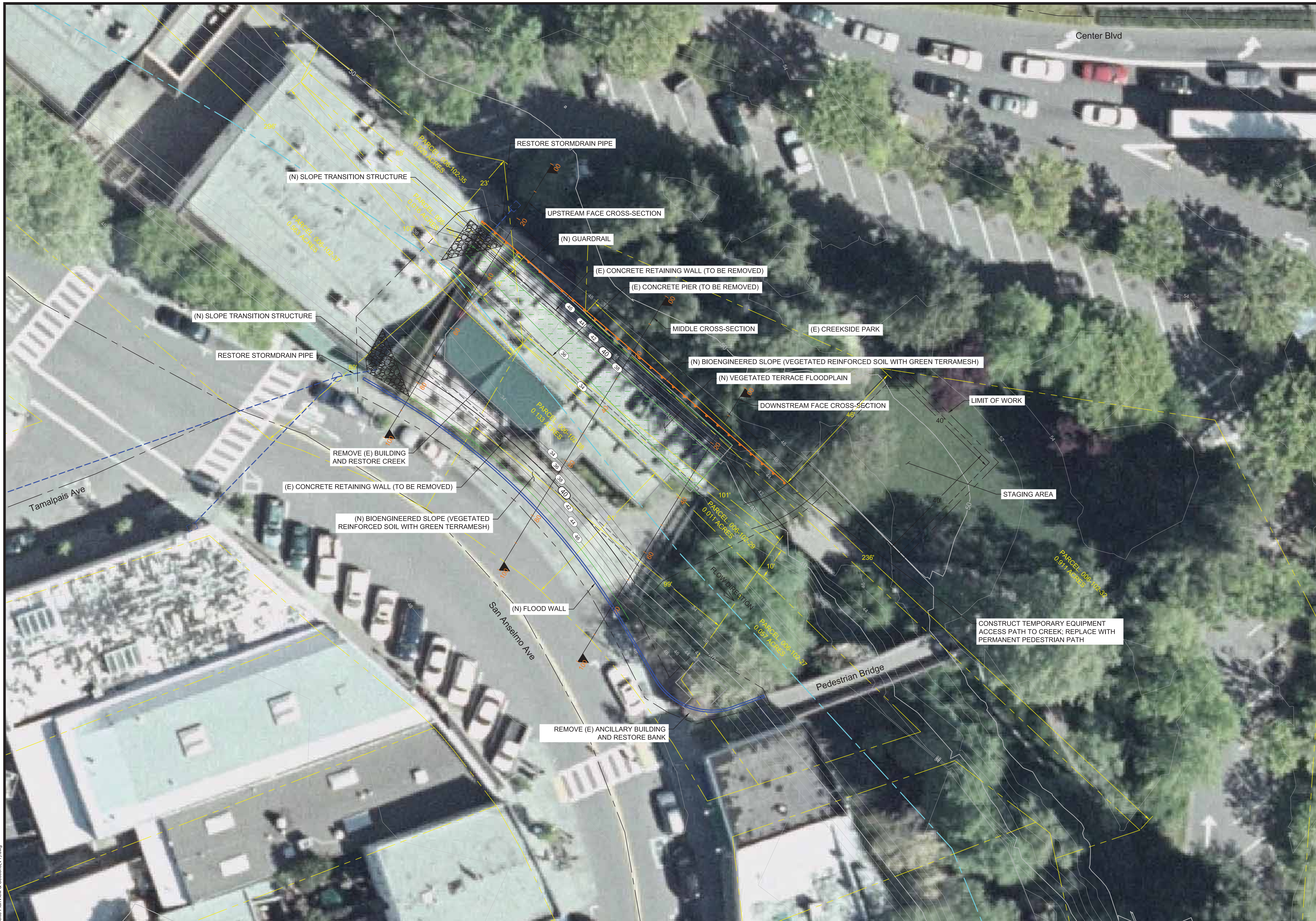
Stetson Engineers Inc.
2171 E. Francisco Blvd., Suite K
San Rafael, CA. 94901
(415) 457-0701

TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

TITLE SHEET AND LOCATION MAP

DATE: JUNE 10, 2014
SCALE: AS INDICATED
PROJECT No.: 2482-02

SHEET 1 OF 3



N W E S

SCALE (Feet)
0 15 30

LEGEND

- EXISTING CONTOUR LINES (2009 LIDAR DATA)
- PROPOSED CONTOUR LINES
- EXISTING BUILDING TO BE REMOVED
- CREEK FLOW LINE
- STORM DRAIN PIPE (APPROX LOCATION)
- EXISTING CONCRETE WALL TO BE REMOVED
- ROAD CENTERLINE
- PARCEL LINE
- NEW GUARDRAIL
- NEW FLOOD WALL
- NEW VEGETATED TERRACE
- STAGING AREA LINE
- LIMIT OF WORK LINE

ESTIMATED QUANTITIES:

BUILDINGS TO BE REMOVED AREA = 3,200 SF
CONCRETE TO BE REMOVED VOLUME = 1,000 CY
NEW FLOOD WALL LENGTH = 175 FT
NEW GUARDRAIL LENGTH = 125 FT
NEW BIO ENGINEERING SLOPE AREA = 2,500 SF
NEW VEGETATED TERRACE AREA = 800 SF

NOTES:

1. VERTICAL DATUM NAVD88.
2. TOPOGRAPHY AND EXISTING FEATURES SHOWN ARE APPROXIMATE, MAY NOT REFLECT ACTUAL LOCATIONS.
3. PARCEL LAYOUT IS APPROXIMATE BASED ON COUNTY OF MARIN WEBSITE DATA.
4. NO MAJOR UTILITIES IN LIMIT OF WORK. UTILITIES LOCATIONS SHALL BE VERIFIED, LOCATED AND IDENTIFIED BEFORE STARTING ANY WORK.
5. USE EXISTING PARK ACCESS FROM PARKING LOT DURING CONSTRUCTION. PARK ACCESS AND STAGING AREA SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITION.

		No.	DATE	REVISION	BY	APPROVED
DESIGNED:	G. Trinidad					
DRAFTED:	G. Trinidad					
CHECKED:	J. Reilly					

STETSON ENGINEERS INC.

Stetson Engineers Inc.
2171 E. Francisco Blvd., Suite K
San Rafael, CA. 94901
(415) 457-0701

TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

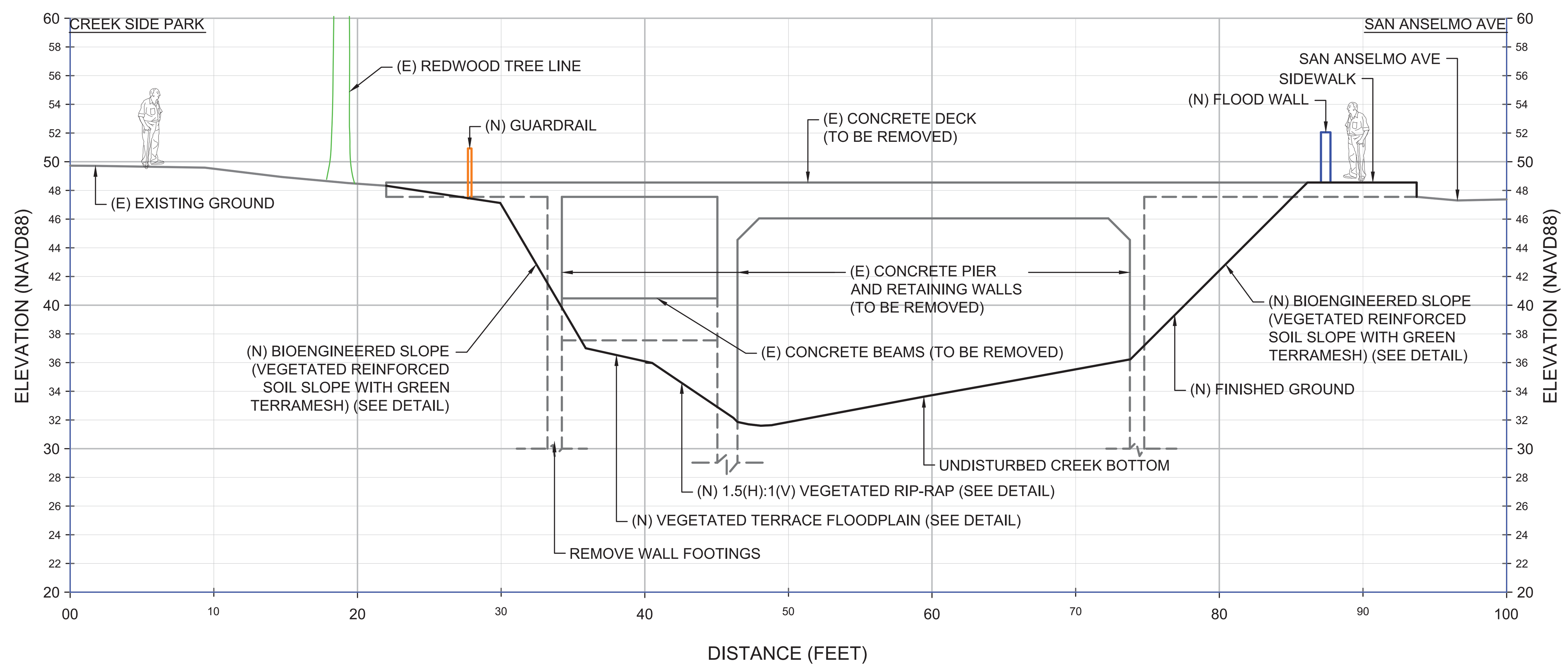
SITE PLAN VIEW

DATE: JUNE 10, 2014
SCALE: 1" = 15'
PROJECT No.: 2482-02

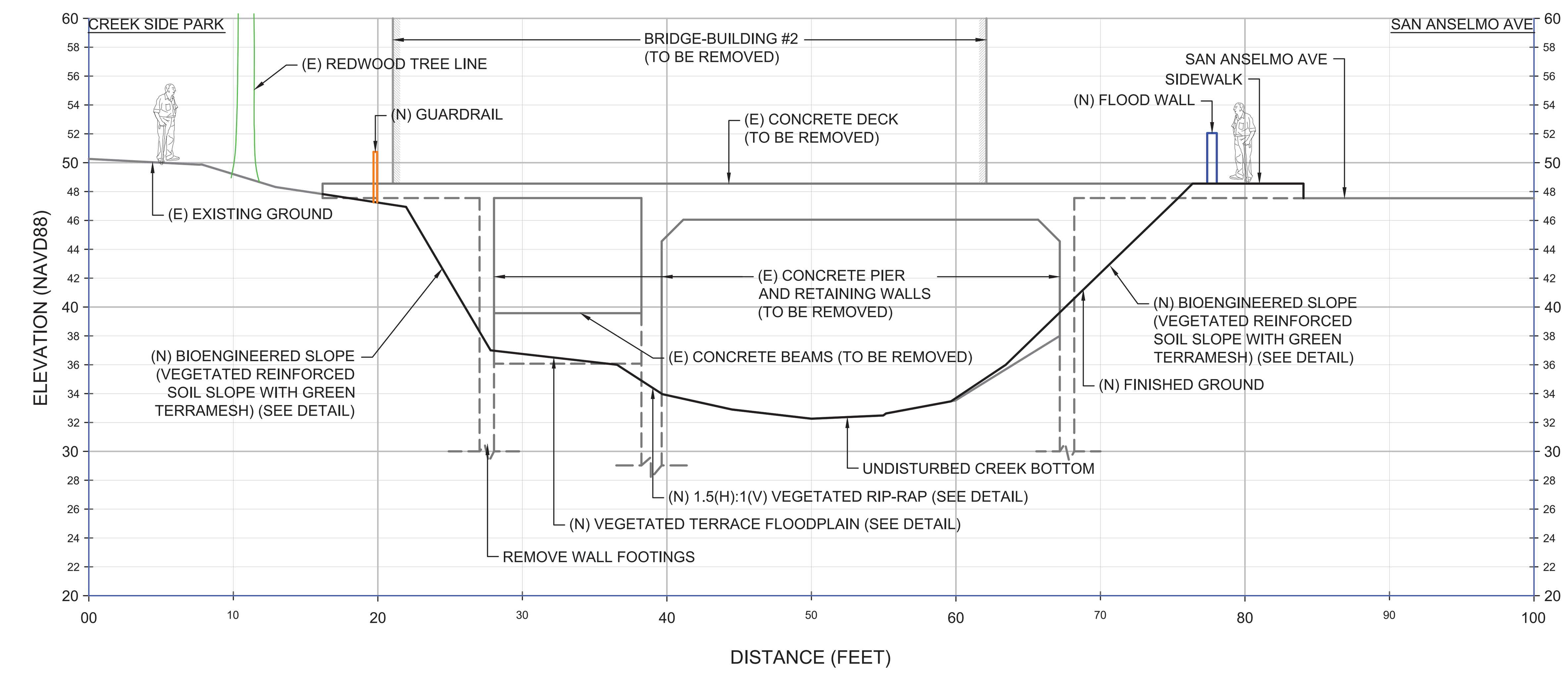
SHEET 2 OF 3

I:\DATA\2482\AutoCAD\Grant Application\Site PlanView & Sections(V1).dwg

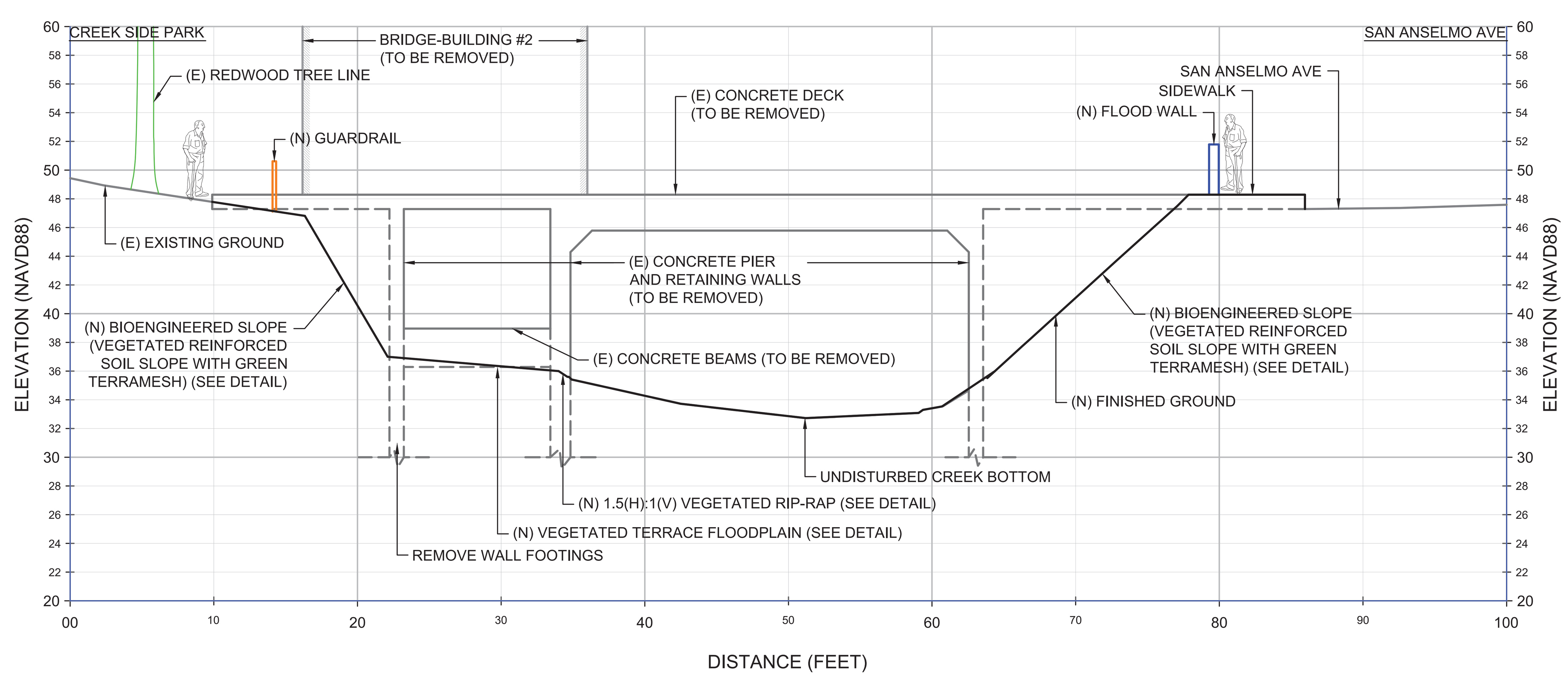
UPSTREAM FACE CROSS-SECTION



MIDDLE CROSS-SECTION

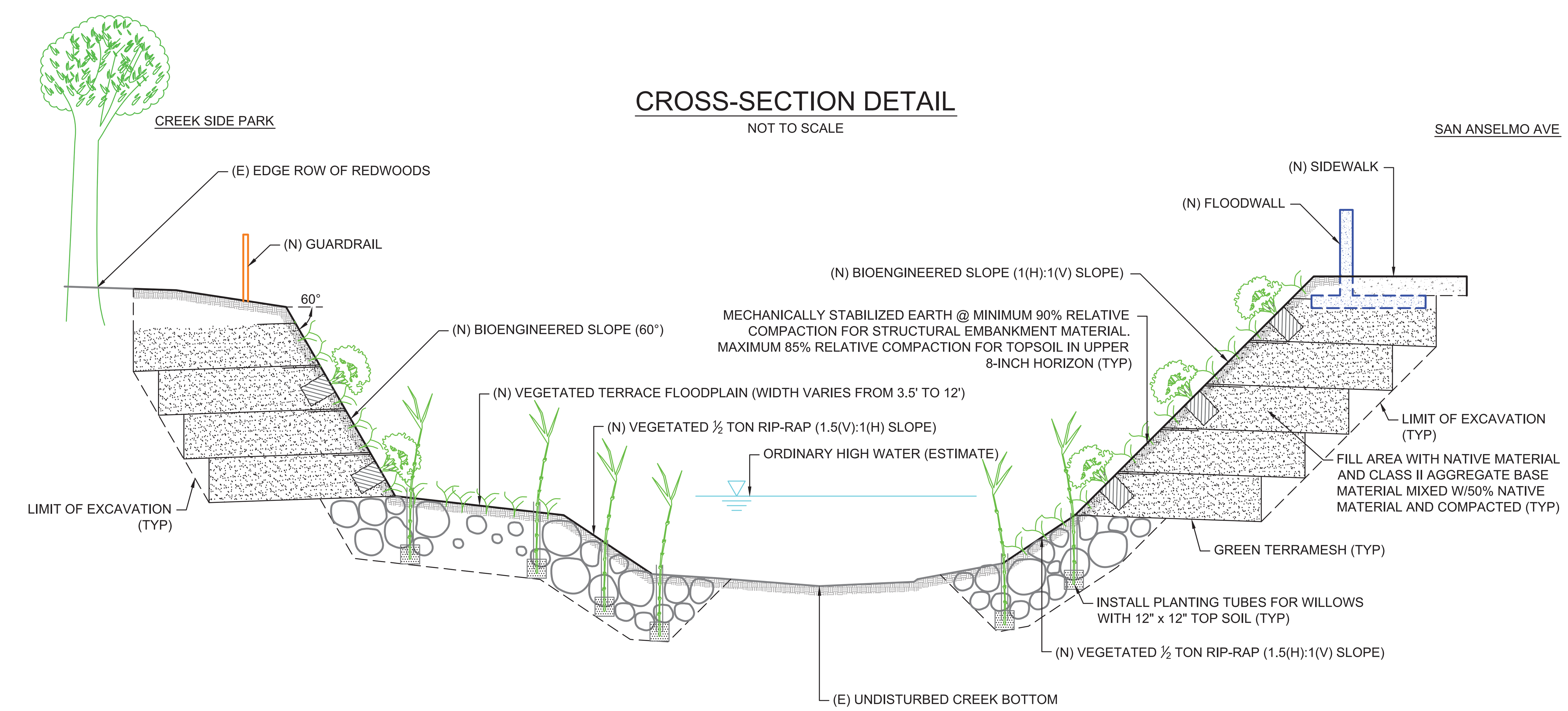


DOWNSTREAM FACE CROSS-SECTION



CROSS-SECTION DETAIL

NOT TO SCALE



NOTES:

1. VERTICAL DATUM NAVD88.
2. ALL CROSS-SECTIONS ARE LOOKING DOWNSTREAM.

SCALE (Feet)
0 7.5 15

DESIGNED: G. Trinidad	No.	DATE	REVISION	BY	APPROVED	
DRAFTED: G. Trinidad						
CHECKED: J. Reilly						

STETSON ENGINEERS INC.
Stetson Engineers Inc.
2171 E. Francisco Blvd., Suite K
San Rafael, CA. 94901
(415) 457-0701

TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

SITE CROSS-SECTIONS AND DETAIL

DATE: JUNE 10, 2014
SCALE: AS INDICATED
PROJECT No.: 2482-02

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D-4 Geomorphic and Scour Assessment Corte Madera Creek Flood Protection Project, Option 2A and 2A Plus

TECHNICAL MEMORANDUM

Geomorphic and Scour Assessment Corte Madera Creek Flood Protection Project, Option 2A and 2A Plus

PREPARED FOR:	Russ Eberwein, P.E. Senior Civil Engineer County of Marin Department of Public Works, Flood Control and Water Resources Division
PREPARED BY:	Mitchell Swanson, Geomorphologist, CH2M mitch.swanson@ch2m.com Jeremy Thomas, Geomorphologist, CH2M jeremy.thomas@ch2m.com
DATE:	December 4, 2017; revised January 15 and February 23, 2018

Introduction

The proposed Corte Madera Creek Flood Protection Project (proposed project) is located in Marin County, California, within Corte Madera Creek (CMC) and along the tributary streams of Fairfax Creek and San Anselmo Creek (Figure 1). This technical memorandum (TM) presents the results of a reconnaissance-level geomorphic assessment of two flood protection options proposed by the Marin County Flood Control and Water Conservation District (District) in the CMC watershed.

The two flood protection options are as follows:

Option 2A

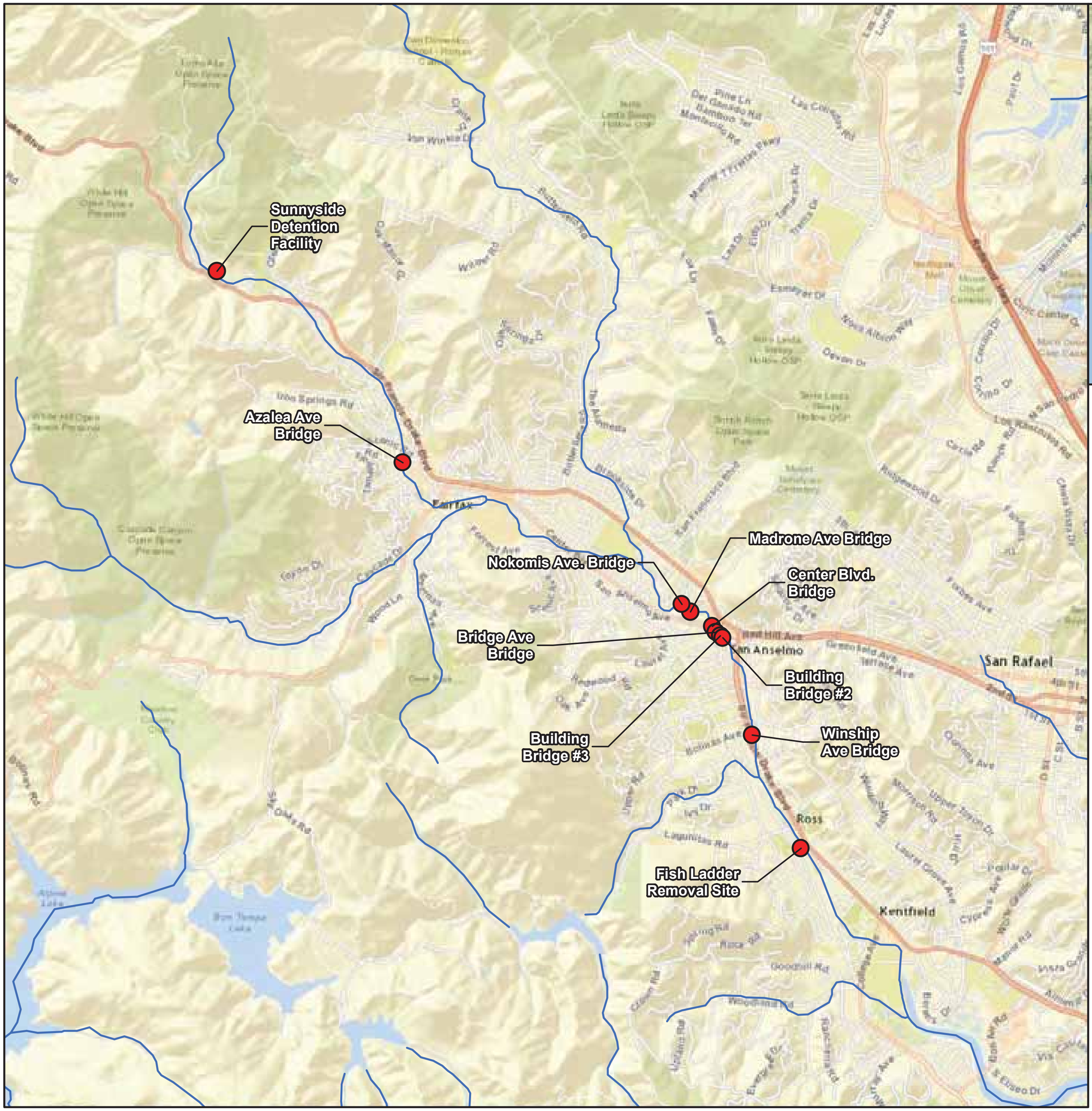
1. Construct a flood detention facility along Fairfax Creek at the former Sunnyside Nursery site.
2. Remove Building Bridge #2 (BB#2) from San Anselmo Creek channel in downtown San Anselmo.

Option 2A Plus Foreseeable Future Conditions (Option 2A Plus)

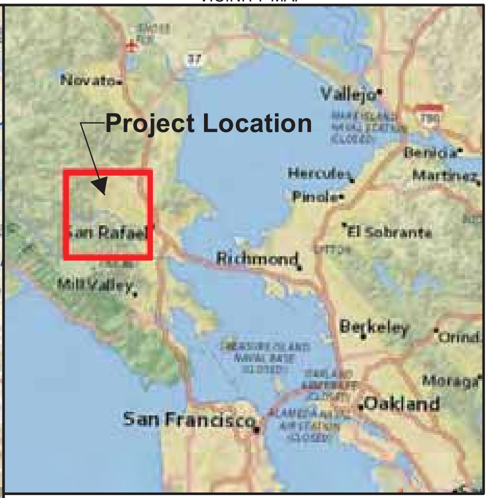
1. Features of Option 2A.
2. Remove and replace bridges at Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Boulevard, Bridge Boulevard, and Winship Avenue.
3. Remove the fish ladder in CMC at the head of the concrete channel in Ross.

CMC and several of its tributaries flow in densely urbanized commercial and residential areas that have been flooded numerous times in the recent past. The purpose of Options 2A and 2A Plus is to increase the hydraulic capacity of the CMC and detain floodwaters to lower the flood peak and reduce urban flood risk. The hydraulic changes associated with these improvements could potentially impact the movement of sediment, change erosional and depositional patterns in channels, and disrupt the geomorphic processes that govern channel stability.

The purpose of this TM is to characterize potential geomorphic changes and how the flood improvements might impact infrastructure. This characterization is necessary for a California Environmental Quality Act (CEQA) environmental review. The scope of this investigation is limited to sediment transport and scour effects of the proposed project; the changes in hydraulics associated with flood dynamics are addressed by Stetson Engineers, Inc. (Stetson) (Stetson, 2017a; 2017b).



VICINITY MAP



Legend

Project Location

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

0 4,000 8,000
Feet

FIGURE 1
Location Map
San Anselmo Flood Risk Reduction Project

\\SACFPP01\GROUPS\WBG\DOUGLAS_E\ANSELMOCREEK\PROJECT_LOCATION_20171127.MXD 11/27/2017 10:13:26 AM

Study Objectives

The objectives of this study are as follows:

1. Characterize the environmental setting of the CMC watershed as it affects geomorphic processes in Fairfax, San Anselmo, and Corte Madera creeks, including effects of historical and present land uses.
2. Gain an understanding of and document geomorphic and sediment transport conditions and processes at each of the eight sites identified above for Option 2A or Option 2A Plus where improvements are proposed.
3. Review hydraulic modeling output provided by the District and completed by others for on existing conditions, Option 2A, and Option 2A Plus to estimate the potential impacts at the eight improvement locations resulting from erosion, bed scour, bank erosion, and sedimentation that could damage infrastructure, impair flood operations and/or cause channel instability.
4. Identify feasible countermeasures, if practical, to offset potentially significant geomorphic impacts.

Methods

This study was conducted at a reconnaissance level; the analysis and results primarily rely on existing information and data with limited new data collection.

Existing data and information were collected and reviewed, including information about the CMC watershed geomorphology, flooding, sediment transport, and historical geomorphic and channel stability studies, most notably Stetson (Stetson, 2000), Marin County Watersheds[1], and the San Anselmo Historical Museum.[2]

Available project design documents and drawings were reviewed as listed below, and the features of each improvement were confirmed:

- A preliminary set of 10% complete design drawings (CH2M, 2017a)
- The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic modeling data (Stetson, 2017a; 2017b) for the Sunnyside Detention Basin
- BB#2 removal and channel bank reconstruction plans CH2M, 2017b)

The District provided CH2M HILL Engineers Inc. (CH2M) with HEC-RAS hydraulic modeling prepared by Stetson (Stetson, 2017a; 2017b) for existing conditions and Options 2A and 2A Plus for a projected 25-year flood event. CH2M used this modeling information and prepared appropriate graphs, plots, and tables for field work and an impact analysis. The HEC-RAS modeling information includes output of important hydraulic variables that are proxies for sediment transport, including flow velocity, mean shear stress, and stream power.

The impact analyses focused on changes in peak mean shear stress, comparing existing conditions with Option 2A and Option 2A Plus. Shear stress governs the sizes of sediment moved on a channel bed and is an indication of the potential for channel bed erosion. Scour is the short-term erosion and lowering of the channel bed during peak flow conditions and is a key factor for designing protection for infrastructure such as bridges (e.g. abutments, support piers), retaining walls and rock slope revetments.

For this assessment, CH2M compared the bed material sediment sizes at each site with HEC-RAS output and critical shear stress particle size mobility relations developed by the U.S. Geological Survey (USGS) (USGS, 2008). This comparison was used to determine whether a significant change in scour depth could occur at each site and, thus, produce a potentially significant impact.

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1 http://www.marinwatersheds.org/rossvalleywatershed-org/index.html

2 http://sananselmohistory.org/articles/flooding/

CH2M conducted field reconnaissance on November 1 and 2, 2017, to visit each site where improvements are proposed. Each site was documented via photographs and video with field notes, including evidence of current and past erosion, sediment deposition, and channel morphology changes. A general characterization of bed and bank materials and sizes was made at each site. To assess the potential mobility of a gravel/cobble bar under Building Bridge #3 (BB#3), pebble counts were taken and the raw data were reduced to grain-size cumulative frequency using standard techniques (Wolman, 1954). Key information was compiled into fact sheets for each site (Attachment A).

