

SIR FRANCIS DRAKE BOULEVARD REHABILITATION PROJECT



October 17, 2008



SIR FRANCIS DRAKE BOULEVARD REHABILITATION

3.0 PROJECT DESCRIPTION

3.1 OVERVIEW

Sir Francis Drake Boulevard (SFDB) is an east-west arterial roadway located in Marin County that commences just west of the Richmond-San Rafael Bridge and ends at the Point Reyes Lighthouse. A section of SFDB located about one mile west of the Town of Lagunitas between Shafter Bridge and Platform Bridge Road contains segments of severely deteriorated pavement that has exceeded its design life. The Marin County Public Works Department in association with the Board of Supervisors and the Transportation Authority of Marin has commenced studies to develop a strategy for the rehabilitation of this 5.2 mile long segment of roadway.

A majority of the roadway exhibits distress including cracking and dislocations of the pavement. Prior maintenance by Public Works has included removal and replacement of damaged sections of roadway and overlays of asphalt concrete. However, these repairs are no longer effective as the pavement's structural section has failed. Without major rehabilitation, the roadway's condition will likely further deteriorate as cracks in the pavement allow water to infiltrate weakening the sub grade and creating additional distress.

SFDB contains critical environmental resources including Lagunitas Creek, vegetative communities of redwood and oak, native plants, and habitats suitable for protected species. Additionally, the roadway bisects both Samuel P. Taylor State Park and the Golden Gate National Recreation Area.

Topographic, geotechnical, and environmental studies of the Project Area have been completed and used as a basis to develop a strategy for rehabilitation of SFDB. Factors that have been considered include environmental resources, physical site constraints, cost, construction feasibility, and roadway design standards. Various alternatives were explored and a proposed rehabilitation strategy was selected that will extend the roadway's design life and enhance safety while preserving environmental resources.

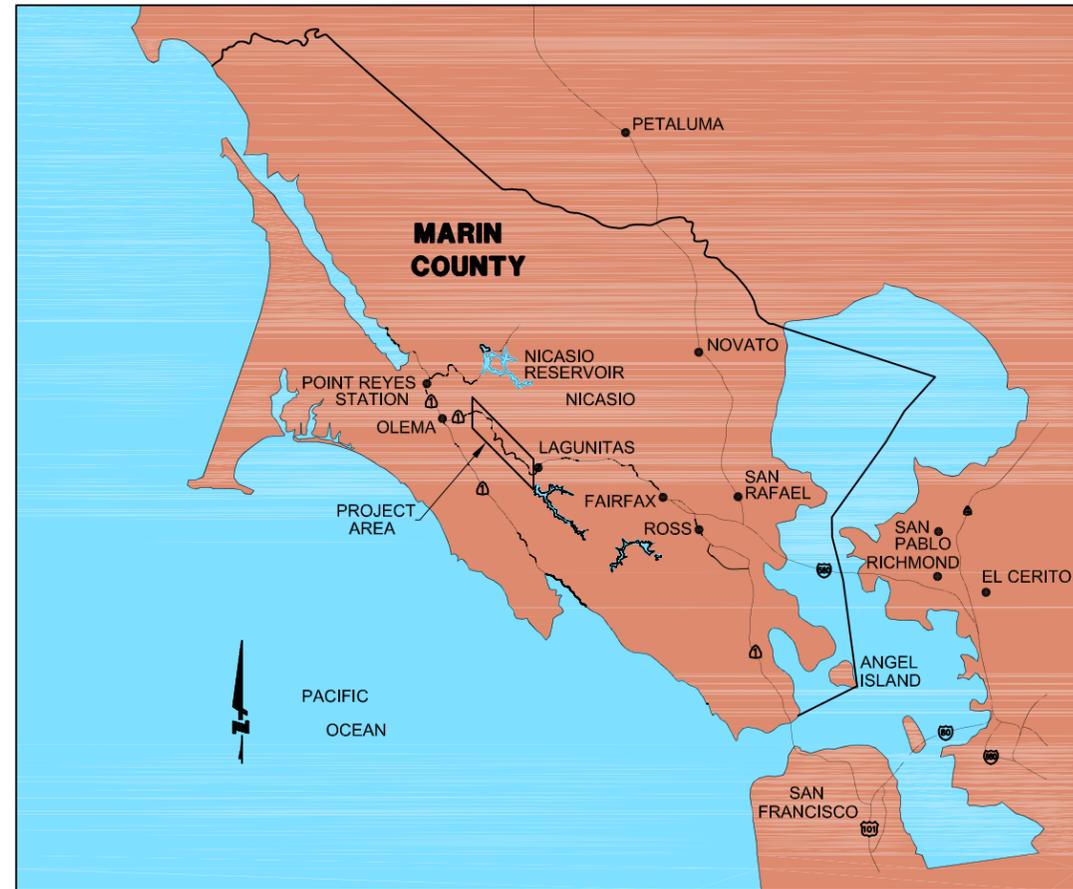
3.2 EXISTING ROADWAY CONDITIONS

The section of SFDB between Platform Bridge Road and Shafter Bridge (Project Area) as shown in **Figure 1** was constructed in the 1929 as a two lane arterial roadway. Along a majority of the Project Area, there is limited recorded right of way. While SFDB bisects both a federal and state park, the County of Marin has historically maintained the roadway.

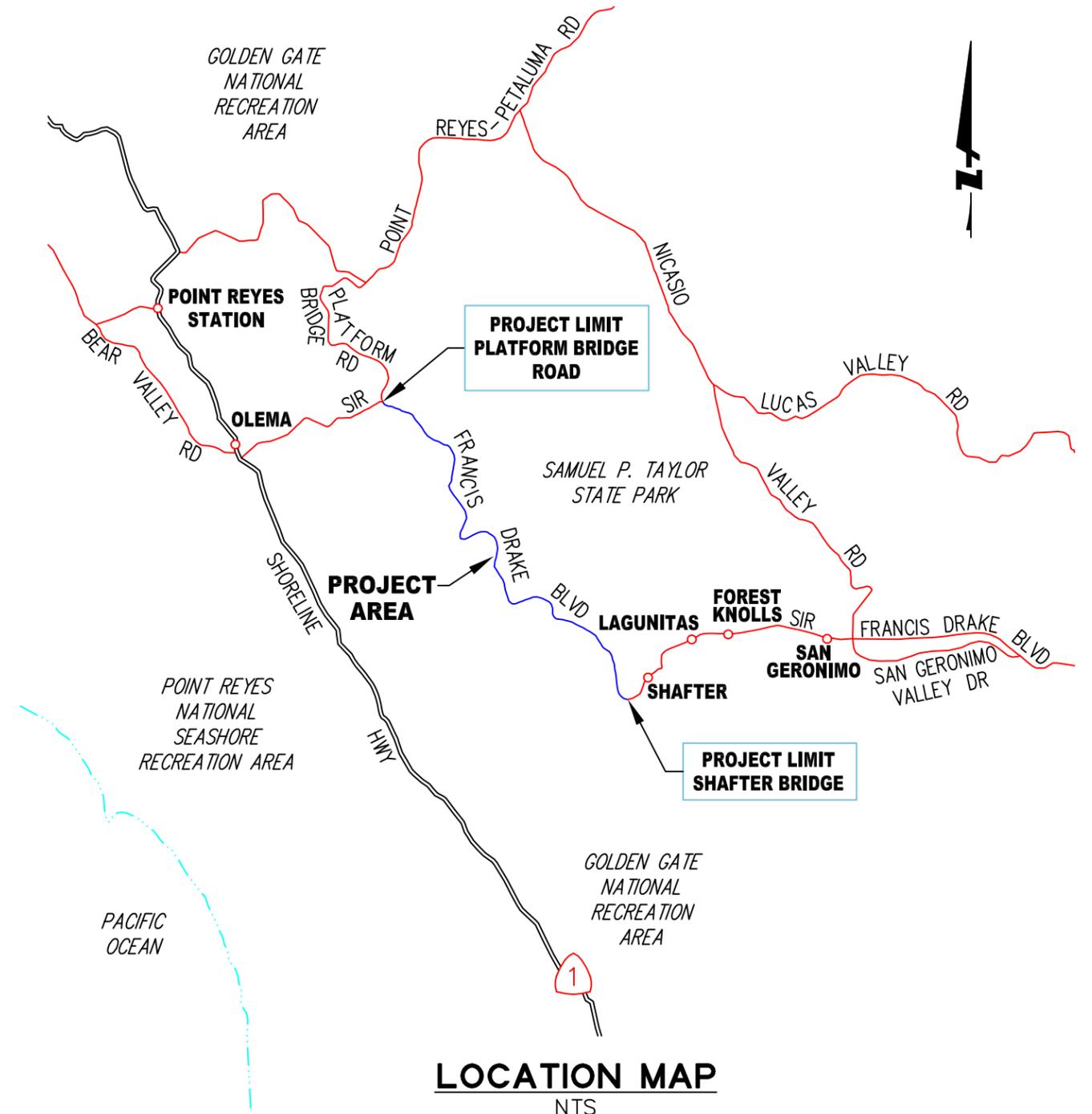
For reference to specific features, a station line as shown in **Figure 2** is provided along the roadway. Each station indicates an interval of 100 feet and commences at Station 5+60 (Platform Bridge Road) and ends at Station 279+50 (Shafter Bridge).