The CH2M geomorphology team coordinated through conference calls and emails with District staff and the project's CEQA consultant, Environmental Science Associates (ESA). Key information was exchanged and confirmed through these conversations, including the scope of this investigation, final proposed project features, the contents of this TM, and schedule.

Setting

The downtown commercial and residential properties affected by flooding are within the valley floor or floodplain communities of Fairfax, San Anselmo, and Ross. The CMC flows generally southeast, draining 28 square miles from the crest of the Coast Range (maximum elevation 2,571 feet) into Richardson Bay at sea level. The upper watershed and terrain surrounding the valley floors is steep with a mix of forest and grassland covers, and includes both open space and rural residential development. The valley floors are densely developed with residential and commercial cover, much of it impervious. Creek channels are highly modified and encroached by roads, narrow bridges, retaining walls, fill, pipelines, and buildings that span the creek as bridges or overhang the creek like balconies. Sir Francis Drake Boulevard is the main access road from Highway 101 to the upper watershed.

The CMC watershed experiences a Mediterranean climate that produces seasonal winter rains from October to April (averaging 40 inches per year), which periodically include intense storms that trigger hillslope erosion and landslides and cause widespread flooding and erosion. Recent damaging flood events include those occurring in 1986, 1995, 1997, 2005, and 2017. Geologically, the CMC watershed is underlain by highly sheared and deformed rock of the Mesozoic Franciscan Formation, including mélange units that have been identified with high sediment production. Combined with tectonic uplift and intense winter storms, the hillslopes of the CMC watershed produce rapidly peaking floods and an abundant volume of coarse and fine sediments through landslides and natural- and human-caused gully and sheet erosion.

Fairfax Creek, San Anselmo Creek, and the CMC flow within incised, single thread channels featuring gravel beds bounded by steep and erosive banks generally over 6 feet high. Human-caused hydro-modification of watershed land cover by roads, urban and agricultural development, logging and grazing, and channelization led to systemwide channel incision thought to be on the order of 4 or more feet by the early 1900s (Stetson, 2000). Creekside development was particularly aggressive in the early to mid-1900s, when channel banks were often filled and replaced with vertical walls or rock-slope revetments, or both, and the construction of several buildings that partially span or fully cover the stream channel within downtown San Anselmo. Numerous undersized public and private bridges form significant hydraulic constrictions. Many of these were constructed in the early 1900s with center support piers and narrow abutments that constrict channel flow area, in some cases, to 50 percent less than the adjoining reaches. Backwatering upstream of constricted bridges increases overbank flooding onto the developed floodplains and disrupts sediment transport. Many of the bridges have experienced damage by Historic channel bed erosion (degradation). It is generally believed that most of the channel bed incision ceased in the early 1900s as vertical erosion reached the depth of erosionally resistant bedrock (Stetson, 2000).

Hydraulic/Geomorphic Effects, Potential Impacts, and Potential Mitigations of Proposed Project Options 2A and 2A Plus

Options 2A and 2A Plus include strategic removal of constrictions to remove backwater effects, to increase channel flood capacity, and to reduce the frequency and extent of overbank flooding. Removal of constrictions can change the hydraulic forces governing erosion and sediment transport ridge removal, and replacements can increase flooding downstream due to an increase in-channel flows (i.e., rather than overbank flows). The proposed Sunnyside flood detention facility is designed to offset this impact. It includes a diversion dam across Fairfax Creek that would pond floodwaters in order to divert peak flow over an armored weir and into the detention basin. However, ponding and flow diversion out of the creek can affect sediment transport and geomorphic processes governing channel stability.

Generally speaking, where hydraulic forces increase, the channel bed and banks could erode. Of particular concern is the depth of scour or short-term lowering of the channel bed during peak flow, which could undermine channel banks, bridge abutments and support piers, pipelines, building structures, and retaining walls.

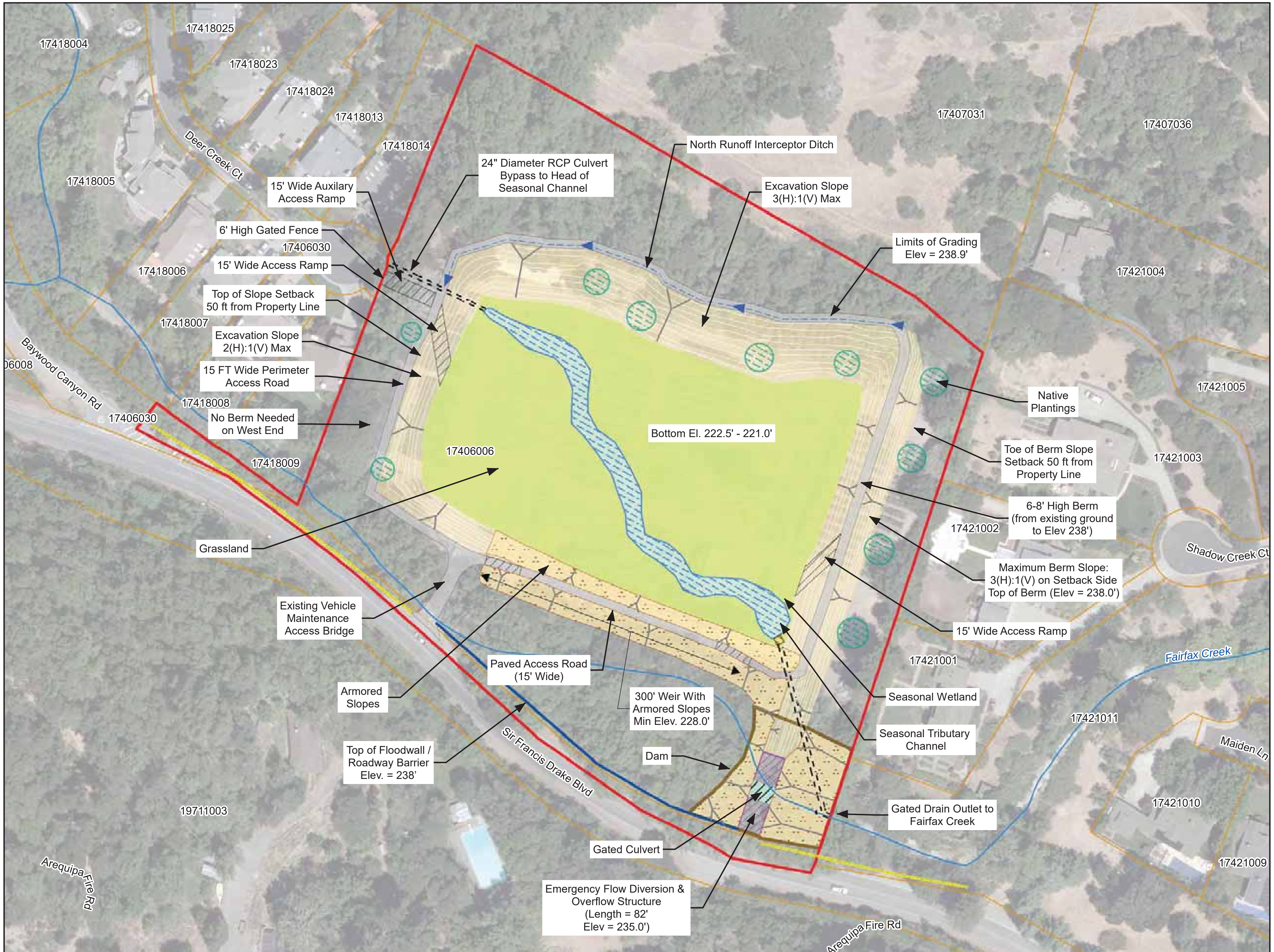
Conversely, a decrease in hydraulic force such as that resulting from the detention facility operation, could induce sediment deposition, fill the channel, reduce channel flood capacity, and increase overbank flooding. Channel filling can also cause abrupt lateral erosion and movement (i.e., avulsion) through adjacent floodplain properties.

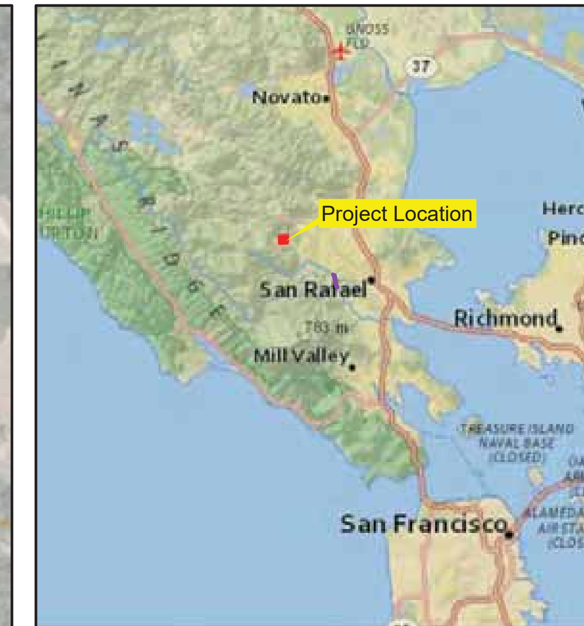
Option 2A

Sunnyside Detention Facility

Figure 2 and the attached fact sheet (Attachment A) show the proposed layout and design of the Sunnyside detention facility and key features. A levee embankment will separate a proposed detention basin to the north from the Fairfax Creek channel to the south. A 13-foot high diversion dam would be constructed across Fairfax Creek to pond floodwater upstream and allow excess rising flows to spill over an armored lateral weir on the levee crest at the northern side of the channel into the adjacent detention basin. The detention basin would be constructed by excavating the floodplain bench north of Fairfax Creek and using fill to create berms up to 6 feet high on the eastern and southern sides of the detention basin, forming a detention-basin dam to the east and the aforementioned levee embankment between the detention basin and the creek to the south. A gravity flow culvert would drain the basin after storms and discharge back into Fairfax Creek, discharging just downstream of the Fairfax Creek diversion dam. The diversion dam would have a 6-foot wide by 4-foot high ungated opening to allow normal streamflows to pass through the structure without entering the detention basin (Figure 3). There would also be a second 10-foot wide by 5-foot high gated culvert in the diversion dam to control the diversion of the flow into the detention facility, and an armored emergency spillway across the diversion dam crest to pass excess flow without overtopping either the diversion dam embankment crest or the detention-basin eastern embankment crest when the detention facility is full.

Fairfax Creek at the former Sunnyside Nursery site (Attachment A) has a coarse gravel bed with vertical, sandy loam banks that are eroding along several sections just upstream of the diversion dam site. Bay laurel and other trees line the channel banks with soil-binding roots that increase erosional resistance; where trees are lost to erosion, the banks have retreated rapidly.





LEGEND

- Project Area
- 17421005 Parcel Boundary
- Creek Flowline
- Drainage
- MBGR
- Floodwall
- North Interceptor Ditch and Underdrain
- Access Ramp
- Access Road
- Armored Slopes
- Dam
- Gated Culvert
- Inlet
- Native Grassland
- Seasonal Tributary / Drainage Channel
- Spillway
- Oak Bay Woodlands Plantings

N

0 100 200
Feet

FIGURE 2
Sunnyside Nursery Flood Diversion and Storage Basin Site Plan
San Anselmo Flood Risk Reduction Project
Marin County, California

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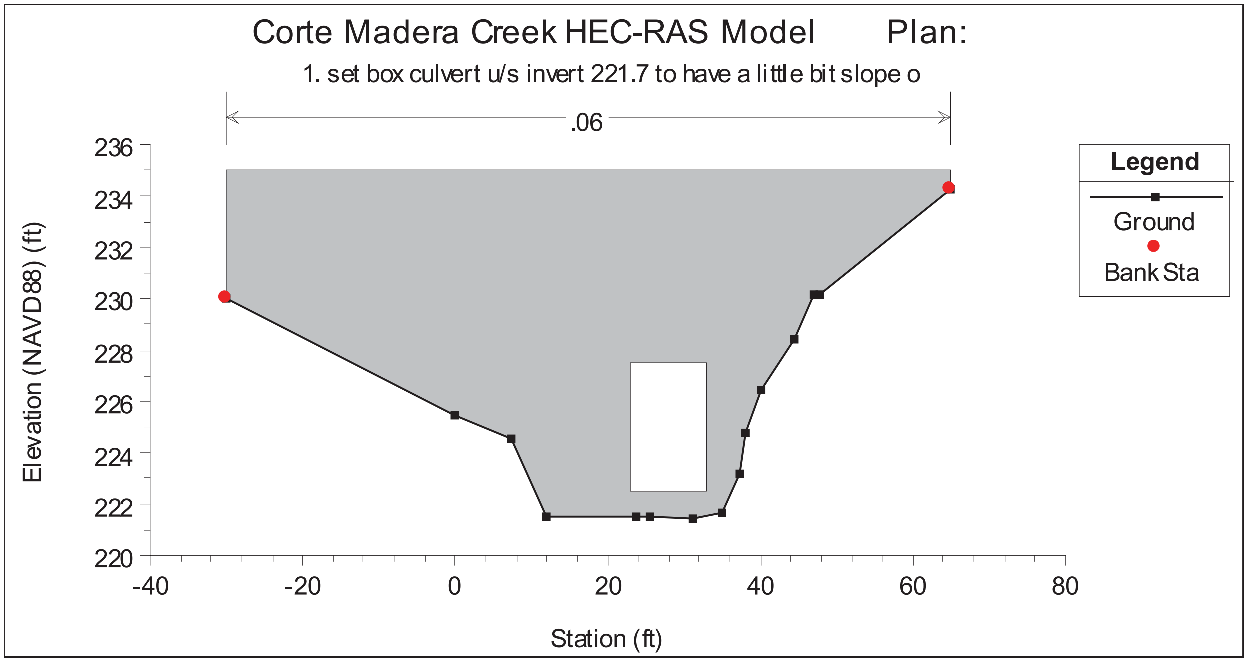


Figure 3. HEC-RAS Cross Section 10500 Showing Proposed Diversion Dam

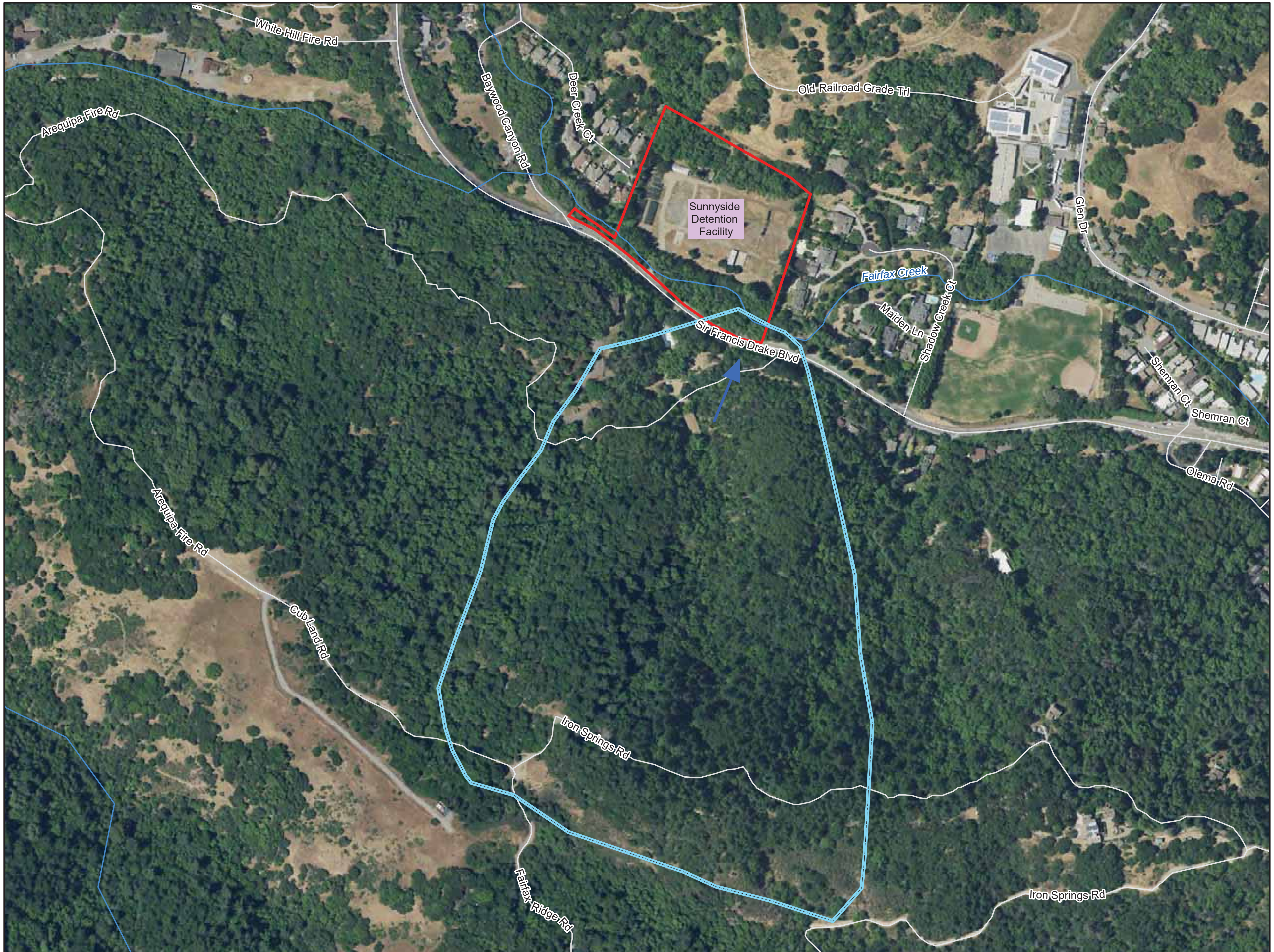
As of November 2017, the left bank (northern bank), where the proposed lateral weir is to be located, was actively eroding and undermining trees. This erosion appeared to be in response to a recently deposited gravel bar on the right side of the channel where an ephemeral tributary discharges into Fairfax Creek (Figure 4). The drainage area for this small tributary exhibits active landsliding and erosion, indicating a high rate of sediment production and delivery. This local source adds to the coarse sediment load flowing into the project site from upper Fairfax Creek.