FIGURE 1

PROJECT LOCATION MAP



REGIONAL MAP
NTS

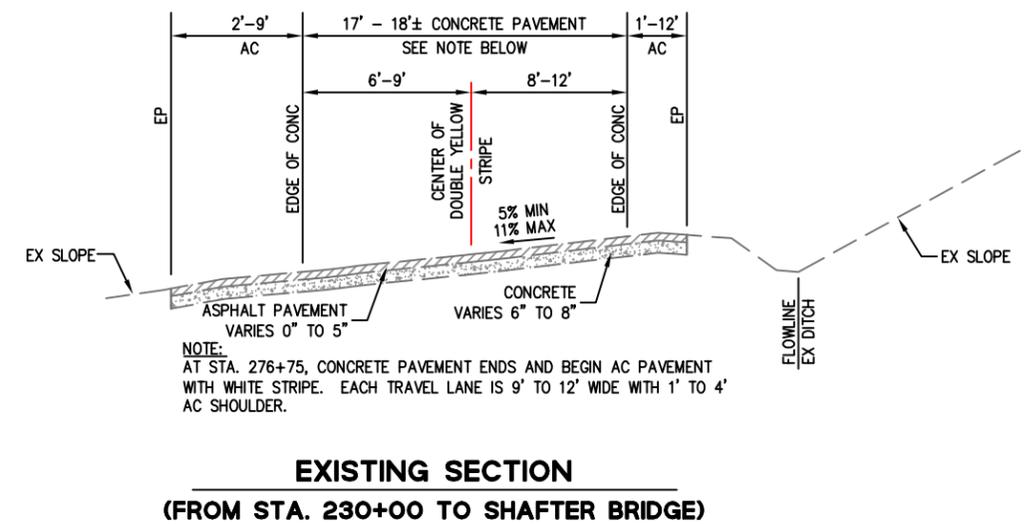
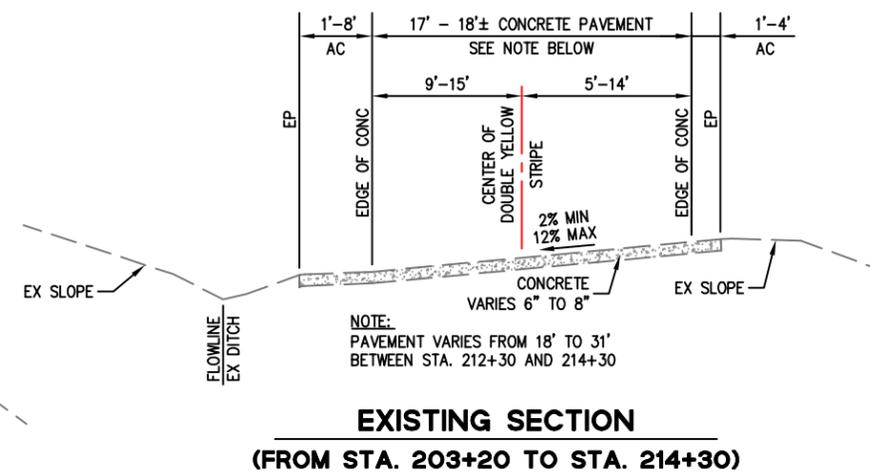
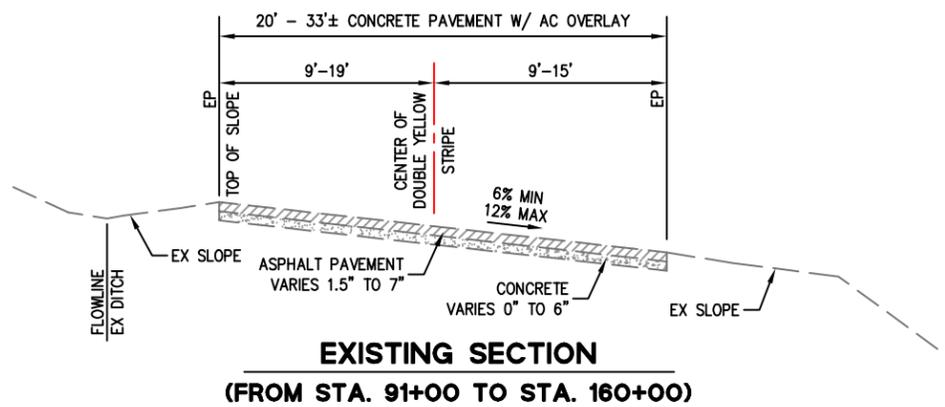
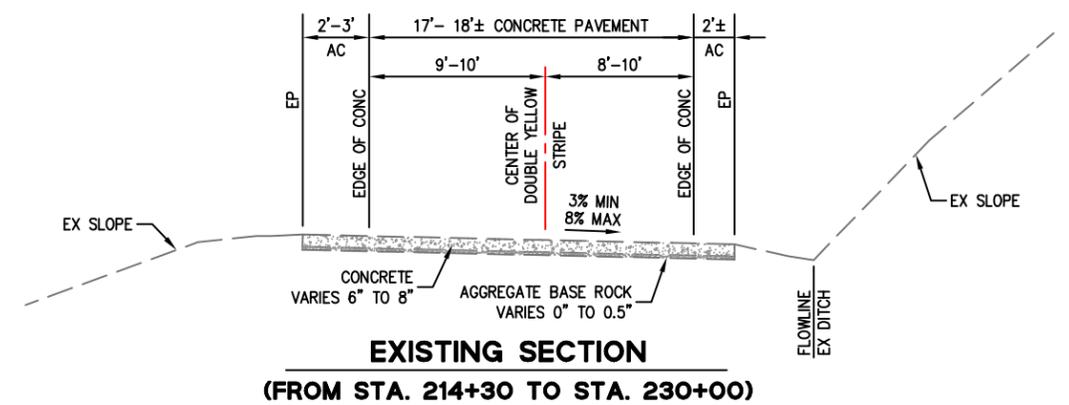
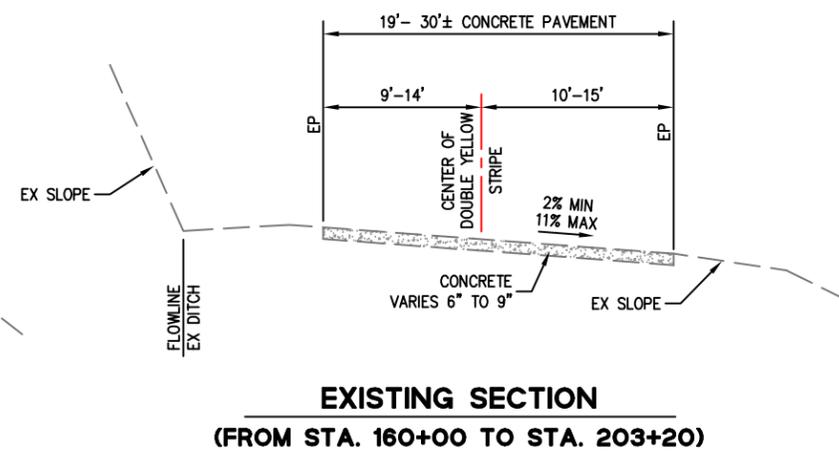
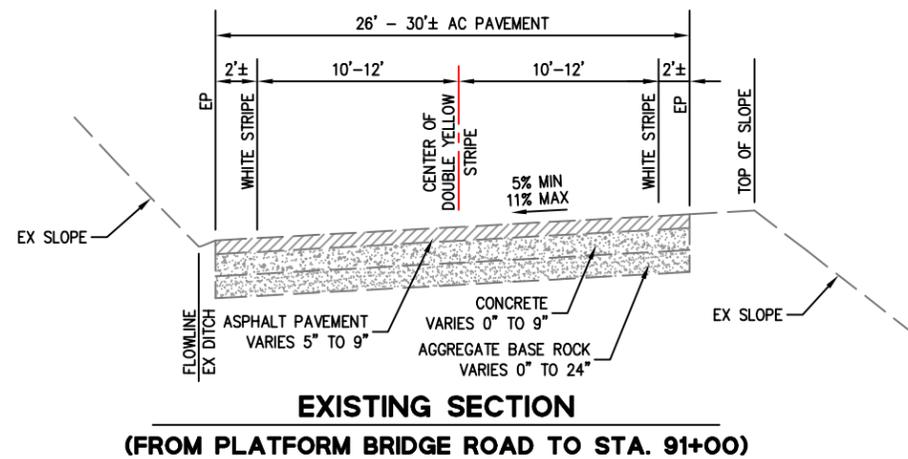
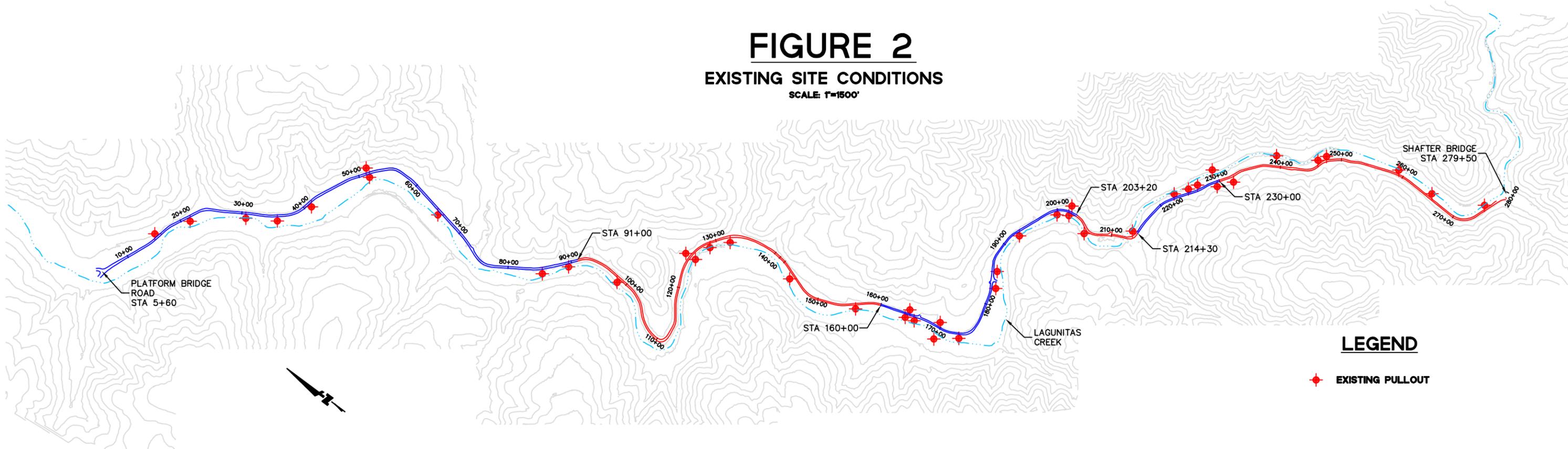


LOCATION MAP
NTS

FIGURE 2

EXISTING SITE CONDITIONS

SCALE: 1"=1500'



ROADWAY ALIGNMENT

The horizontal alignment of SFDB is curvilinear and generally parallel to Lagunitas Creek. In response to the numerous tight radius curves along the roadway, the posted speed limit varies from 15 MPH to 40 MPH. The vertical alignment does not vary significantly with grades ranging from 0.1% to 3.5%. The lowest and highest elevations along the centerline of the roadway in the Project Area are 82 and 209 feet respectively based on the National Geodetic Vertical Datum of 1988. In section, the existing roadway is super elevated and bordered by sloped banks in excess of 45 degrees. The roadway is significantly constrained by trees, vegetation, and topographic features which are often only a few feet from the existing edge of pavement as illustrated in **Figure 3**.



Figure 3: Site Constraints

While the roadway's width is highly variable, it is narrowest at Shafter Bridge and widest at Platform Bridge Road. At Shafter Bridge, the roadway is generally 22 to 30 feet wide with lane width of 11 feet but as small as 9 feet. At Platform Bridge Road, the roadway is 32 feet with a lane width of 12 feet. **Figure 2** illustrates various widths contained in the Project Area.

SFDB does not comply with current design standards as published by the State of California Department of Transportation (CALTRANS) and the American Association of State Highway Officials (AASHTO). Items in variance of the standards include:

- Curve radii that are below minimum values
- Alignments containing reverse horizontal curves
- Alignments containing improper transitions between horizontal curves
- Lane width that is too narrow
- Super elevation transitions zones that are too short
- Improper clear recovery zone
- Sight distance and obstacles

EXISTING ROADWAY DRAINAGE

As SFDB is super elevated, runoff is generally directed to one side of the roadway. When the roadway slopes away from the adjacent hillside, storm water sheet flows from the

edge of pavement to Lagunitas Creek. When the roadway slopes towards the hillside, the water is trapped between the edge of pavement and the toe of slope. The water ponds to the elevation required to convey flow to an existing culvert which eventually discharges under the roadway to Lagunitas Creek. As the profile SFDB is generally flat and ditches are not well defined, storm water inundates a portion of the lane during significant storm events. There are 62 corrugated metal or plastic pipe culverts and two large concrete box culverts that cross SFDB. Locations of these features are shown in **Figure 4**. According to Public Works maintenance staff and site observations, many of the metal culverts have corroded and require replacement.

EXISTING ROADWAY PAVEMENT CONDITION

A geotechnical investigation performed in the Project Area included eleven borings to depths of up to 11.5 feet below existing grade. The thickness of the existing pavement section was measured and soil samples were acquired and visually classified. Laboratory testing was performed on representative soil samples to determine moisture-density, particle size, corrosivity, Atterberg Limits, expansion index, and unconfined compressive strength.

The roadway is primarily constructed of concrete pavement that varies from 6 to 9 inches in thickness. In the narrowest sections, asphalt concrete has been used to widen the concrete pavement providing additional shoulder area. During prior maintenance efforts, asphalt concrete was used to overlay the concrete pavement with thicknesses of as much as 8 inches. Additionally, it appears that sections of the concrete pavement were removed and replaced with traditional asphalt concrete. The asphalt section varies in thickness from 1.5 to 9 inches with underlying aggregate base varying from 0 to 24 inches.

Sub grade soils were generally found to be silty sandy gravel, greenstone, and clayey gravel with sand. No ground water was found at the depth and time of exploration. The primary subsurface geotechnical issues affecting the project include variable sub grade conditions, slope instability, and the potential for liquefaction and related ground deformations during seismic events.

A visual evaluation of pavement condition was performed in a manner similar to the standards developed by the Bay Area Metropolitan Transportation Commission. The existing pavement's condition deteriorates in an easterly direction from Platform Bridge Road. **Figure 5** illustrates examples of pavement distress. In sections of concrete pavement, the primary distress includes longitudinal and transverse cracking as well as a condition known as a shattered slab. A shattered slab occurs when the pavement is broken into four or more sections. A medium severity slab is defined by cracks that are 1/8 inch or less wide while high severity has larger cracks with distortion present. Where asphalt has been used to overlay the concrete, reflective cracking is present. The Project Area has three distinct pavement conditions that include:

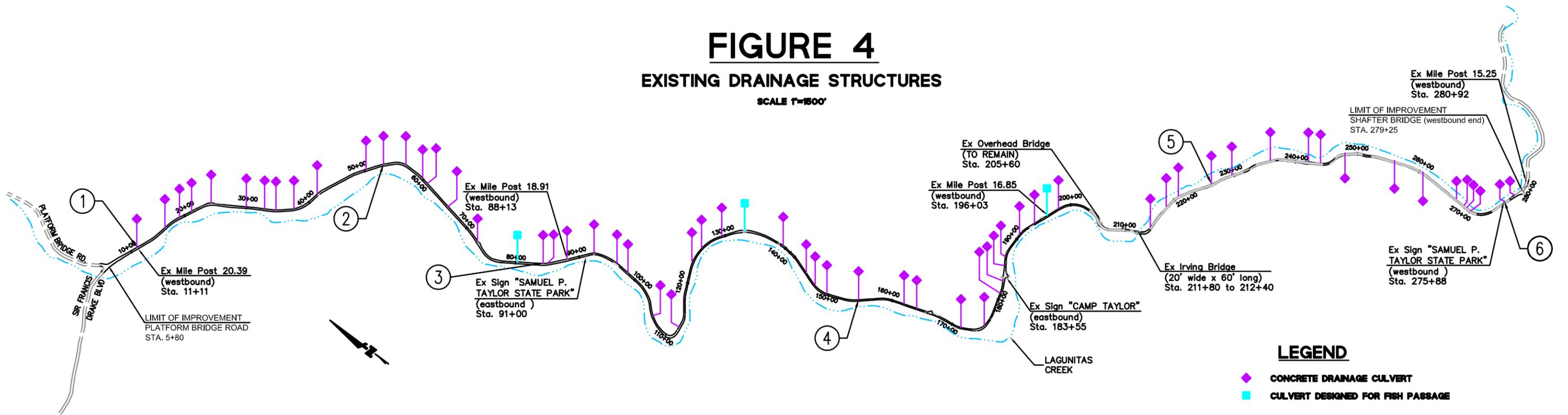
Segment 1: Station 100+00 to Shafter Bridge Road

Segment 1 is primarily composed of concrete pavement with shattered slabs of medium to high severity. The pavement is considered to have failed and has exceeded its design life.

FIGURE 4

EXISTING DRAINAGE STRUCTURES

SCALE 1"=1500'



①



②



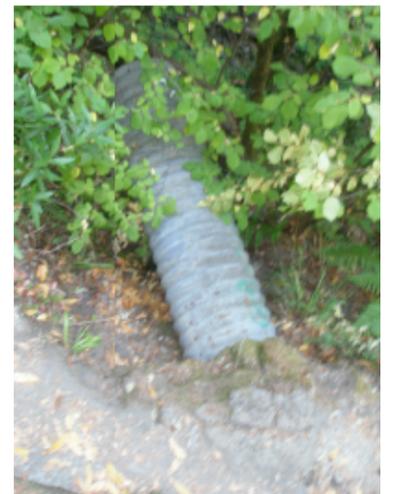
③



④



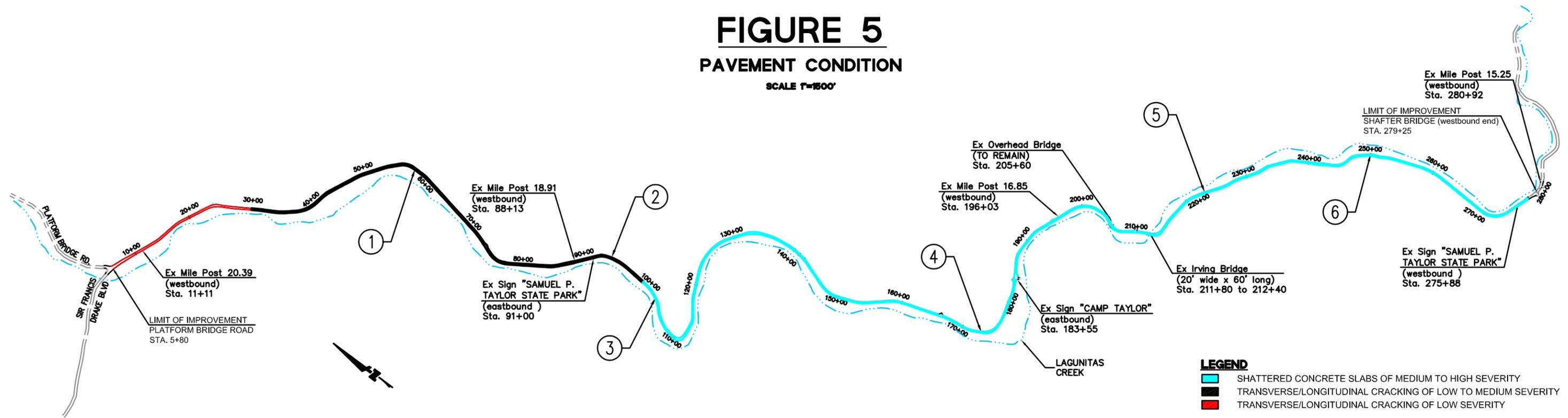
⑤



⑥

FIGURE 5 PAVEMENT CONDITION

SCALE 1"=1500'



① **DISLOCATED SLAB**



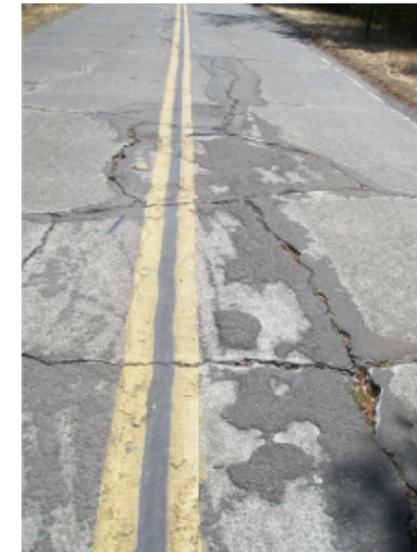
② **SHOULDER ALLIGATOR CRACKING**



③ **SHATTERED CONCRETE SLAB**



④ **SHATTERED CONCRETE SLAB**



⑤ **SHATTERED CONCRETE SLAB**



⑥ **SHATTERED CONCRETE SLAB**

Segment 2: Station 30+00 to Station 100+00

Segment 2 is concrete pavement with a thick layer of asphalt overlay. The primary distress is low to medium severity longitudinal/transverse cracking. This segment has received remedial repairs to extend its design life, but rehabilitation will soon be required to prevent a failed condition.