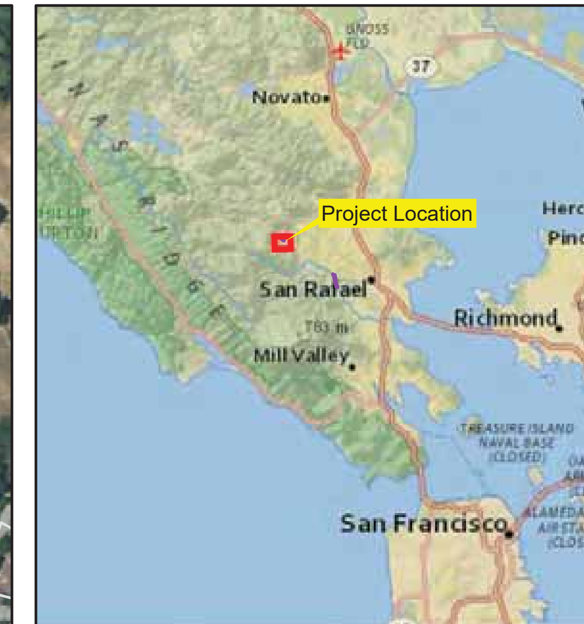
HEC-RAS modeling shows that operation of the detention facility creates a significant reduction in sediment transport capacity upstream of the diversion dam across Fairfax Creek during the peak 6-hour period of the 25-year design flood (Figure 5). Under existing conditions, flood flows are adequate to maintain the low flow and bankfull channel by moving the coarse gravel to small cobble-sized channel bed materials downstream (USGS, 2008). With the proposed facility operations and the gated outlet on diversion dam closed, the available shear stress in the Fairfax Creek above the diversion dam is reduced; Fairfax Creek will be able to transport only sand-sized particles, meaning that nearly all sediment flowing into the local reach under peak conditions would cease moving and deposit. These sediments could partially or substantially fill the channel over the long term or during a single large flood event. Channel filling by sedimentation could reduce hydraulic performance of the detention system by raising the water surface elevation and disrupting the timing of overbank spill over the weir. Flood reduction benefits could be reduced if the detention basin fills on the rising limb of the hydrograph because of sediment deposits in the channel. This could also cause more frequent spills over the diversion dam spillway (elevation 235 feet), upstream flooding, bank erosion, and possible channel avulsion northward into the detention basin or southward toward Sir Francis Drake Boulevard. Design of the downstream apron of the diversion dam spillway would need to account for the potential for increased spillway flows. If the bed elevation is raised to the lateral weir height (i.e., 228 feet), coarse sediments might be deposited in the detention basin, which would add to an unknown volume of fine suspended sediments already entrained in weir overflow.

Preliminary estimates of sediment deposition during operation indicate that the loss of channel flood capacity is potentially significant. Estimates using local bed load transport data are widely variable, but when the same estimates are made using sediment transport formulas, a mid-range estimate matches a bedload data set taken between 1980 and 1981. These mid-range results indicate the channel upstream of the diversion dam could be partially or fully filled with sediment during the 10- and 25- year design flood events.

Field inspection of older flood deposits in Fairfax Creek between the diversion dam and bridge indicate past episode(s) of channel filling up to elevation ±232 feet; however, these could be related to the extreme January 3-5 1982 flood event, which triggered numerous landslides and delivered large volumes of sediment from hillslopes to stream channels, particularly in Marin and Santa Cruz counties. In 1989, the USGS estimated that the 1982 event was a greater than 100-year peak flow on CMC near Ross, with over 14 inches of rain falling in 36 hours. The extreme rainfall rates (which induced hillslope erosion) in January 1982 were preceded by an unusually wet winter season, leaving saturated watersheds as the antecedent (i.e., pre-January 3) condition. Additional study is needed to calculate the frequency of events involving heightened sediment delivery from hillslopes to stream channels.

The hydraulic effects of detention facility operations and the potential for increased sediment deposition in Fairfax Creek could extend upstream of the District-owned property. Loss of coarse sediment transport and supply downstream of the diversion dam could cause enhanced erosion via sediment hungry water effects, a condition where hydraulic force increases as sediment load is lost to upstream deposition.





LEGEND

- Sunnyside Detention Facility
- Creek Flowline
- Approximate Watershed Area (54 acres) of tributary flowing into Fairfax Creek at Sunnyside Detention Facility Site

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FIGURE 4
Sunnyside Detention Facility
Fairfax Creek
San Anselmo Flood Risk Reduction Project
Marin County, California

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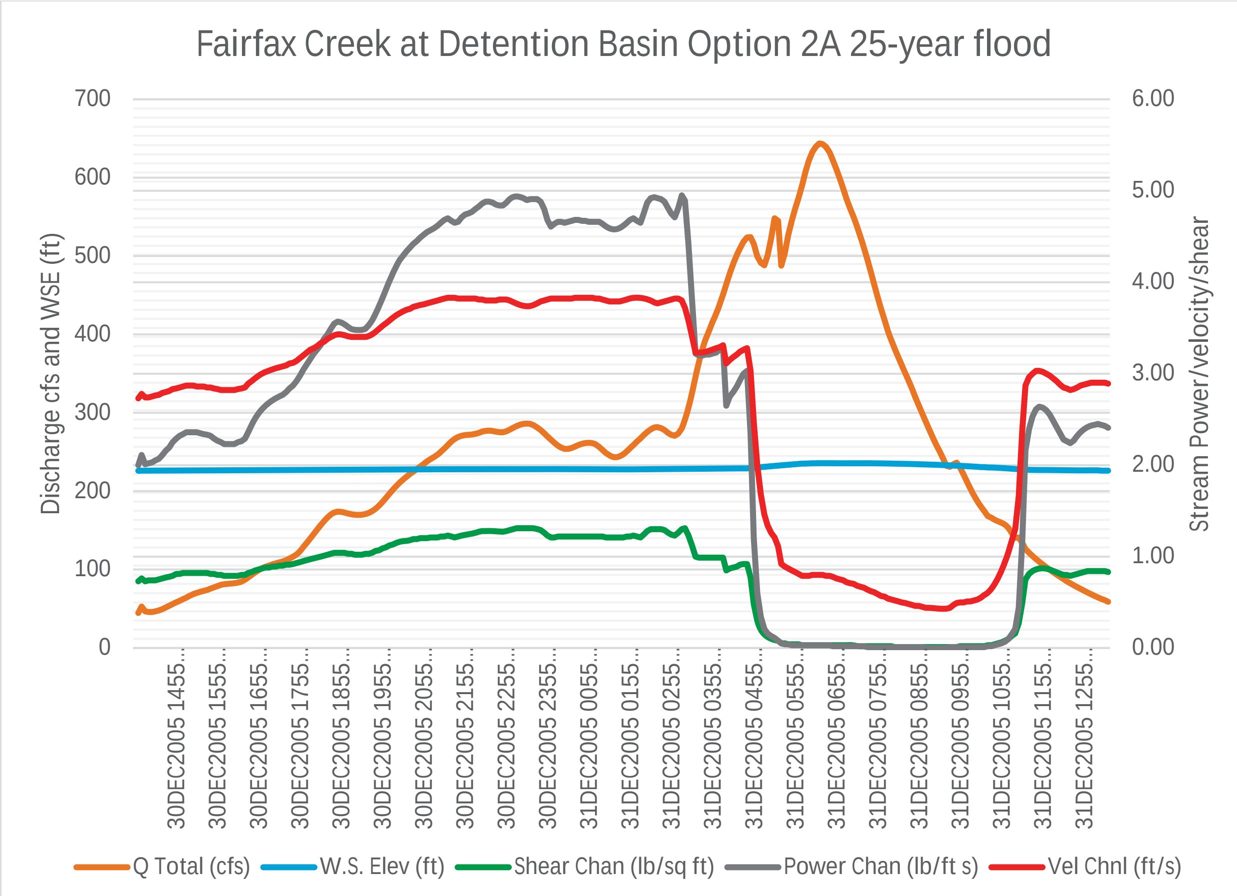


Figure 5. Hydraulic Output for HEC-RAS Cross Section 10745 for 25-Year Flood Event
With the gated opening on the diversion dam closed, storage of floodwater in Fairfax Creek upstream of the proposed diversion dam causes dramatic reductions in velocity, shear stress and stream power for the 6-hour peak flow period (0455 hours to 1055 hours).

There are countermeasures that could offset the sediment deposition effects; however, these require further investigation and HEC-RAS hydraulic modeling beyond the scope of this investigation. Candidate countermeasures would require estimating the locations, volumes, and rates of sediment deposition in Fairfax Creek during a single 25-year design event, and multiple flood events over long-term future conditions. Periodic maintenance dredging within the project property boundaries (and possibly upstream) could be effective if sediment deposition rates do not affect single flood operations. Estimating the volume and frequency of dredging requires further study. If it is found through further study that sediment deposition and channel filling during a single flood event would have a significant impact, modifying the design of the diversion dam outlet, emergency spillway or operations, or modifying a combination of the three, could flush sediment downstream. In addition, it might be possible to discharge the detention basin after the flood into Fairfax Creek upstream of the diversion dam and flush the stored sediments downstream. Other possible countermeasures could be revealed upon further study and analysis.

Periodic maintenance dredging and other countermeasures could involve additional costs and may have additional environmental impacts such as the following:

- Limited fish passage due to channel blockage
- Loss of riparian vegetation via sedimentation-induced erosion and avulsion
- Impact to long-term water quality due to discharge of fine sediments from erosion of channel banks

Removal of BB#2

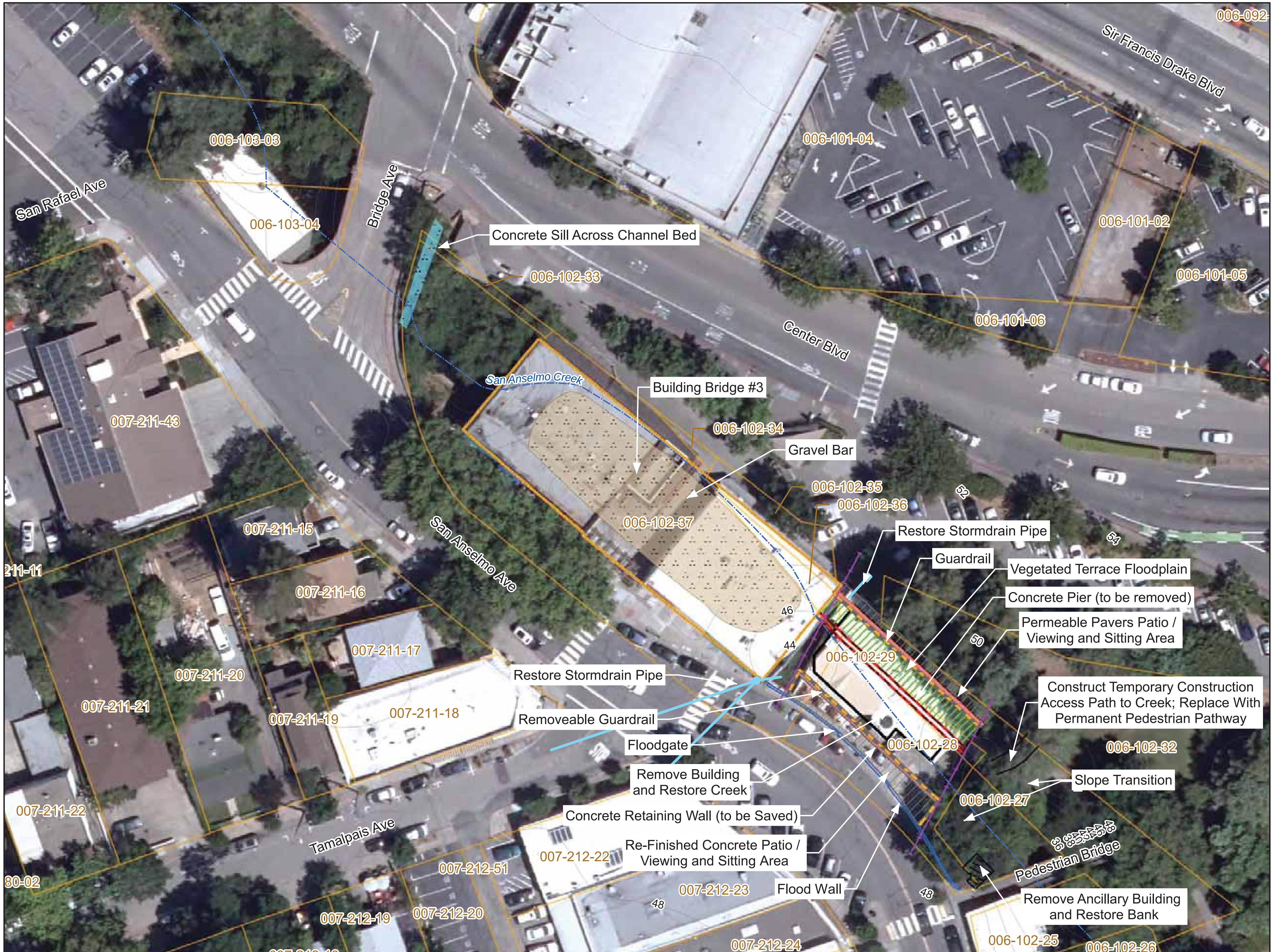
Figure 6 shows the demolition and channel reconstruction plans for the BB#2 in San Anselmo Creek and the location of BB#3 immediately upstream. Option 2A includes removal of the BB#2 building as well as all of the underlying concrete walls and support piers that lay within the channel bed and banks. The proposed channel reconstruction plans shown on Figure 6 include bioengineered bank protection with a rock revetment and native riparian vegetation plantings.