Segment 3: Platform Bridge Road to Station 30+00

Segment 3 is primarily composed of asphalt pavement over aggregate base. The primary distress is low severity longitudinal/transverse cracking. This segment is currently in relatively good condition.

An additional consequence of the distress along SFDB is an increase in road noise. As indicated in the article entitled, "Vehicle Exterior Noise" written by Paul R Donavan (2007), the noise of a vehicle originates from tire/pavement, engine/powertrain and aerodynamics. The article notes that the noise associated with the tire and pavement interaction is the dominant source for vehicles traveling above 30 MPH. Observations along SFDB indicate that road noise appears to increase in sections with higher levels of distress as the vehicle's tires encounter dislocations in the pavement.

EXISTING TRAFFIC VOLUME

A count of traffic type and volume was completed along SFD from October 18, 2007 to November 3, 2007 at the each end of the project. The total average daily traffic (ADT) is 5,031 and distributed as follows:

Type	ADT	Weekday ADT	Weekend ADT
Cars	2057	1455	3561
Vehicles with 3 or more axle	62	57	76
Bicycles	60	30	136

Table 1: ADT at Shafter Bridge

Type	ADT	Weekday ADT	Weekend ADT
Cars	2697	2177	3996
Vehicles with 3 or more axles	96	102	81
Bicycles	59	32	127

Table 1: ADT at Platform Bridge Road

It is noted that traffic volumes increases considerably on the weekends likely due to the recreational destinations along and beyond the roadway. Bicycle traffic is about 2% of the total traffic volume.

ACCIDENT DATA

A record of traffic collisions from September 2001 to September 2006 provided by Marin County Traffic Engineering Department indicates that there were 20 reported incidents within the Project Area. During this time period, none of the accidents resulted in a fatality. **Figure 6** illustrates the type and location of each accident. The majority of the

accidents are located at the westerly segment of the roadway which could be a result of the higher rates of speed achieved as the alignment is less constrained. Additionally, numerous accidents occurred at the tight radius curve located at station 110+50.

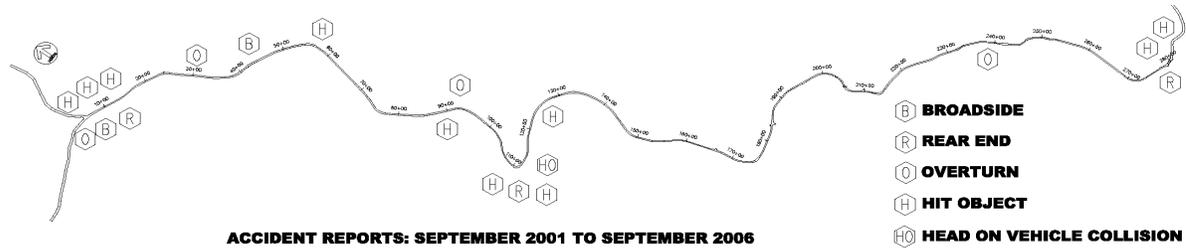


Figure 6: Accident Data

3.3 PROJECT CHARACTERISTICS

The following goals have been established to guide the rehabilitation effort for SFDB:

- The roadway's pavement is to be restored to provide an additional 30 year design life.
- Improvements to the roadway's alignment are to be completed where possible to enhance safety.
- All proposed improvements shall protect environmental resources during and after construction.
- The improvements should enhance pedestrian and bicycle uses of the roadway.

3.4 PAVEMENT REHABILITATION

As described in Section 3.2, there are three distinct regions of pavement distress found in the Project Area. As Segment 1 has effectively failed, the traditional rehabilitation technique would be removal and re-construction of the roadway. However, this option is both expensive and time consuming. Less intrusive methods such as crack and seat (crush roadway material in place as base and place new roadway over crushed base) are available which can prolong the roadway's design life. Another benefit to cracking and seating is that it eliminates the truck trips. As the distress found in Segments 2 and 3 is less severe than Segment 1, milling and asphalt overlay is appropriate.

Rather than use a traditional asphalt concrete, the project proposes to use rubberized asphalt concrete (RAC). RAC is a road material made of recycled tires that has been successfully used in California since the late 1970's. The benefits of RAC include:

- **Cost-Effective:** RAC is more flexible and provides a longer design life than conventional asphalt.
- **Safe:** RAC has excellent traction and visibility characteristics in wet weather conditions.
- **Quiet:** Research by state highway departments indicates that roads paved with RAC reduce vehicle noise.

REHABILITATION BY CRACK AND SEAT

It is proposed to rehabilitate Segment 1 from Station 100+00 to the Shafter Bridge using the crack and seat technique which re-uses the existing concrete pavement as a base course for a new overlay of asphalt concrete. The method commences by milling all existing asphalt overlay from the concrete pavement. Equipment is then used to apply loads to the existing concrete pavement at one to three feet intervals to break it into smaller panels. After the cracking is complete, a roller is used to compress and interlock the panels into the sub grade. An overlay of at least 3 inches of rubberized asphalt concrete will be applied.



FIGURE 7: Crack and Seat Operation

REHABILITATION BY MILL AND RUBBERIZED APHALT CONCRETE OVERLAY

It is proposed to rehabilitate Segments 2 and 3 from Platform Bridge Road to Station 100+00 by milling the existing surface and applying an overlay of a rubberized asphalt. As the distress found in these sections is localized, only full depth repairs at these distressed locations is required. The process begins by milling all asphalt overlay from the concrete pavement. The existing concrete pavement will then be ground to remove areas with vertical displacements. In segments where the existing pavement is asphalt, it will be ground to a depth that leaves a structural section of at least 1.5 inches. All localized failures will be removed and replaced with aggregate base. Once ground, an overlay of at least 3 inches of rubberized asphalt concrete material will be applied.

3.5 DRAINAGE IMPROVEMENTS

All existing culverts that are composed of corrugated metal or plastic located in the Project Area will be removed and replaced. The culvert will generally be placed in the same alignment and grade as the existing condition. For existing culverts that extend ten or more feet beyond the proposed edge of pavement, only the section within the disturbed area will be replaced. New concrete headwalls will be installed at each

culvert's inlet and outlet. In locations where the culvert discharges onto a natural slope, a properly sized dissipation device consisting of adequately sized rip-rap will be provided. In certain locations, level spreaders may be installed to produce natural sheet flow discharges.

To reduce the inundation of the traveled lanes in locations where the roadway slopes to the existing bank, a sub drain will be installed. As shown in **Figure 8**, a layer of pervious material will allow runoff from the roadway to percolate and be collected into a perforated pipe. The pipe will be connected to the nearest culvert. To reduce the discharge rate from the pipe, a weir or orifice structure may be installed.

There are three culverts identified by the County of Marin Flood Control and Watershed Management Department as locations where fish passage improvements should be considered. The improvements to these culverts will be consistent with the department's recommendations to enhance fish habitat.

3.6 ROADWAY PULLOUT

There are numerous unpaved areas along SFDB that are used by vehicles to pullout of the roadway as shown in **Figure 1**. Many of the existing pullouts are too small to safely accommodate a vehicle. Furthermore, some provide inadequate sight distance to vehicles traveling along the roadway creating a hazardous condition. To provide a refuge for slower traveling vehicles, adequately designed paved pullouts will be provided as shown in **Figure 9**. Each pullout will be signed as a no parking zone. Boulders or large rocks will be placed in the locations of existing pullouts to discourage stopping.

To limit sediment discharged from the pullout into the watershed during rainfall, the project proposes to pave these areas with permeable asphalt. Storm water falling on the pullout will percolate through the asphalt, a permeable base, and be collected in a perforated pipe for discharge to the nearest culvert. To reduce the discharge rate from the pipe, a weir or orifice structure may be installed. The parking area at Devil's Gulch will remain in its current condition as an unimproved surface.

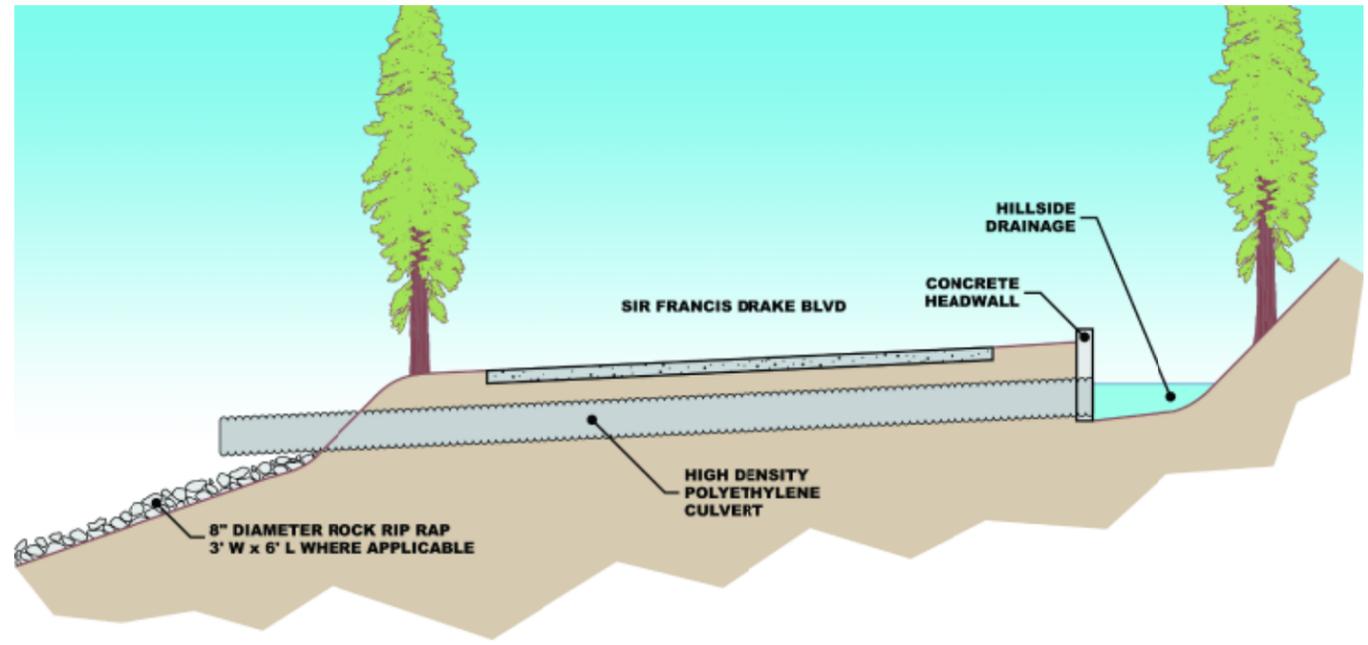
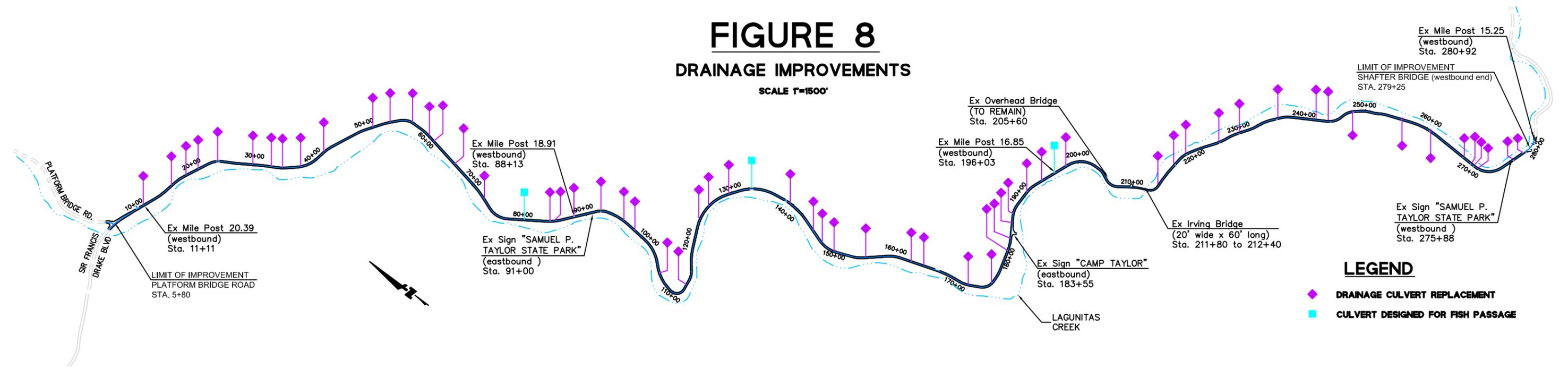
3.7 SLOPE REPAIR

At approximate station 270+25, an unstable slope condition is present along SFDB as illustrated in **Figure 10**. Near the toe of slope, erosion can be found which increases instability as illustrated by the sinking shoulder and pavement cracking. The County of Marin Public Works maintenance staff has placed numerous overlays of asphalt but report that the condition has worsened in the last few years.

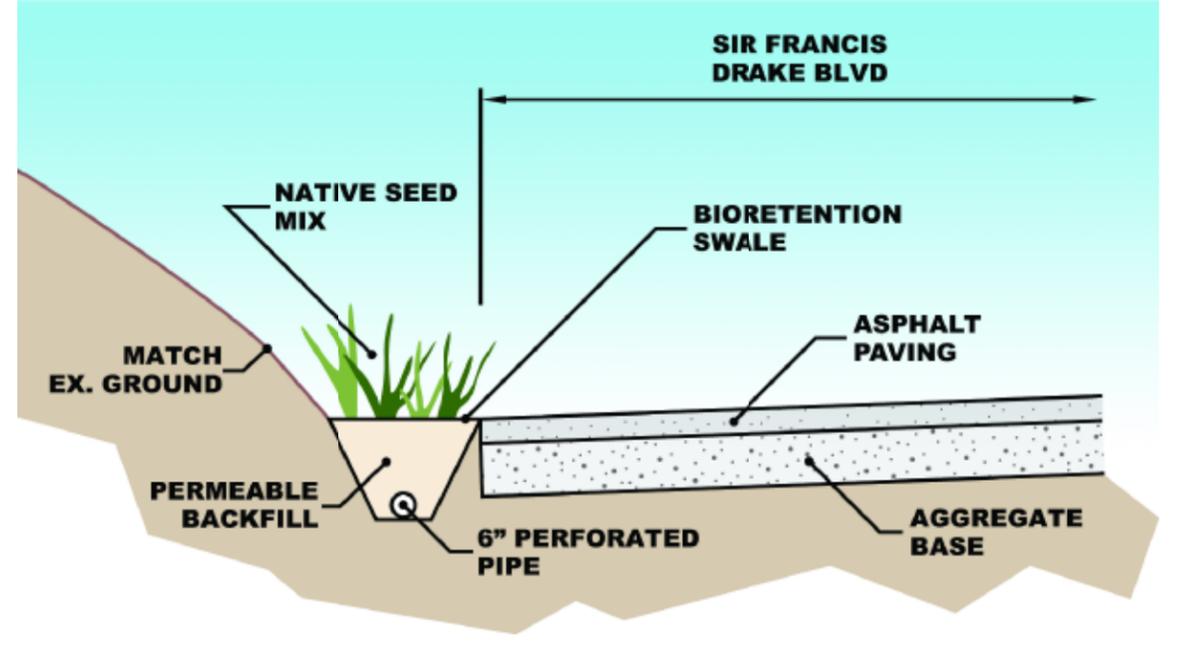
Much of the erosion appears to be occurring from both an existing culvert that discharges onto the slope and during high flow conditions in Lagunitas Creek. To eliminate the culvert erosion, the culvert will be routed to discharge flow at a lower elevation. Furthermore, the slope will need to be re-constructed to ensure stability. All unstable soil will be excavated to a depth where firm materials are found. Material will be backfilled and compacted in benches as shown in **Figure 10**. It is estimated that 2,000 cubic yards of excavation will be required. Rock rip rap will be placed at the toe

FIGURE 8 DRAINAGE IMPROVEMENTS

SCALE 1"=1500'



PROPOSED NEW CULVERT

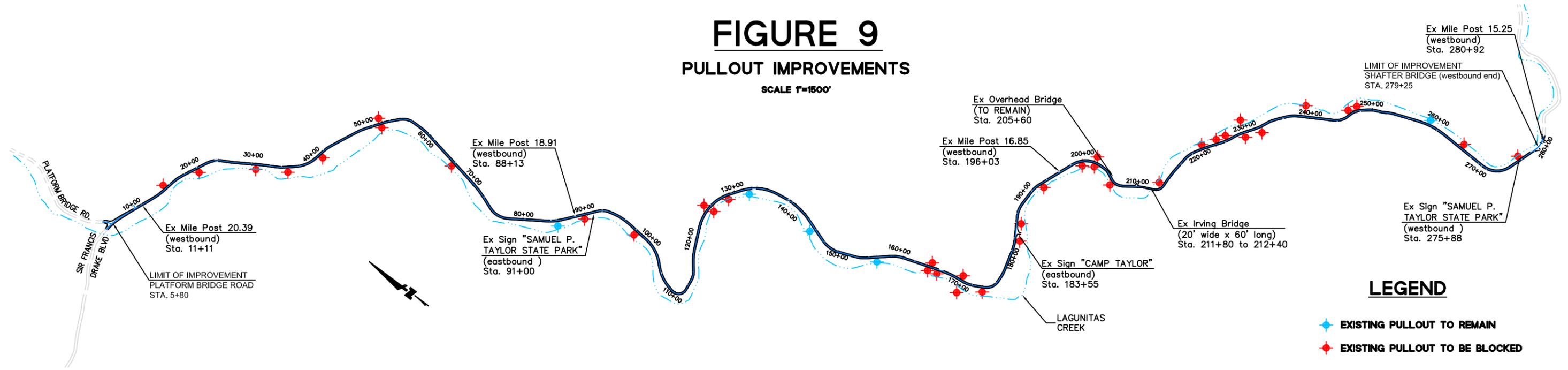


PROPOSED SWALE SECTION

FIGURE 9

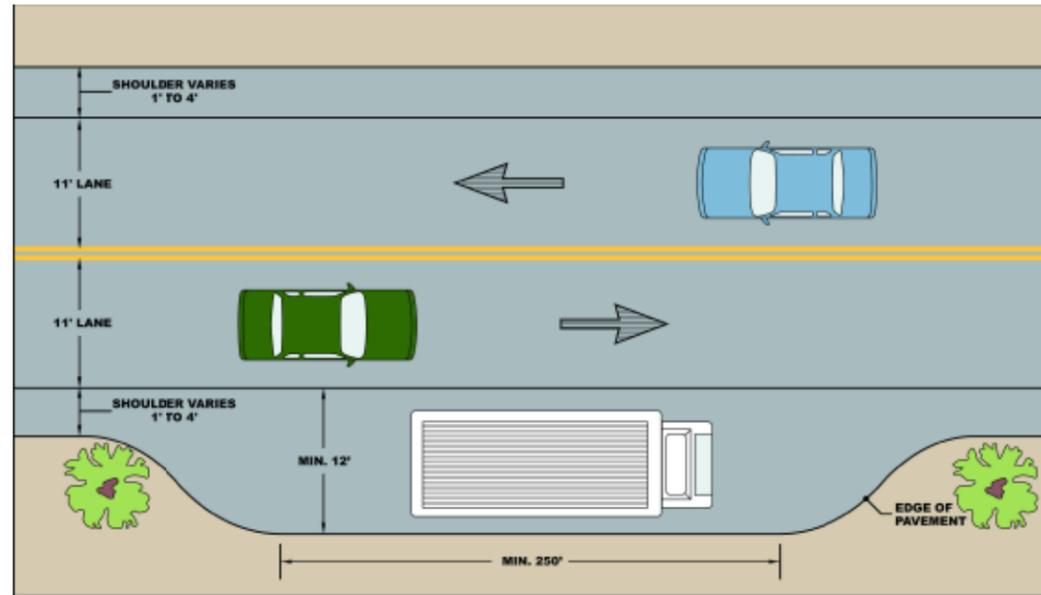
PULLOUT IMPROVEMENTS

SCALE 1"=1500'