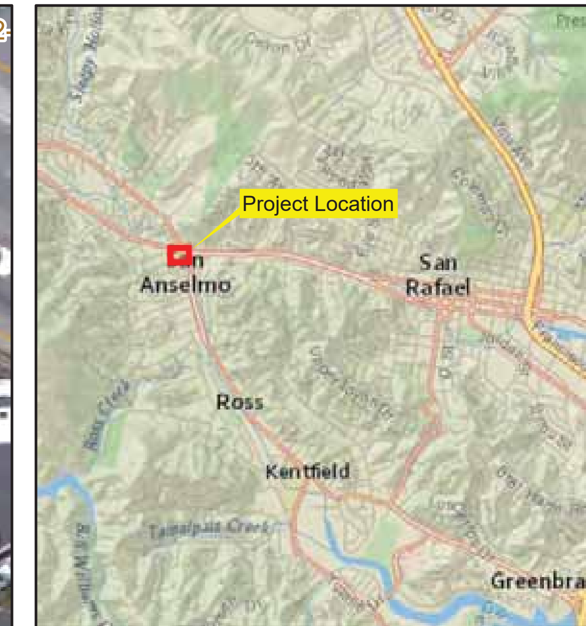
San Anselmo Creek flows beneath BB#3, which is just upstream of the BB#2 removal site. Under BB#3, a 2- to 3-foot high (above low water) gravel/cobble bar has formed by sediment deposition in the hydraulic backwater area created by the BB#2 constriction during storm runoff events. The gravel bar and low-flow channel are bounded by the BB#3 foundation structure that includes support piers and retaining walls. This bar has a surface pavement of coarse gravels (i.e., greater than 16 millimeters [mm] mean diameter) and cobbles (great than 64 mm mean diameter) with underlying finer gravels and sands. The sediments are generally loosely consolidated except for the upstream head of the bar, where interlocking large cobbles and small boulders armor the bed.

Removal of the BB#2 structure would eliminate a hydraulic constriction and associated upstream backwatering under BB#3. This would increase local hydraulic forces and sediment transport capacity through BB#3 and for approximately 70 feet further upstream to the Bridge Avenue bridge, where a concrete-covered pipe forms a sill across the channel bed and functions as grade control.

To assess changes in sediment mobility upstream of BB#2 constriction, new bed material grain-size data were collected by pebble counts taken along three transects under BB#3 (Attachment B). Under existing conditions, and using the pebble count data (Attachment B) and the critical shear thresholds from USGS (USGS, 2008), over 80 percent of the grain sizes sampled are already mobile under the 25-year design event. Under Option 2A, the sizes and fraction of bed materials mobilized increases to nearly 90 percent. This indicates that scour could increase in the channel reach from BB#2 though BB#3 upstream to Bridge Avenue and the sill; this reach includes support piers and a retaining wall under BB#3, channel banks, and the concrete sill and pipeline at Bridge Avenue.

Based upon the information presented above, there is the potential for erosion and scour damage to the foundation of BB#3, the channel banks between BB#2 and BB#3 and the banks upstream of BB#3 to the concrete sill at Bridge Avenue. It is feasible to install scour protection countermeasures for these locations, including adding new rock revetment or extending the depth of existing rock revetments, and extending the foundations of vertical retaining walls using sheet pile or concrete. New bioengineered bank protection may be needed where protection is presently absent (i.e., between BB#2 and BB#3 and upstream of BB#3 to Bridge Avenue). The depth and design of the scour protection would be determined during engineering design and, if necessary, added to construction plans and specifications then implemented. The potential for environmental impacts of any countermeasures employed would need to be addressed (e.g., removal of natural channel bank or bed and vegetation and habitats).





LEGEND

- 006-102-25 Parcel
- Creek
- 2 Foot Elevation Contours

Building Bridge #3

- Building Bridge #3
- Concrete Sill Across Channel Bed
- Gravael Bar

Building Bridge #2

- Concrete Pier (to be removed)
- Concrete Retaining Wall (to be removed)
- Flood Wall
- Permeable Pavers Patio / Viewing and Siting Area
- Remove Ancillary Building and Restore Bank
- Remove Building and Restore Creek
- Vegetated Terrace Floodplain
- Floodgate
- Guardrail
- Temporary Construction Access
- Profile
- Restore Stormdrain Pipe

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FIGURE 6
Building Bridge #2 Demolition Plan and Building Bridge #3 and Underlying Gravel Bar

San Anselmo Flood Risk Reduction Project
Marin County, California

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Option 2A Plus Foreseeable Future Conditions

The following analysis of Option 2A Plus was prepared to the level of detail necessary for CEQA cumulative impact analysis per discussion with the District's CEQA consultant.

Option 2A Plus includes Option 2A (and the impacts and mitigations described above), as well as the following bridge removals and replacements:

- Azalea Avenue
- Madrone Avenue
- Nokomis Avenue
- Center Boulevard
- Bridge Avenue
- Winship Avenue
- Fish ladder structure located at the head of the concrete channel in CMC in Ross

The conditions at each of these sites are shown in the fact sheets in Attachment A. Each of the bridges to be removed and replaced is hydraulically constricted and HEC-RAS hydraulic modeling of the anticipated 25-year flood indicates potential changes in erosion, scour and sediment transport. Figure 7 shows the changes in grain sizes mobilized by changes in peak shear stress during a 25-year event. In general, the bed materials observed at each site are already mobile under existing conditions, and the changes are relatively minor. The notable exception is Madrone Street Bridge, where shear stress is lowered; however, based on field observations, it appears that most of the channel bed sediments will still be mobile, and no major changes in channel stability are anticipated.

HEC-RAS modeling indicates that the removal of the fish ladder in CMC Ross significantly increases peak shear stress upstream of the ladder from that moving cobble-sized (64-mm) sediment to that moving boulder-sized (256-mm and greater) sediment (Figure 7). Inspection of the reach from the fish ladder upstream to Lagunitas Road indicates a high degree of stability, with bank armoring by rock revetments and dense bank vegetation. Moreover, the potentially affected channel bed is protected against significant incision by the 5,000-foot long CMC concrete channel that begins just below the fish ladder structure.

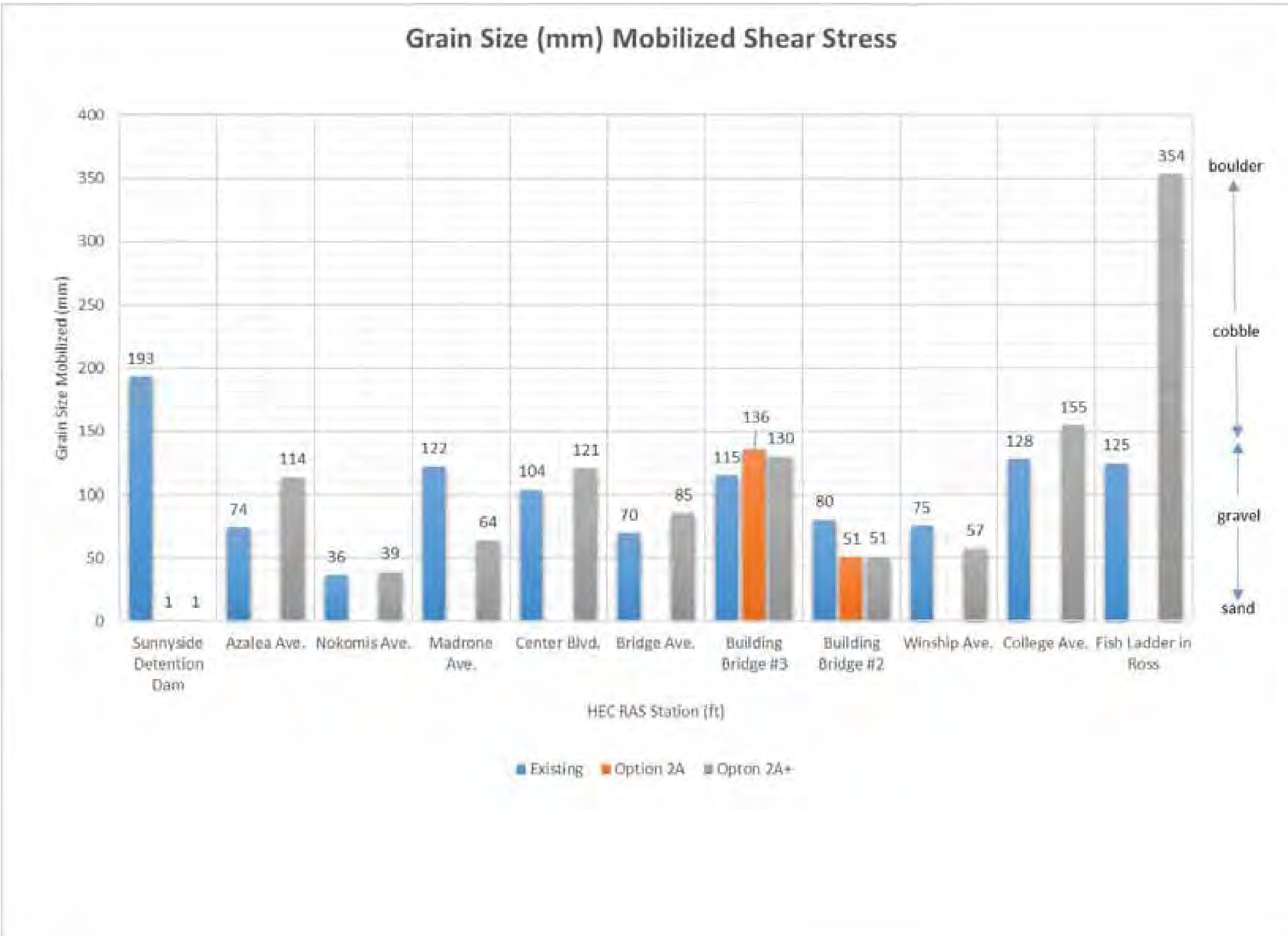

Figure 7. Changes in Maximum Grain Sizes Moved Under Existing Conditions

For Options 2A and 2A Plus at removal/replacement locations using HEC RAS critical shear stress output to particle size moved using USGS (2008)

All of the measures proposed for Option 2A Plus will undergo full engineering design, which will include geotechnical investigations and detailed hydraulic and structural engineering typical for bridge replacements. This would include accounting for potential hydraulic changes in the local reaches and protection of the existing channel, structures, and properties from scour. The scour protection countermeasures available include extending the depth of rock revetments, retaining walls, and bridge abutments and/or installing new erosion protection, as needed. The potential for environmental impacts of any countermeasures employed would need to be addressed (e.g., removal of natural channel bank or bed.

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Attachment A
Corte Madera Creek
Improvement Sites Fact Sheets

Fairfax Creek at Sunnyside Nursery Detention Basin Site (HEC-RAS Station 10400 to 11000)

Features Option 2A and 2A Plus: Detention basin, 300-foot-long armored lateral weir, and diversion dam across Fairfax Creek

Channel Dimensions: Flood Channel: 100 feet wide x 13 feet deep; Bankfull: 15 feet wide by 2 feet deep

Bed Slope: 0.005

Bed Materials: Maximum: Large cobble; Average: Medium gravel; Small: Sand

Bank Conditions: Left Bank (LB): eroding; Right bank (RB): aggraded with gravel bar at tributary confluence

Potential Impacts/Countermeasures:

Channel Sedimentation upstream of diversion dam would require periodic dredging; possible compromise in performance during flood

Bank Erosion along LB for entire length of weir requiring installation of rock revetment to depth below potential scour

Figure A-1. Fairfax Creek Looking Upstream
Looking along weir location showing active bank erosion and trees to be removed.

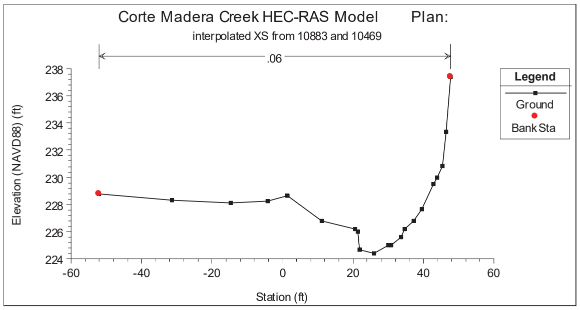

Figure A-2: Fairfax Creek HEC-RAS Cross Section
Looking downstream at proposed weir location.

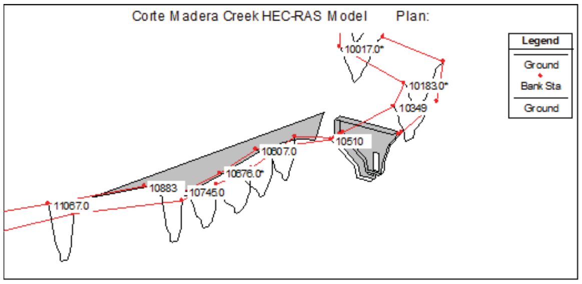

Figure A-3. HEC-RAS 3D Plot of Fairfax Creek
Plot is at Sunnyside Nursery
with proposed weir and diversion dam (in grey).

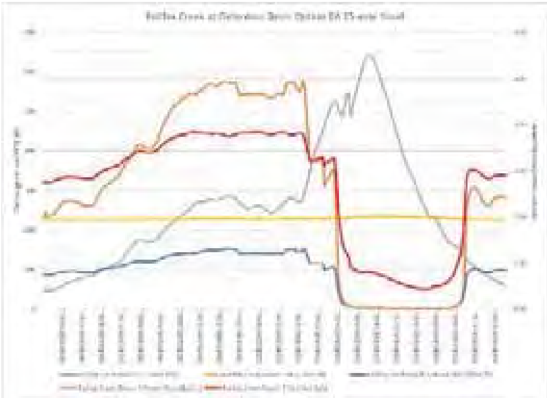

Figure A-4. HEC-RAS Output for 25-year Flood
Plot is for cross section at weir showing loss of sediment transport capacity
during 6-hour peak flow period.

Fairfax Creek at Azalea Street Bridge (HEC-RAS Station 2230)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 25 feet wide by 13 feet deep; Bankfull: 25 feet wide by 2 feet deep

Bed Slope: 0.005

Bed Materials: Maximum: Large cobble; Average: Medium gravel; Small: Muds

Bank Conditions: LB: armored; RB: armored

Potential Impacts/Countermeasures:

Channel Incision: Channel bed well armored less than significant

Bank Erosion: Potential bank toe erosion requiring scour protection to be determined during design

Figure A-5: Azalea Avenue Bridge Upstream View

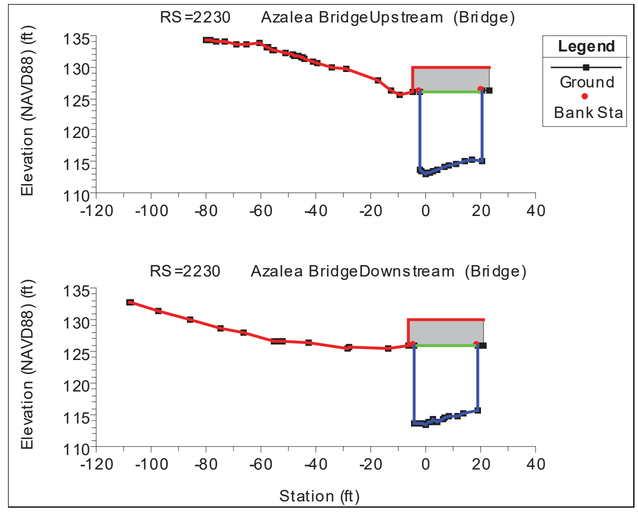

Figure A-6: HEC-RAS plot of Azalea Avenue Bridge

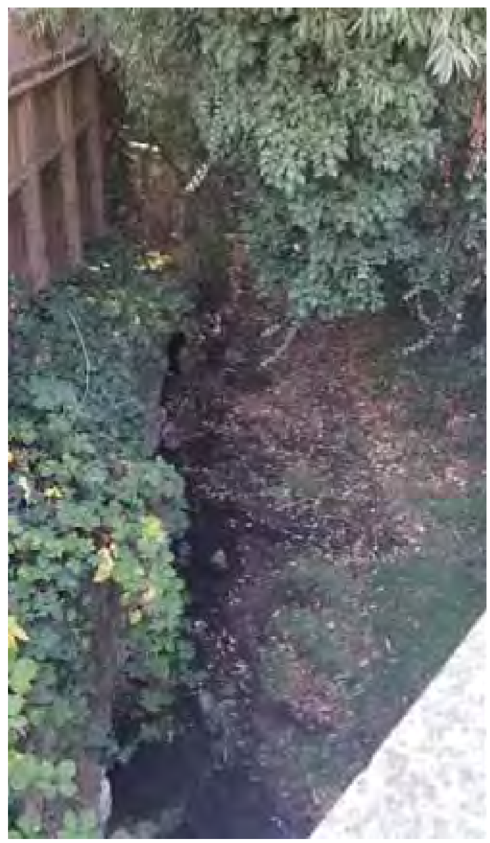

Figure A-7: Azalea Avenue Bridge Downstream Channel

San Anselmo Creek at Nokomis Avenue Bridge (HEC-RAS 455513)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 75 feet wide by 6 feet deep; Bankfull: 20 feet wide by 4 feet deep

Bed Slope: 0.006

Bed Materials: Maximum: Medium cobble; Average: Large to medium gravel; Small: Sands

Bank Conditions: LB: natural and riprap; RB: concrete wall and riprap

Potential Impacts/Countermeasures:

Mobilization of sediments around the bridge piers. A large bar deposit extending 70 feet upstream of the bridge down to the Sorich Creek confluence (90 feet downstream of the bridge) could be remobilized with bridge replacement.