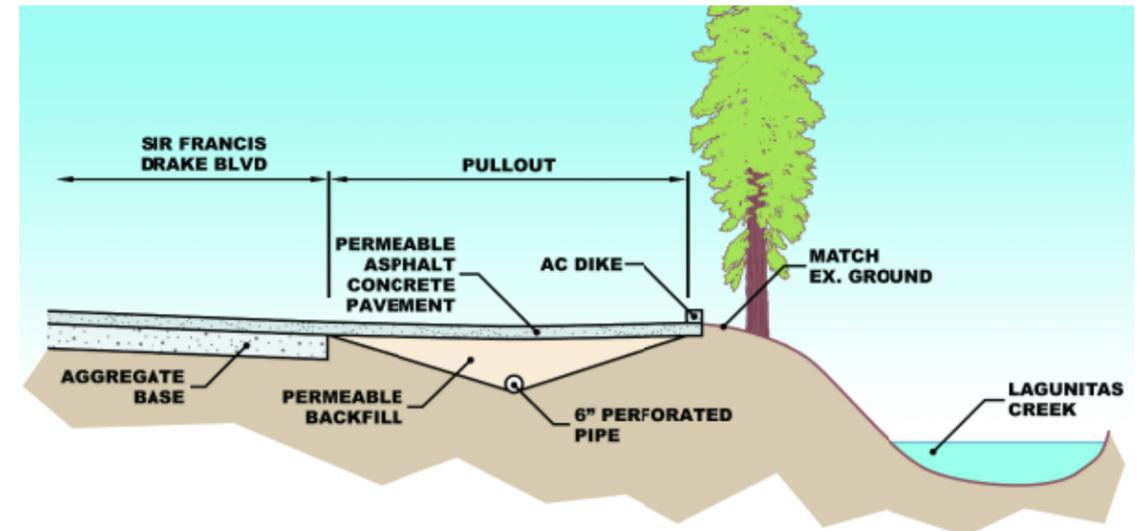


LEGEND

- ◆ EXISTING PULLOUT TO REMAIN
- ◆ EXISTING PULLOUT TO BE BLOCKED



TYPICAL PULLOUT

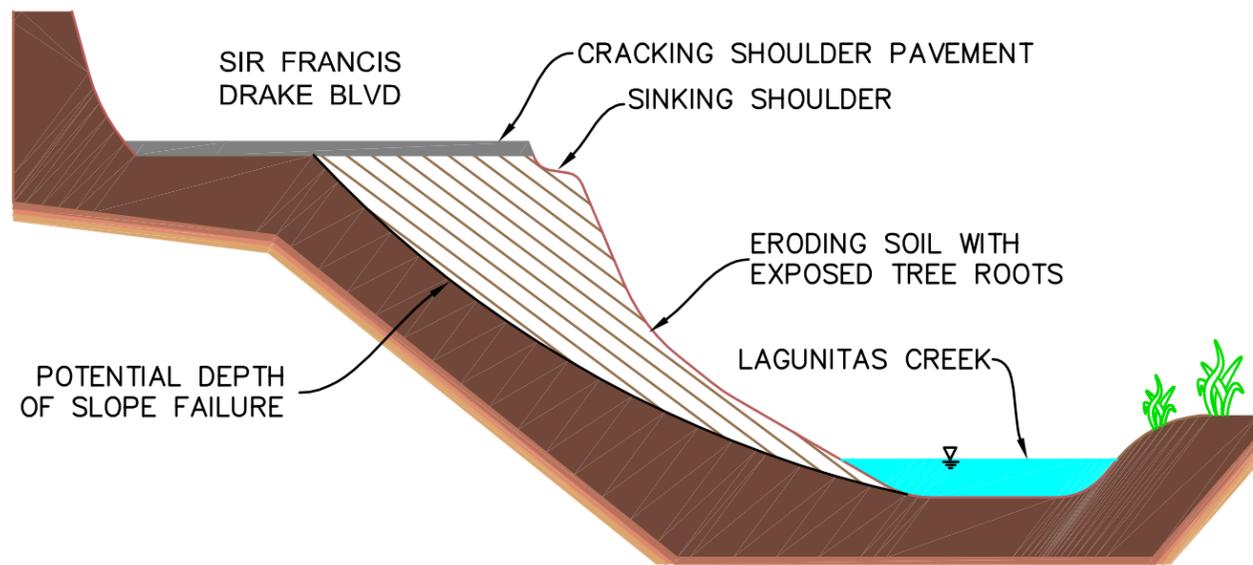
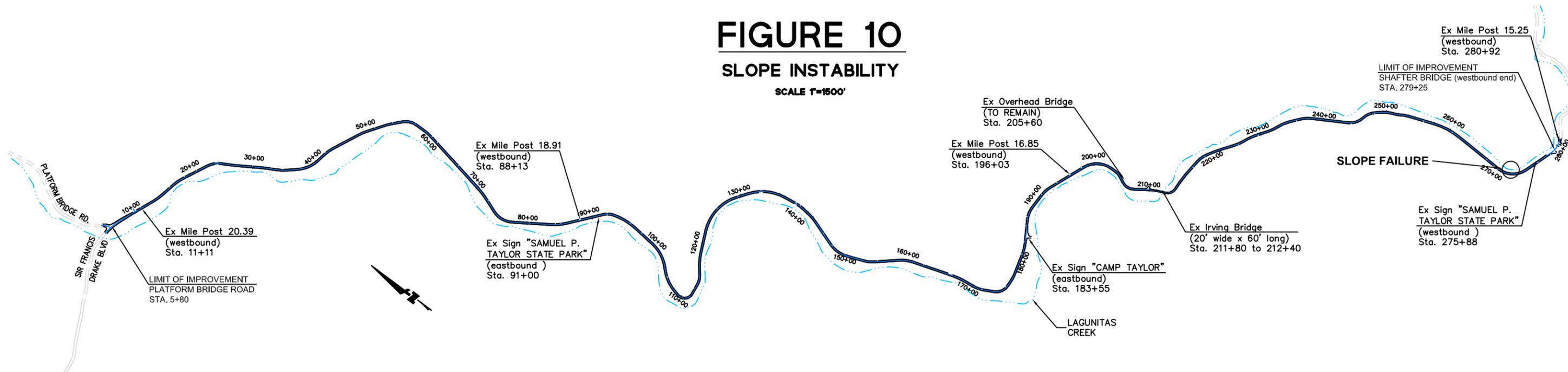


TYPICAL PULLOUT SECTION

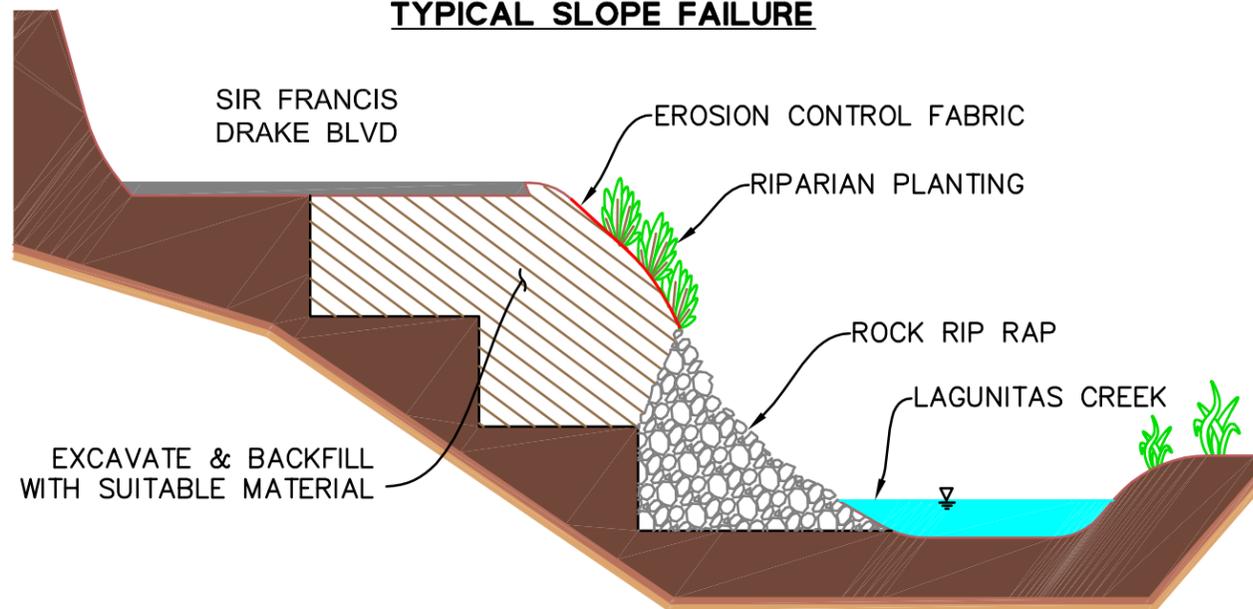
FIGURE 10

SLOPE INSTABILITY

SCALE 1"=1500'



TYPICAL SLOPE FAILURE



SLOPE REHABILITATION



PHOTO 1: SLOPE FAILURE



PHOTO 2: EDGE OF PAVEMENT

EXISTING FAILURE CONDITIONS

while an erosion control fabric and plants installed along the slope to limit the transport of sediment during high creek flows.

3.8 PROPOSED ROADWAY IMPROVEMENTS

In addition to the pavement rehabilitation, drainage improvements, and pullouts, improvements to the roadway's alignment and width are needed. Where possible, modifications to the horizontal alignment will be made to ensure compliance with design guidelines of the State of California Department of Transportation (CALTRANS) and the American Association of State Highway Transportation Officials (AASHTO). The proposed project improvements are shown in **Figure 11** and summarized in the following table.