Figure A-8: View of Upstream Face of Nokomis Bridge

Notice large gravel bar deposits underneath and in left bay of bridge.

Figure A-9: Composition of Gravel Bar at Nokomis Bridge

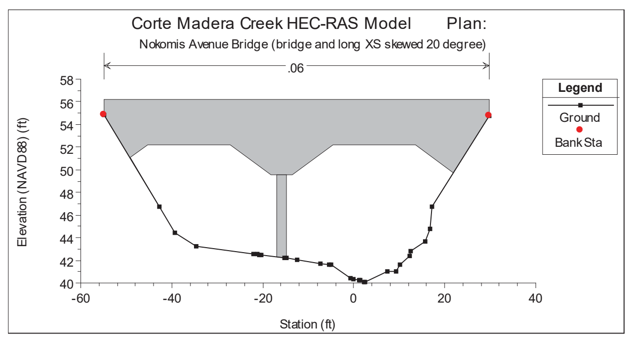

Figure A-10: HEC-RAS cross section at Nokomis Bridge

San Anselmo Creek at Madrone Avenue Bridge (HEC-RAS Station 44949)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 70 feet wide by 16 feet deep; Bankfull: 20 feet wide by 3 feet deep

Bed Slope: 0.0045

Bed Materials: Maximum: Bedrock / large gravel; Average: Medium gravel; Small: Sands and silts

Bank Conditions: LB: riprap; RB: rip rap and natural

Potential Impacts/Countermeasures:

Channel Incision: Localized mobilization of gravel bar under bridge, but channel bed generally well armored with no evidence of any recent channel adjustment - less than significant

Bank Erosion: Although the channel banks are well armored and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-11: View of Channel Upstream of Madrone Avenue

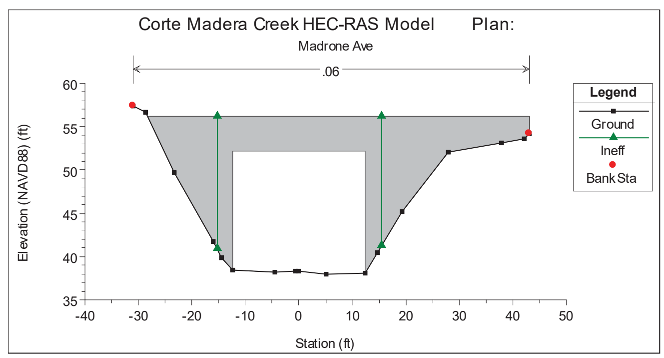

Figure A-12: HEC-RAS Cross Section at Madrone Avenue Bridge

San Anselmo Creek at Center Avenue Bridge (RM 44026)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 65 feet wide by 18 feet deep; Bankfull: 25 feet wide by 3 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Embedded large gravel; Average: Medium gravel; Small: Sands and silts

Bank Conditions: LB: riprap, concrete wall, bedrock, and natural; RB: riprap, concrete wall, bedrock, and natural

Potential Impacts/Countermeasures:

Channel Incision: Concrete sill under Bridge Street Bridge (just downstream) creates a backwater effect and controls potential incision - less than significant

Bank Erosion: Although the channel banks have structural control and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-13: View of Channel Downstream of Center Avenue Bridge

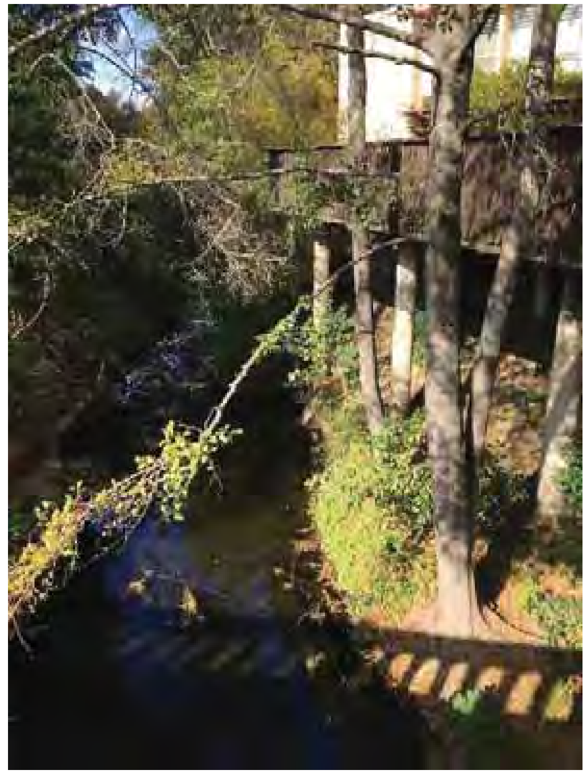

Figure A-14: View of Channel Upstream of Center Avenue Bridge

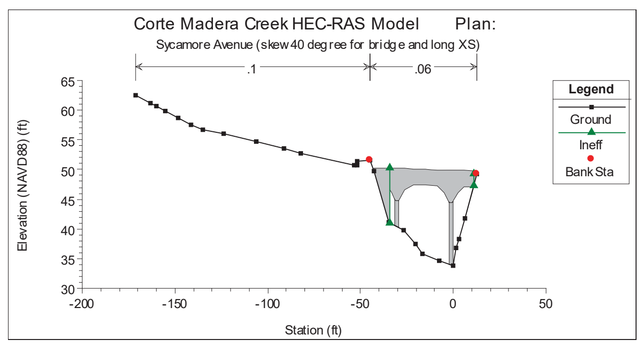

Figure A-15: HEC-RAS Plot at Center Avenue Bridge

San Anselmo Creek at Bridge Boulevard Bridge (HEC-RAS Station 44026)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 70 feet wide by 14 feet deep; Bankfull: 25 feet wide by 3 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Concrete sill across channel; Average: Medium to small gravel; Small: Sands and silts

Bank Conditions: LB: Concrete wall, bedrock, and natural; RB: concrete wall, bedrock, and natural

Potential Impacts/Countermeasures:

Channel Incision: Concrete sill under Bridge Street Bridge creates a backwater effect and controls potential incision - less than significant

Bank Erosion: Although the channel banks have structural control and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-16: Concrete Sill Extending across Channel on Downstream Face of Bridge Street Bridge

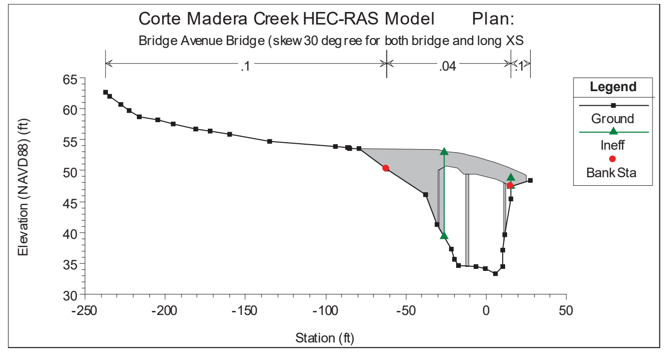

Figure A-17: HEC-RAS Cross Section Bridge Boulevard Bridge

San Anselmo Creek at Winship Avenue Bridge (HEC-RAS Station 40556)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 80 feet wide by 20 feet deep; Bankfull: 35 feet wide by 4 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Large cobble; Average: Large to medium gravel; Small: Sands and silts

Bank Conditions: LB: Concrete wall, natural; RB: Concrete wall, natural

Potential Impacts/Countermeasures:

Channel Incision: Potential for mobilization of small gravel bar under bridge and minor channel incision, but channel appears very stable in this reach - less than significant

Bank Erosion: Although the channel banks seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-18: Looking Upstream at Downstream Face of Winship Avenue Bridge

Figure A-19: Looking Upstream at Channel Upstream of Winship Avenue Bridge

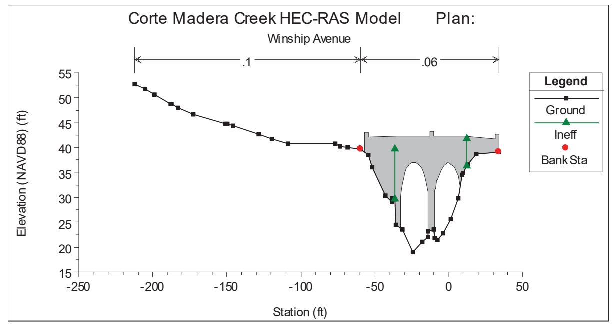

Figure A-20: HEC-RAS Cross Section at Winship Avenue Bridge

Attachment B
Grain Size Data Plot for Gravel Bar under Building Bridge #3 in San Anselmo Creek

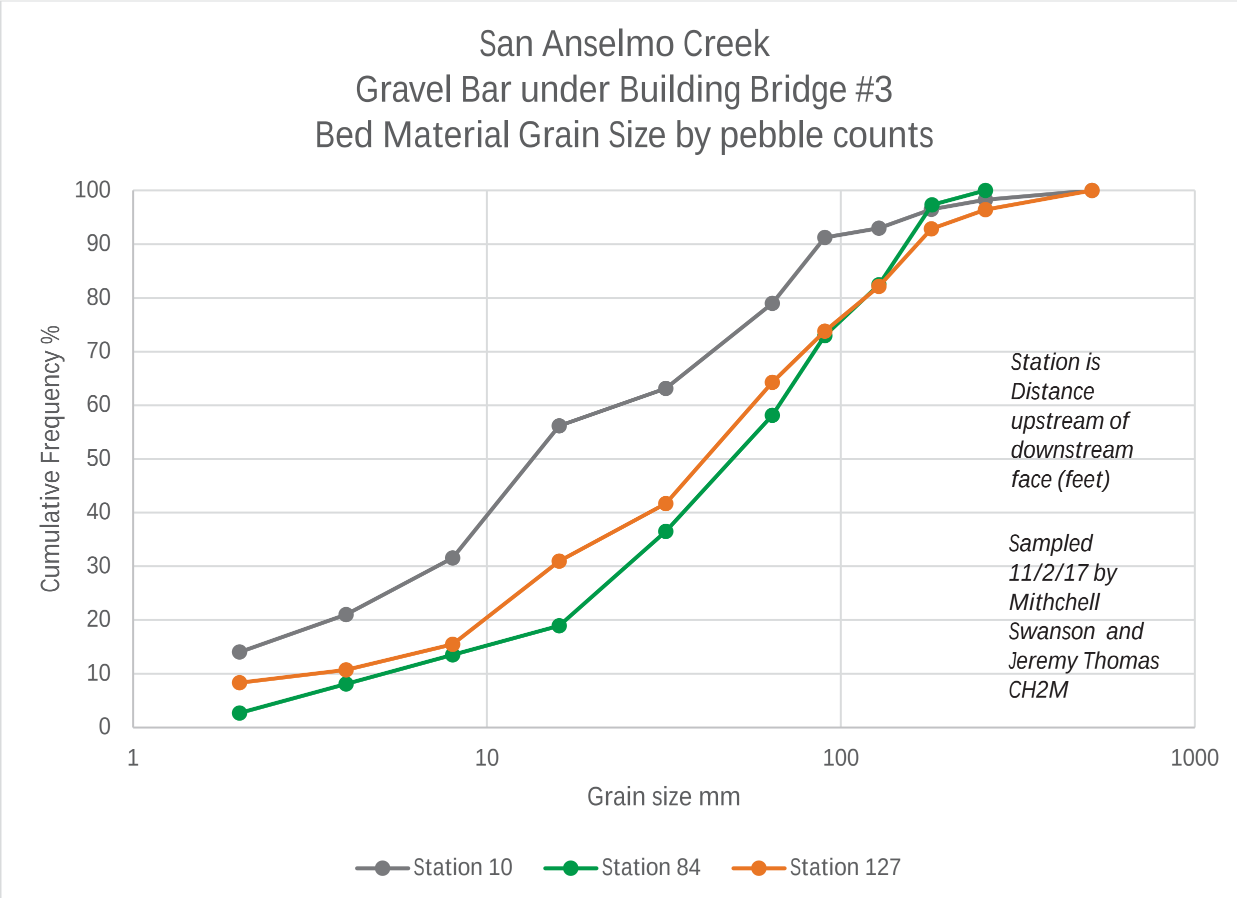

Figure B-1. Channel Bed Grain Size Distribution Sampled by Pebble Counts from Bar under BB#3.

APPENDIX E

Mitigation Monitoring and Reporting Program

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Introduction

The Marin County Flood Control and Water Conservation District (Flood Control District) is the lead agency implementing the California Environmental Quality Act (CEQA) environmental document for the San Anselmo Flood Risk Reduction Project (Project). The primary goal of the Project is to substantially reduce the frequency and severity of flooding within portions of the San Anselmo Creek and Fairfax Creek subwatersheds in Ross Valley. The Flood Control District would meet this goal by implementing a project that would increase creek capacity by enlarging the San Anselmo Creek channel by removing existing obstructions to flow and reducing peak discharge by attenuating flows through use of a flood diversion and storage (FDS) basin. The Flood Control District prepared an environmental impact report (EIR) to evaluate the potential for the Project to result in significant adverse effects on the physical environment.

This Mitigation, Monitoring, and Reporting Program (MMRP) has been formulated based upon the findings of the EIR and lists the Project-level mitigation and minimization measures recommended in the Draft EIR.

This MMRP is designed to fulfill Section 21081.6(a) of the CEQA, which requires public agencies to adopt a reporting or monitoring program whenever a project or program is approved that includes mitigation measures identified in an environmental document for which the agency makes a finding pursuant to CEQA Section 21081(a)(1). Therefore, this MMRP must be adopted when the Flood Control District makes a final decision on the Project.

Table E-1 lists each of the EIR mitigation measures, and includes the following categories for monitoring and reporting.

1. **Implemented By**. The name of the entity responsible for implementing the mitigation measure.

2. **When Implemented**. Most measures are to be implemented prior to, during, or immediately after project construction.

3. **Monitored By**. The name of the person who is responsible for monitoring implementation of the mitigation measure. At this time, the field is blank – it will be completed during implementation.

4. **Verified By**. The signature of the responsible person and the date compliance is verified. At this time, the field is blank – it will be completed during implementation.

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TABLE E-1
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.3 Air Quality and Greenhouse Gas Emissions					
Impact 4.3-1: Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation.	**Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures** To limit dust, criteria pollutants, and precursor emissions associated with construction, the following BAAQMD-recommended Basic Construction Measures shall be implemented and included in all contract specifications for components constructed under the Project: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. 4. All vehicle speeds on unpaved roads shall be limited to 15 mph. 5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. 6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. 7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. 8. Post a publicly visible sign with the telephone number and person to contact at the Flood Control District regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.	Marin County Flood Control and Water Conservation District (Flood Control District)/Contractor	During construction		
Impact 4.3-2: Construction of the Project would result in emissions that could conflict with the 2017 Clean Air Plan.	**See Mitigation Measure 4.3-1, above.**	Flood Control District/Contractor	During construction		
Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions.	**Mitigation Measure 4.3-4: Tier 4 Engines for Construction Equipment** All off-road equipment greater than 25 horsepower that operates for more than 20 total hours over the entire duration of construction activities shall have engines that meet the USEPA or CARB Tier 4 interim or Tier 4 Final off-road emission standards.	Flood Control District/ Contractor	During construction		
4.4 Energy, Mineral, Forest and Agricultural Resources					
Impact 4.4-1: Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources.	**See Mitigation Measure 4.3-1, above.**	Flood Control District/ Contractor	During construction		
4.5 Biological Resources					
Impact 4.5-1: Project implementation could have substantial adverse effects on special-status aquatic species or habitats.	**Mitigation Measure 4.5-1a: Seasonal Avoidance of Sensitive Aquatic Species** In-water construction work, including activities on the banks that are expected to create turbidity or disturb the streambed, shall be conducted within resource agency-approved work windows intended to reduce potential impacts on salmonids (generally limiting work to the period between June 15 and October 15) with resource agency concurrence for the following exceptions: 1. Removal of debris, foundations or other manmade materials from the creek bed may continue year-round, in areas of the stream which are dry and where such activity shall not create turbidity. 2. Tree removal and invasive species removal may take place year-round, providing the area is free of nesting birds and roosting bats as provided under **Mitigation Measure 4.5-4.** 3. Revegetation activities may occur year-round.	Flood Control District/ Contractor	During construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-1 (cont.)	**Mitigation Measure 4.5-1b: Relocation of Special-Status Fish** If in-channel work requires dewatering, including for sediment removal maintenance activities, fish shall be captured and relocated downstream of the Project areas to avoid injury and mortality and minimize disturbance. The Flood Control District shall implement the measures below, or whatever more stringent species preservation and avoidance measures are imposed by resource agencies, including NMFS and CDFW, with jurisdiction over aquatic special-status species. 1. The name(s) and credentials of qualified biologist(s) to act as construction monitors shall be submitted to CDFW and NMFS for approval at least 15 days before construction work begins. 2. Prior to and during the initiation of construction activities, qualified fisheries biologist (i.e., approved by CDFW and/or NMFS) shall be present during installation and removal of creek diversion structures. 3. For sites that require flow diversion and exclusion, the work area shall be blocked by placing fine-meshed nets or screens above and below the work area to prevent salmonids from re-entering the work area. To minimize the potential for re-entry, mesh diameter shall not exceed 1/8 inch. The bottom edge of the net or screen shall be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening shall be placed in low velocity areas to minimize fish impingement against the mesh. Screens shall be checked periodically and cleaned of debris to permit free flow of water. 4. Before removal and relocation on individual fish begins, a qualified fisheries biologist shall identify the most appropriate release location(s). In general, release locations should have water temperatures similar to (<3.6°F difference) the capture location and offer ample habitat (e.g., depth, velocity, cover, connectivity) for released fish, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on exclusion nets or screens. 5. The means of capture shall depend on the nature of the work site, and shall be selected by a qualified fisheries biologist as authorized by CDFW and NMFS. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, fish and other aquatic species may be captured by pumping down the pool and then seining or dip netting. Electrofishing, if necessary, shall be conducted only by properly trained personnel holding current permits from CDFW and NMFS and following the most recent NMFS electrofishing guidelines (NMFS, 2000). 6. Initial fish relocation efforts shall be performed several days prior to the scheduled start of construction. Flow diversions and species relocation shall be performed during morning periods. The fisheries biologist shall survey the exclusion screening throughout the diversion effort to verify that no special-status fish, amphibians, or aquatic invertebrates are present. Afternoon pumping activities shall be limited and pumping shall be suspended when water temperatures exceed 18 degrees Celsius (64.5° F). Water temperatures shall be measured periodically, and flow diversion and species relocation shall be suspended if temperatures exceed the 18-degree limit under NMFS guidelines. Handling of fish shall be minimized. When handling is necessary, personnel shall wet hands or nets before touching them. 7. Prior to translocation, fish that are collected during surveys shall be temporarily held in cool, aerated, shaded water using a five-gallon container with a lid. Overcrowding in containers shall be avoided; at least two containers shall be used and no more than 25 fish shall be kept in each bucket. Aeration shall be provided with a battery-powered external bubbler. Fish shall be protected from jostling and noise, and shall not be removed from the container until the time of release. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature. Special-status fish shall not be held more than 30 minutes. If water temperature reaches or exceeds 18 degrees Celsius (USFWS 2012), the fish shall be released and relocation operations shall cease. 8. If fish are abundant, capture shall cease periodically to allow release and minimize the time fish spend in holding containers. 9. Fish shall not be anesthetized or measured. However, they shall be visually identified to species level, and year classes shall be estimated and recorded. 10. Reports on fish relocation activities shall be submitted to CDFW and NMFS in within one week.	Qualified Fisheries Biologist (construction monitoring; fish relocation); Qualified Fisheries Biologist (reporting)	Prior to and during construction; during construction		
	Mitigation Measure 4.5-1c: Contractor Environmental Awareness Training and Site Protection All construction personnel that are working in areas of potential endangered species habitat shall attend an environmental education program delivered by a qualified biologist prior to working on either Project site. The training shall include an explanation as how to best avoid the accidental take of special-status species, including salmonids and other fish species, western pond turtle, California red-legged frog, and listed birds. The training session shall be mandatory for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of maps showing areas where minimization and avoidance measures are being implemented. The program shall include an explanation of appropriate federal and state laws protecting endangered species. The contractor shall provide closed garbage containers for the disposal of all trash items (e.g., wrappers, cans, bottles, food scraps). Work sites shall be cleaned of litter before closure each day, and placed in wildlife-proof garbage receptacles. Construction personnel shall not feed or otherwise attract any wildlife. No pets, excluding service animals, shall be allowed in construction areas.	Qualified Biologist/ Construction Monitor (training); Contractor (garbage containers, litter removal)	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-2: Project implementation could have substantial adverse effects on special-status plants.	**Mitigation Measure 4.5-2: Avoid Impacts to Rare Plants** A qualified biologist shall conduct a pre-construction survey of each Project site for special-status plant species with the potential to occur within the area of disturbance. The survey shall be floristic in nature and shall follow the procedures outlined in the CDFW Publication *Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Commu*nities (CDFW, 2009). The survey shall be conducted between April and July in conjunction with the blooming seasons of those rare plants with moderate potential to occur in the Project area. If no special-status plants are observed during appropriately timed surveys by a qualified botanist, it is assumed the construction activity will have no impact on special-status plants and no further action is required. If special-status plants are identified within the Project area, the individuals or populations shall be mapped and quantified and reported to the CNDDB, and the project manager shall be notified so that potential impacts to these known occurrences shall be avoided, when feasible. Coordination with CDFW and/or USFWS staff shall be conducted to establish appropriate avoidance and minimization measures if the species is federally or State listed. Avoidance and minimization measures may include: 1. No-disturbance buffers. 2. Work windows for low impact activities that are compatible with the dormant phase of a special-status plant life cycle but that may kill living plants or severely alter their ability to reproduce. 3. Silt fencing or construction fencing to prevent vehicles, equipment, and personnel from accessing the occupied habitat. 4. Erosion control BMPs such as straw wattles made of rice straw, erosion control blankets, or hydroseeding with a native plant seed mix to prevent sedimentation from upslope construction activities. 5. Before the construction activity commences, special-status plant occurrences shall be marked with pin flags in the field, and all maintenance personnel shall be instructed as to the location and extent of the special-status plants or populations and the importance of avoiding impacts to the species and its habitat. 6. If needed a qualified biologist shall be present or on-call during construction activities to provide guidance on avoiding special-status plants, ensure that other avoidance measures (buffers, fencing, etc.) are observed, and to document the total impact of the maintenance activity, particularly if it is greater or less than anticipated. 7. In consultation with, and as authorized by, CDFW or USFWS, a qualified botanist may collect and spread seeds or relocate plants to appropriate locations.	Qualified Biologist	Prior to construction; during construction		
Impact 4.5-3: Project implementation could have substantial adverse effects on special-status amphibians.	**Mitigation Measure 4.5-3a: Install Wildlife Exclusion Fencing** The Flood Control District shall implement the measures below, or whatever more stringent California red-legged frogs (CRLF) and western pond turtle (WPT) preservation and avoidance measures are imposed by resource agencies with primary jurisdiction over special-status wildlife species, including USFWS and CDFW. 1. Before ground-disturbing activity occurs, the contractor shall install temporary exclusion/silt barrier fencing around the perimeter of the construction site. Fencing shall be installed to the extent necessary to exclude CRLF from the construction area (in areas with habitat), and minimize impacts to natural habitat. Fencing material shall provide for wildlife exclusion as well as maintenance of water quality. Construction personnel and construction activity shall avoid areas outside the fencing. The need for and exact location of the fencing shall be determined by a qualified biologist, with the goal of protecting sensitive biological habitat and water quality. The fencing shall be checked at regular intervals (e.g., weekly) and maintained until construction is complete at individual work sites. The fence shall contain exit funnels to allow any wildlife within the construction area to leave without human intervention while preventing entry into the construction zone. Exit funnels shall be placed at ground level no more than 100 feet apart along the fence, or as modified by a qualified biologist or as directed by resource agencies with primary jurisdiction over special-status wildlife species. 2. The fencing shall be monitored as prescribed in **Mitigation Measure 4.5-6.**	Flood Control District/ Contractor (installation); Qualified Biologist (fence inspection/monitoring)	Prior to construction; during construction		
	Mitigation Measure 4.5-3b: Avoid Impacts to California Red-legged Frog and Western Pond Turtle The name(s) and credentials of the qualified biologist(s) to act as construction monitors shall be submitted to the USFWS for approval at least 15 days before construction work begins. Prior to commencing work, an approved biologist shall survey the entire construction footprint for California red-legged frog and other special-status species with potential to be present, such as western pond turtle. At the beginning of each workday that includes initial ground disturbance, including grading, excavation, and vegetation-removal activities, an approved biologist shall conduct on-site monitoring for the presence of these species in the area where ground disturbance or vegetation removal is planned. If required by the USFWS or CDFW, perimeter fences shall be inspected to ensure they do not have any tears or holes, that the bottoms of the fences are still buried, and that no individuals have been trapped in the fence.	Qualified biologist (site surveying); Contractor (trench covering, temporary fencing)	Prior to construction; during construction		