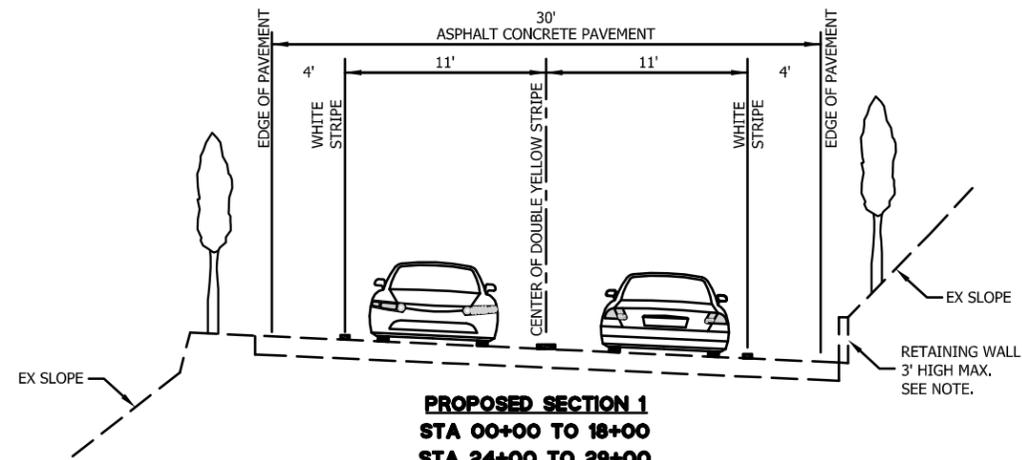
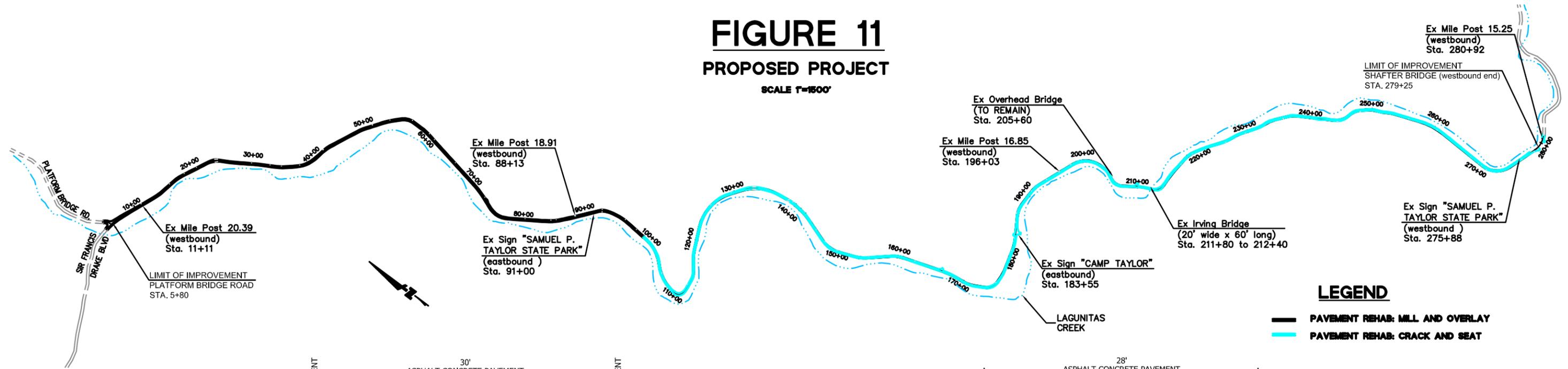
Station Range	Overall Width (Feet)	Lane Width (Feet)	Shoulder Width (Feet)
5+80 to 18+00	30	11	4
18+00 to 24+00	28	11	3
24+00 to 29+00	30	11	4
29+00 to 41+00	28	11	3
41+00 to 50+00	30	11	4
50+00 to 56+00	28	11	3
56+00 to 68+00	30	11	4
68+00 to 98+00	28	11	3
98+00 to 135+00	30	11	4
135+00 to 140+00	26	11	2
140+00 to 157+00	30	11	4
157+00 to 166+00	28	11	3
166+00 to 175+00	26	11	2
175+00 to 179+00	28	11	3
179+00 to 184+00	26	11	2
184+00 to 187+00	24	11	1
187+00 to 193+00	28	11	3
193+00 to 199+00	26	11	2
199+00 to 213+00	24	11	1
213+00 to 262+00	26	11	2
262+00 to 280+00	24	11	1

Table 2: Roadway Dimensions

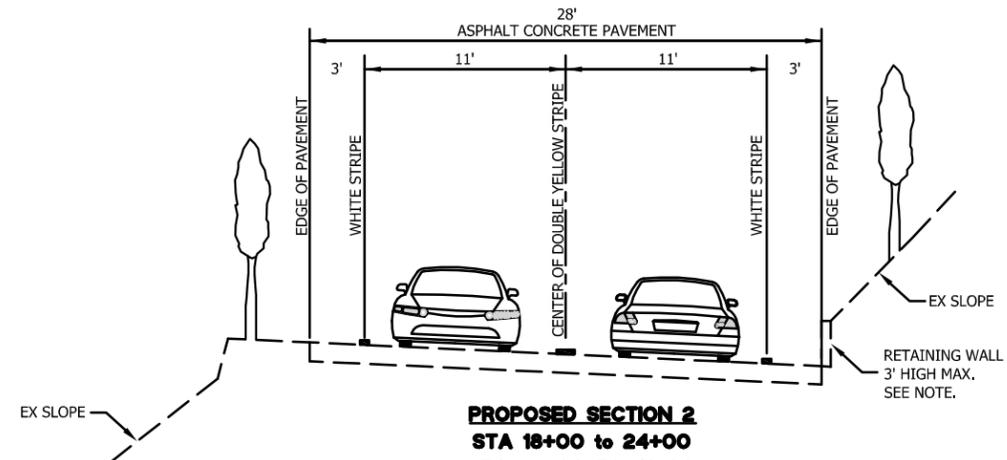
This design maintains much of the construction within the existing roadway limits and does not require tree removal or major excavations. To provide for additional shoulder width and to minimize the expansion of the roadway's grading limit, small retaining walls of no more than 3 feet may be provided. The retaining walls could be constructed from concrete or timber lagging.

FIGURE 11 PROPOSED PROJECT

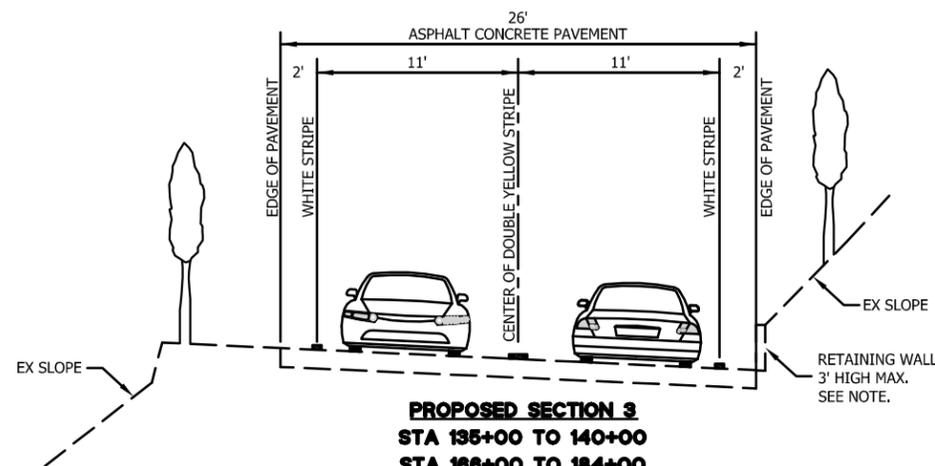
SCALE 1"=1500'



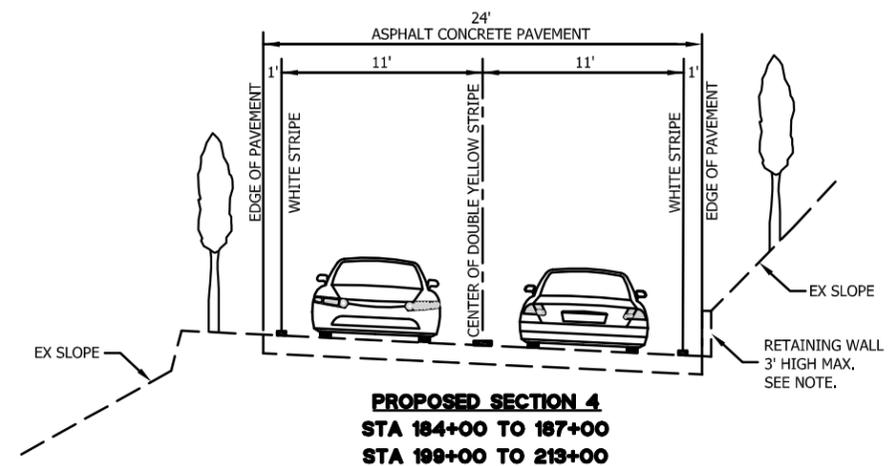
PROPOSED SECTION 1
 STA 00+00 TO 19+00
 STA 24+00 TO 29+00
 STA 41+00 TO 50+00
 STA 56+00 TO 68+00
 STA 98+00 TO 135+00
 STA 140+00 TO 157+00



PROPOSED SECTION 2
 STA 18+00 TO 24+00
 STA 29+00 TO 41+00
 STA 50+00 TO 56+00
 STA 68+00 TO 98+00
 STA 157+00 TO 166+00
 STA 187+00 TO 193+00



PROPOSED SECTION 3
 STA 135+00 TO 140+00
 STA 166+00 TO 184+00
 STA 193+00 TO 199+00
 STA 213+00 TO 262+00



PROPOSED SECTION 4
 STA 184+00 TO 187+00
 STA 199+00 TO 213+00
 STA 262+00 TO 280+00

NOTE:
 KICKER WALL TO BE INSTALLED AS NEEDED TO MAINTAIN PROPOSED ROADWAY WIDTH.