Table E-1 (continued)
Mitigation, Monitoring, and Reporting Program

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-3 (cont.)	All excavated or deep-walled holes or trenches greater than 2 feet deep shall be covered at the end of each workday using plywood, steel plates, or similar materials, or escape ramps shall be constructed of earth fill or wooden planks to allow animals to exit. Before such holes are filled, they shall be thoroughly inspected for trapped animals. If a special-status species is present within the exclusion fence area during construction, work shall cease in the vicinity of the animal, and the animal shall be allowed to relocate of its own volition unless relocation is permitted by state and/or federal regulatory agencies. The contractor shall maintain the temporary fencing—both exclusion fencing and protective fencing (if installed)—until all construction activities are completed. No construction activities, parking, or staging shall occur beyond the fenced exclusion areas.				
Impact 4.5-4: Project implementation could have substantial adverse effects on nesting birds.	**Mitigation Measure 4.5-4: Avoid Impacts to Special-status and Nesting Birds, including Raptors and Northern Spotted Owls** Tree removal activities shall be avoided during the nesting season (February 1 to August 31). Prior to any tree removal or construction in nesting season, a qualified biologist shall conduct a spotted owl and general nesting bird survey in each Project site and areas within 1/2-mile. Any identified spotted owl nesting areas or activity centers shall be flagged and avoided with a buffer of 1/4-mile throughout the active nesting season. Other nesting birds with active nests in the vicinity of the construction area shall be avoided by a buffer of 50 feet, or as determined in coordination with USFWS and CDFW. Construction work may continue outside of the no-work buffer. Northern spotted owl nesting surveys shall be conducted in coordination with Marin County Parks and Point Blue Conservation Science (Point Blue, 2017).	Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring)	Prior to construction; during construction		
Impact 4.5-5: Project implementation could have substantial adverse effects on Northern spotted owls.	**See Mitigation Measure 4.5-4, above.**	Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring)	Prior to construction; during construction		
Impact 4.5-6: Project implementation could have substantial adverse effects on special-status bats.	**Mitigation Measure 4.5-6: Avoid Impacts to Special-status Bats** Prior to any construction, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in trees to be removed or pruned and structures to be demolished. If no roosting bats are found, no further action is required. If a bat roost is found, the following measures shall be implemented to avoid impacts on roosting bats. If active maternity roosts are found in trees or structures that shall be removed or demolished as part of construction, tree removal or demolition of that structure shall commence before maternity colonies form (generally before March 1) or after young are flying (generally by July 31). Active maternal roosts shall not be disturbed. If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist and with approval from CDFW. Removal of the tree or demolition of the structure should occur no sooner than two nights after the initial minor site modification (to alter airflow), under guidance of the qualified bat biologist. The modifications shall alter the bat habitat, causing bats to seek shelter elsewhere after they emerge for the night. On the following day, the tree or structure may be removed, in presence of the bat biologist. If any bat habitat is not removed, departure of bats from the construction area shall be confirmed with a follow-up survey prior to start of construction.	Qualified bat biologist	Prior to construction		
Impact 4.5-7: Project implementation could adversely affect sensitive natural communities.	**Mitigation Measure 4.5-7a: Vegetation Protection for Sensitive Natural Communities** Prior to start of construction of any Project element, the extent of sensitive natural communities within the work area shall be identified by a qualified botanist or ecologist experienced in the definition and recognition of these communities. The area of impact in sensitive natural communities shall be minimized by siting construction staging and access areas outside the limits of riparian vegetation (as determined during pre-construction surveys) and by utilizing previously-disturbed areas. Before construction begins, the Project engineer and a qualified biologist shall identify locations for equipment and personnel access and materials staging that will minimize riparian vegetation disturbance. When heavy equipment is required, unintentional soil compaction shall be minimized by using equipment with a greater reach, or using low-pressure equipment. Temporary impacts on sensitive natural communities shall be mitigated by revegetation with native species, as required by **Mitigation Measure 4.5-7b.**	Qualified botanist; Contractor/Engineer	Prior to construction; during construction		
	Mitigation Measure 4.5-7b: Habitat Restoration and Monitoring Plan The Flood Control District shall prepare a Habitat Restoration and Monitoring Plan for restoration following construction activities at both Project sites. The plan shall describe required salvage and replanting protocols prior to and after construction is complete and shall thereby reduce the long-term amount of losses of these natural communities. This plan shall include, but not be limited to, protocols for replanting of vegetation removed prior to or during construction, and management and monitoring of the plants to ensure replanting success pursuant to Marin County's Countywide Plan, Marin County Code, or Code requirements of the Town of San Anselmo, or by any more stringent requirements included in other permits issued for the Project. The plan shall specify monitoring and performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits from the various resource agencies with regulatory purview over the Project. Revegetated areas shall be monitored for a five-year period to track progress toward performance criteria.	Flood Control District (Habitat Restoration and Monitoring Plan); Contractor, Qualified Biologist (vegetation salvage)	Prior to construction; After construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-7 (cont.)	Native riparian vegetation that can be propagated by cuttings or easily transplanted such as rushes and sedges within the Project sites shall be salvaged prior to construction and replanted after construction is completed. Areas impacted by construction-related activity shall be replanted or reseeded with native trees, shrubs, and herbaceous perennials and annuals from the watershed under guidance from a qualified biologist. Local plant materials shall be used for revegetation of the disturbed area. The plant materials shall include local cuttings from the local watershed or from adjacent watersheds. This shall ensure that the seeds can be collected during the appropriate season and the container plants shall be of an appropriate size for out-planting. Using local cuttings can reduce the length of this phase. The Habitat Restoration and Monitoring Plan would also address restoration of jurisdictional wetlands and waters. Temporary impacts to wetlands shall be restored onsite with native wetland species under guidance from a qualified biologist. Permanent impacts to jurisdictional wetlands shall be mitigated for by replacement on- or off-site at an equal ratio or whatever more stringent requirements are included in the permits to be issued for the Project. The monitoring plan shall include annual monitoring of restored areas for at least 5 years. The plan shall contain vegetation management protocols, protocols for monitoring replanting success, and an adaptive management plan if success criteria are not being met. The adaptive management plan would include interim thresholds for replanting success and alternative management approaches, such as weed control or additional replanting, to undertake if thresholds are not met.				
	Mitigation Measure 4.5-7c: Avoid Spread of Invasive Species and Pathogens All vehicles and equipment entering each Project site shall be clean of noxious weeds. Noxious weeds could spread between sites as well as from outside the Project sites. All construction equipment shall be washed thoroughly to remove all dirt, plant, and other foreign material prior to entering the Project sites. Particular attention shall be shown to the under-carriage and any surface where soil containing exotic seeds may exist. Arrangements shall be made for inspections of each piece of equipment before entering each Project site to ensure all equipment has been properly washed. Equipment found operating on the Project that has not been i.e., properly washed shall be shut down and may be subject to citation. 1. Certified weed-free permanent and temporary erosion control measures shall be implemented to minimize erosion and sedimentation during and after construction. 2. The contractor shall conform to applicable federal, state, and local seed and noxious weed laws. 3. Nursery operations where plants are stored, propagated, or purchased must certify implementation of best management practices to reduce pest and pathogen contamination within their nursery. 4. Disturbed and decompacted areas outside the restoration area shall be revegetated with locally native vegetation. Revegetated areas shall be protected and tended, including watering when needed, until restoration criteria specified by regulatory agency-issued permits is complete. 5. All tree removal and pruning activities shall include measures to avoid the spread of the Sudden Oak Death (SOD) pathogen. Such measures may include, but are not limited to the following: i. As a precaution against spreading the pathogen, clean and disinfect pruning tools after use on confirmed or suspected infested trees or in known infested areas. Sanitize tools before pruning healthy trees or working in pathogen-free areas. Clean chippers and other vehicles of mud, dirt, leaves, organic material, and woody debris before leaving a site known to have SOD and before entering a site with susceptible hosts. ii. Inform crews about the arboricultural implications of SOD and sanitation practices when they are working in infested areas. iii. Provide crews with sanitation kits containing chlorine bleach, scrub brush, metal scraper, boot brush, and plastic gloves. iv. Sanitize shoes, pruning gear, and other equipment before working in an area with susceptible species. v. When possible, work on SOD-infected and susceptible species during the dry season (June-October). When working in wet conditions, keep equipment on paved, graveled, or dry surfaces and avoid mud. Work in disease-free areas before proceeding to infested areas. vi. If possible, do not collect soil or plant material (wood, brush, leaves, and litter) from host trees in the quarantine area. Within the quarantine area, host material (e.g., wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic host plants should remain onsite to minimize pathogen spread. vii. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a SOD infested site. Scrape, brush, and/or hose off accumulated soil and mud from clothing, gloves, boots, and shoes. Remove mud and plant debris by blowing out or power washing chipper trucks, chippers, bucket trucks, fertilization and soil aeration equipment, cranes, and other vehicles. Restrict the movement of soil and leaf litter under and around infected trees as spores may be found there. viii. Tools used in tree removal/pruning may become contaminated and should be disinfected with alcohol or chlorine bleach.	Contractor/ Flood Control District	During construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-8: Project activities could adversely affect wetlands and other waters.	**See Mitigation Measures 4.5-7a and 4.57b, above.**	4.5-7a. Qualified Botanist; Contractor/Engineer 4.57b. Flood Control District (Habitat Restoration and Monitoring Plan); Contractor, Qualified Biologist (vegetation salvage)	4.5-7a. Prior to construction; during construction 4.57b. Prior to construction; after construction		
Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors.	**See Mitigation Measures 4.5-1a, 4.5-3b, 4.5-4, and 4.5-6, above.**	4.5-1a. Flood Control District/Contractor 4.5-3b. Qualified biologist (site surveying); Contractor (trench covering, temporary fencing) 4.5-4. Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring) 4.5-6. Qualified bat biologist	4.5-1a. During construction 4.5-3b. Prior to and during construction; During construction 4.5-4. Prior to construction; during construction 4.5-6. Prior to construction		
Impact 4.5-10: Project construction would require tree removal.	**Mitigation Measure 4.5-10: Mitigation for Removal of Heritage or Protected Trees** During construction, as much understory brush and as many native trees as possible shall be retained, to maintain shade-producing and bank-stabilizing vegetation for the creeks. All trees to remain during construction within the grading area shall be protected and trimmed if necessary to ensure their trunks and/or limbs are not disturbed during construction. To mitigate for tree removal: For each tree to be removed, the Flood Control District shall plant a replacement tree of the same species or a suitable native species substitute, at a rate of one planting per tree removed or such other mitigation ratio requirements included in the LSAA to be obtained from CDFW (for riparian trees) or any applicable County and/or town recommendations (for heritage trees), and ensure that replacement trees are planted within or in the vicinity of the Project sites to the maximum extent practicable, as follows: 1. Trees shall be replaced within the first year after the completion of construction or as soon as possible after construction is completed. 2. Selection of replacement sites and installation of replacement plantings shall be supervised by an arborist or biologist with experience in restoration. Irrigation of tree plantings during the initial establishment period shall be provided as deemed necessary by an arborist or biologist, consistent with the site **Habitat Restoration and Monitoring Plan** (**Mitigation Measure 4.5-7b**).	Contractor/ Flood Control District	During construction; After construction		
4.8 Hazards and Hazardous Materials					
Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.	**Mitigation Measure 4.8-2a: Check 700/750 Sir Francis Drake Boulevard Investigation Status** Prior to beginning construction activities, the contractor shall check the status of the 700/750 Sir Francis Drake Boulevard investigation available at the SWRCB GeoTracker website at: http://geotracker.waterboards.ca.gov/. Relevant information from the GeoTracker shall be used to inform the Health and Safety Plan and Soil Management Plan, described in subsequent mitigation measures.	Contractor	Prior to construction		
	Mitigation Measure 4.8-2b: Health and Safety Plan The construction contractor(s) shall prepare and implement a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120 to protect construction workers and the public during all excavation and grading activities. The Health and Safety Plan shall include, but is not limited to, the following elements: 1. Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site health and safety plan; 2. A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals based on the most recent reporting of the investigation at 700/750 Sir Francis Drake Boulevard site overseen by the Regional Water Quality Control Board; 3. Specified personal protective equipment and decontamination procedures, if needed; 4. Emergency procedures, including route to the nearest hospital; and 5. Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered.	Contractor	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.8 Hazards and Hazardous Materials (cont.)					
Impact 4.8-2 (cont.)	These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of unknown discovered or suspected hazardous materials release and notifying the Marin County CUPA (415-473-7085). Mitigation Measure 4.8-2b applies to both the Nursery Basin and the Downtown San Anselmo sites.				
	Mitigation Measure 4.8-2c: Soil Management Plan For the Downtown San Anselmo site, the Flood Control District or its contractor shall develop and implement a Soil Management Plan that includes a materials disposal plan specifying how the construction contractor shall remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan shall identify protocols for training workers to recognize potential soil contamination (such as soil staining, noxious odors, debris or buried storage containers), soil testing and disposal by a qualified contractor in the event that contamination is identified, and identification of approved disposal sites (e.g., Redwood Landfill in Novato). Contract specifications shall mandate approval of the Soil Management Plan by the Flood Control District as well as full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of hazardous materials.	Flood Control District/ Contractor	Prior to construction; during construction		
4.9 Hydrology and Water Quality					
Impact 4.9-1: Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality.	**Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work** For in-water dewatering during sediment removal activities, the Flood Control District or its contractor(s) shall prepare a Dewatering Plan. The Dewatering Plan shall identify best management practices (BMPs) that ensure sediment removal activities meet water quality objectives. In-stream sediment removal shall follow approved and permitted dewatering practices for wet weather sediment removal during more infrequent flood events in Fairfax Creek. This work shall be timed to take place as flows are receding and only after instream measures to reduce downstream turbidity are in place. In addition, the Flood Control District shall implement the measures below, or whatever more stringent water quality protection measures are imposed by the RWQCB. 1. All work performed in-water shall be completed in a manner that meets the water quality objectives to ensure the protection of beneficial uses as specified in the Basin Plan 2. All dewatering and diversion methods shall be installed such that natural flow is maintained upstream and downstream of the project area. 3. Any temporary dams or diversion shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area. 4. Screened pumps shall be used in accordance with CDFW's fish screening criteria and in accordance with the NMFS Fish Screening Criteria for Anadromous Salmonids and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes 5. Cofferdams shall remain in place and functional throughout the in-stream construction or maintenance periods. 6. Disturbance of protected riparian vegetation shall be limited or avoided entirely.	Flood Control District/ Contractor	Prior to construction (Dewatering Plan); During construction (in-water work)		
Impact 4.9-3. The Project would alter existing drainage patterns, potentially causing new erosion or siltation.	**Mitigation Measure 4.9-3a. Prioritize Nursery Basin Reach for Stream Maintenance** The Stream Maintenance Program waste discharge requirements impose limits on the total volume of material allowed to be removed from all of the streams covered by that permit. In order to retain the design capacity of the Nursery Basin and the associated storage within the Fairfax Creek channel behind the diversion structure, the Flood Control District shall prioritize sediment removal at this site over other sites covered by the Stream Maintenance Program and shall remove all deposited sediment up to the maximum volume allowed under the existing permit (2,100 cubic yards). If deposited sediment still remains after removing the maximum volume, then this site shall be prioritized in subsequent years to remove the remaining sediment and any newly accumulated material, again up to the maximum allowed.	Flood Control District	After construction		
	Mitigation Measure 4.9-3b. Scour Analysis and Protection Measures Upstream of the Downtown San Anselmo Site Due to the dependence of erosion and sedimentation patterns on the bed-scale morphology of the new structures, measures to counter scour and sedimentation issues must be based on more advanced project design. To reduce Project impacts on erosion and sedimentation, the Flood Control District shall conduct a scour analysis for the San Anselmo Creek channel upstream of the Downtown San Anselmo site and then develop and implement appropriate scour countermeasures from the analysis into project design and operations. The analysis shall be based on at least 30 percent design and must evaluate the potential for scour and channel bank erosion including specifying the expected depth and lateral extent both immediately upstream and downstream of the Project site from 634-636 San Anselmo Avenue to Bridge Avenue bridge. The analysis shall recommend foundation designs and scour protection measures that protect structures to depths below potential scour, estimated using standard engineering methods. The Flood Control District shall implement the foundation designs and scour protection measures in final project design. Foundation design and scour protection measures commonly used to protect existing in-channel structures and banks and that could be implemented in this Project include but are not limited to: 1. Adding new rock revetment or extending the depth of existing rock revetments 2. Extending the foundations of vertical retaining walls using sheet pile or concrete	Flood Control District	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.9 Hydrology and Water Quality (cont.)					
Impact 4.9-4: The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite.	**Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas** For areas upstream and downstream of the Winship Bridge (between Barber Avenue and the Sir Francis Drake Bridge): If the Winship Bridge Replacement Project is not completed prior to construction of the Project, the Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. The flood barriers shall be designed based on hydraulic modeling demonstrating that the flood barriers would protect existing habitable structures on any properties upstream of the Sir Francis Drake Bridge from new inundation during the 25-year event. For areas immediately upstream of the Nursery Basin site: The Flood Control District shall develop, fund, and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. For both of those locations: The flood barriers would ensure that existing habitable structures would not be inundated by the 25-year event. Upon confirmation of permission by the property owners, the Flood Control District shall implement this measure, including implementing any measures identified in permits required from the California Department of Fish and Wildlife, Regional Water Quality Control Board, or other regulatory agencies. However, the potentially adversely affected parcels are privately owned, and the Flood Control District cannot necessarily require the installation of flood barriers because the property owner(s) may specifically request that such measures not be implemented. In that case, this Mitigation Measure shall not be implemented and the affected parcels may experience an increased level of flood inundation in a 25-year event or larger.	Flood Control District	Prior to construction		
4.14 Parks and Recreation					
Impact 4.14-2: Construction and operation of the Project could include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment.	**See Mitigation Measures 4.3-1 and 4.9-1, above.**	4.3-1. Flood Control District/ Contractor 4.9-1. Flood Control District/ Contractor	4.3-1. During construction 4.9-1. Prior to construction (Dewatering Plan); During construction (in-water work)		
4.15 Transportation and Circulation					
Impact 4.15-1: Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), and could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.	**Mitigation Measure 4.15-1: Traffic Management Plan** Prior to initiation of construction, the Project contractor(s) shall use a qualified traffic engineer to prepare a TMP. The TMP shall be developed during the design phase on the basis of detailed design plans for the approved Project. The TMP shall be reviewed and approved by the Flood Control District and agencies with jurisdiction over roadways affected by Project construction activities, prior to construction. Once approved, the TMP shall be incorporated into the contract documents specifications. The TMP shall include, but not necessarily be limited to, the elements listed below: 1. Develop truck access routes to minimize impacts on local street circulation. The route selection for movement of heavy equipment and truck traffic shall be coordinated with the Marin County Department of Public Works, Marin County Sheriff's Department, and Police Departments for applicable towns, cities, and unincorporated communities. Truck drivers shall be notified of, and required to use, the most direct route between the Project work sites and U.S. 101. 2. As needed to avoid unacceptably adverse impacts on traffic flow, schedule truck trips outside of peak morning and afternoon/evening traffic hours. 3. Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic on-site inspections. 4. Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the California Manual on Uniform Traffic Control Devices; Part 6: Temporary Traffic Control); flaggers would be used, when warranted, to control vehicle movements. 5. Implement a public information program to notify interested parties of the impending construction activities using means such as print media, radio, and/or web-based messages and information. 6. Comply with roadside safety protocols to reduce the risk of accidents. 7. Maintain access for emergency vehicles at all times. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways. 8. Store all equipment and materials in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction to traffic. 9. Identify locations for parking by construction workers (within the construction work site or at the designated construction staging areas, or, if needed, at a nearby location with transport provided between the parking location and the worksite).	Qualified Traffic Engineer/ Contractor/ Flood Control District; Construction Monitor (environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
	10. Prior to Project construction, document road conditions for all routes that shall be used by Project-related vehicles. Roads damaged by construction shall be repaired to a structural condition equal to that which existed prior to construction activity. 11. Maintaining pedestrian and bicycle access and circulation during Project construction where safe to do so. If construction activities encroach on bicycle routes or multi-use paths, advance warning signs (e.g., “Bicyclists Allowed Use of Full Lane” and/or “Share the Road”) shall be posted that indicate the presence of such users. During construction, an environmental compliance manager shall monitor and complete a construction monitor environmental inspection report checklist to ensure that the contractor implements the TMP measures included in the contract documents. Any noncompliance shall be documented and reported to the Flood Control District to ensure corrective action. A final compliance report shall be prepared post-construction.				
Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles.	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		
Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety.	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		
Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear).	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		