PROPOSED ROADWAY IMPROVEMENTS – OPTION A

To provide additional shoulder area, a more uniform width, and increased sight distance, existing trees located adjacent to the roadway could be removed. If the twenty four trees detailed in **Table 4** were removed, a shoulder width of at least 2 feet could be provided. **Figure 12** illustrates the improvements and is summarized as follows:

Station Range	Overall Width (Feet)	Lane Width (Feet)	Shoulder Width (Feet)
5+80 to 175+00	30	11	4
175+00 to 179+00	28	11	3
179+00 to 195+00	30	11	4
195+00 to 199+00	26	11	2
199+00 to 206+00	30	11	4
206+00 to 213+00	28	11	3
213+00 to 262+00	30	11	4
262+00 to 269+00	28	11	3
269+00 to 272+00	30	11	4
272+00 to 274+00	26	11	2
274+00 to 280+00	30	11	4

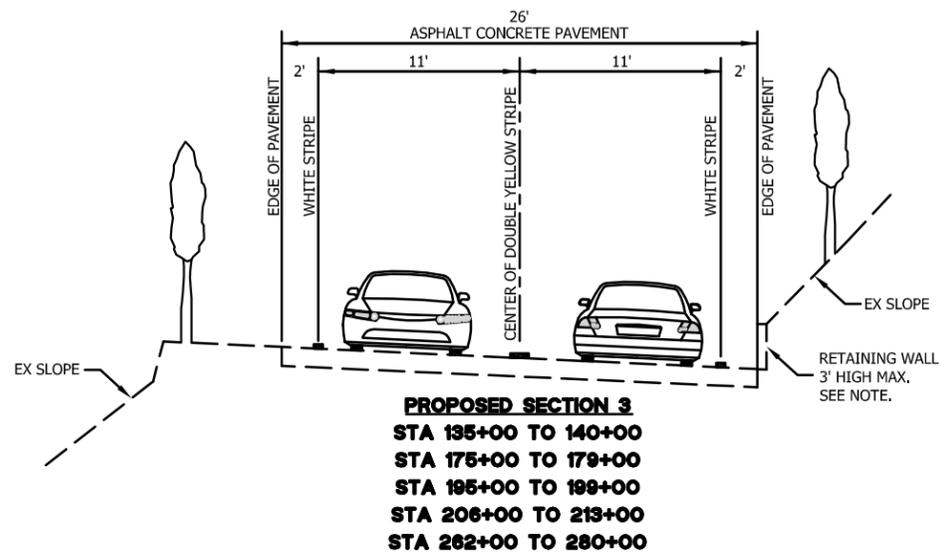
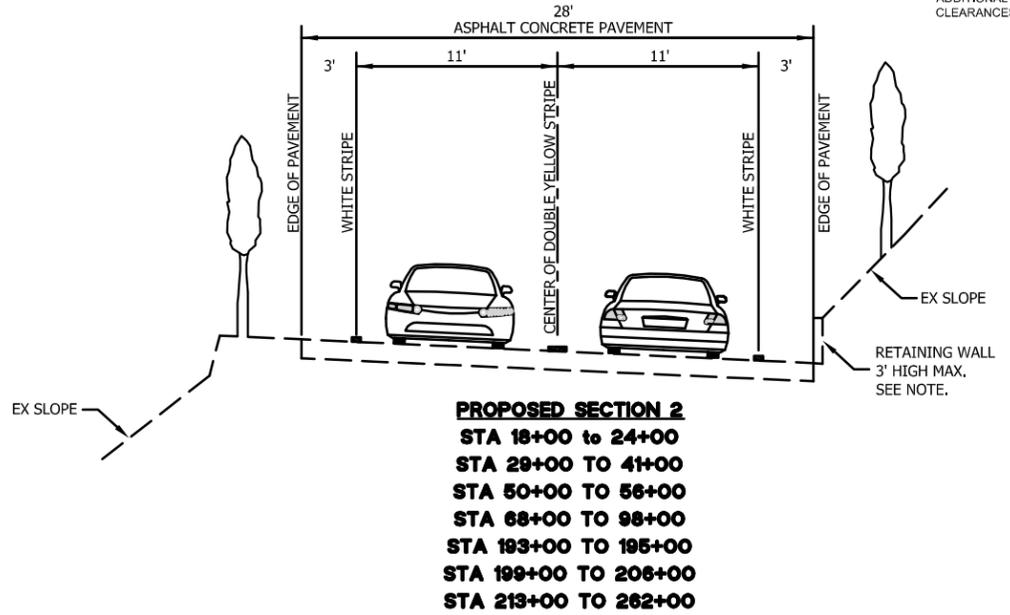
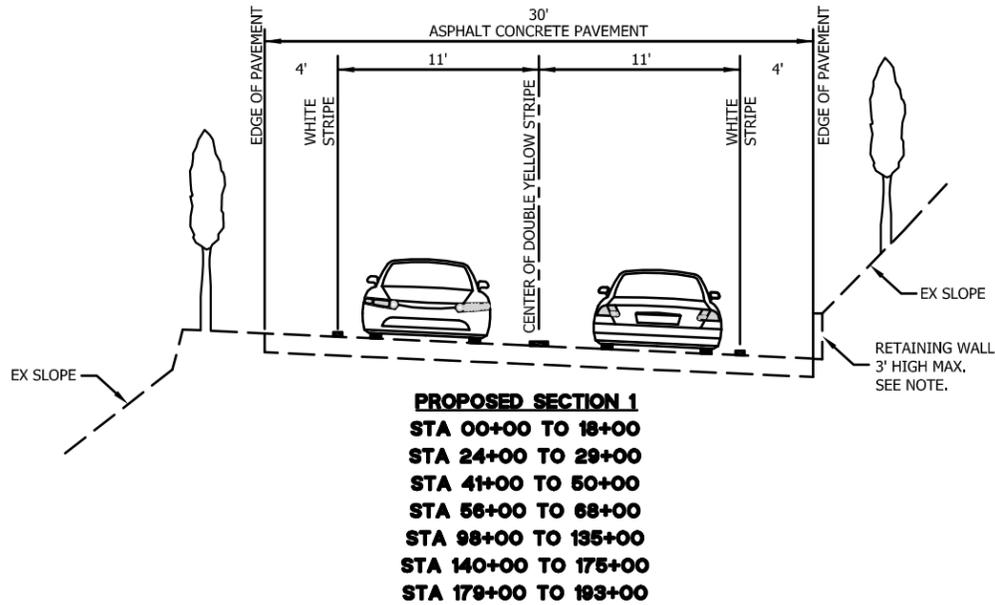
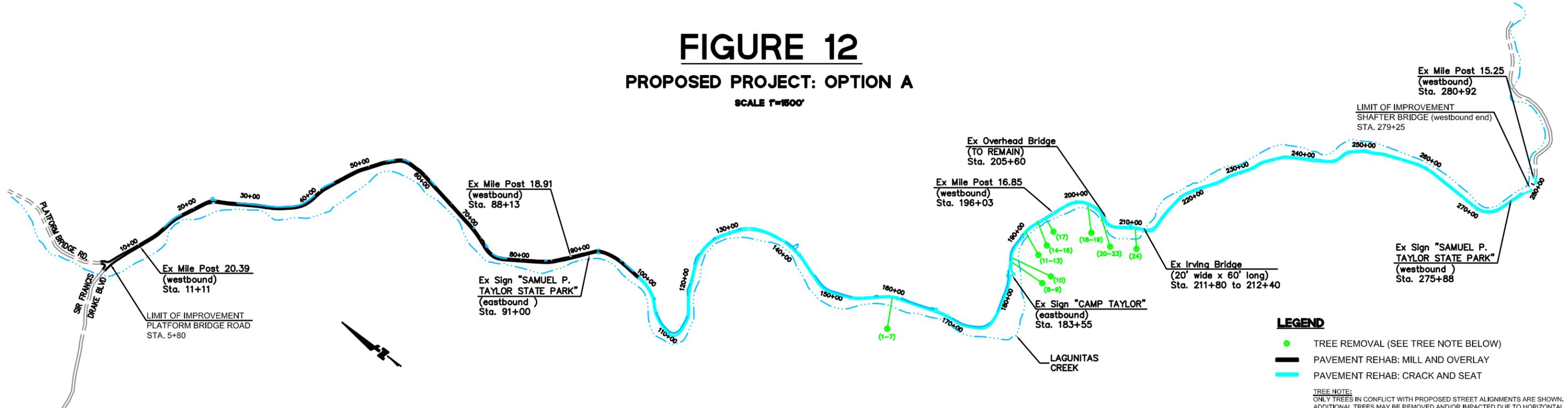
Table 3: Roadway Option A Dimensions

To achieve the uniform shoulder width, additional small retaining walls would be required. Additional shoulder width cannot be achieved in other locations along SFDB due to critical topographic constraints. Any further increase in roadway width would create the need to fill portions of Lagunitas Creek and to cut into the existing slopes. As the slopes are very steep, the volume of earthwork would be extensive. Furthermore, this would create the need to remove more existing trees as they would be in conflict with the grading limits.

FIGURE 12

PROPOSED PROJECT: OPTION A

SCALE 1"=1500'



NOTE:
KICKER WALL TO BE INSTALLED AS NEEDED TO MAINTAIN PROPOSED ROADWAY WIDTH.

Number	Station	Side of Road	Tree Tag Number	Type	Diameter
1	159+15	Right	1119	Redwood	6"
2	159+15	Right	1120	Redwood	12"
3	159+15	Right	1121	Redwood	14"
4	159+15	Right	1121	Redwood	40"
5	159+15	Right	1121	Redwood	9"
6	159+15	Right	1121	Redwood	8"
7	159+15	Right	1121	Redwood	19"
8	185+70	Left	1197	Redwood	15"
9	185+70	Left	1197	Redwood	30"
10	186+10	Right	1228	Redwood	55"
11	190+40	Left	444	Oak	24"
12	190+80	Left	442	Redwood	36"
13	191+00	Left	441	Redwood	36"
14	193+00	Left	422	Redwood	36"
15	193+10	Left	425	Redwood	36"
16	193+35	Left	420	Redwood	36"
17	194+40	Left	1257	Redwood	40"
18	201+60	Right	1283	Redwood	50"
19	202+30	Right	1306	Redwood	34"
20	204+10	Right	1312	Redwood	45"
21	204+10	Right	1313	Redwood	55"
22	204+10	Right	1314	Redwood	30"
23	204+10	Right	1315	Redwood	50"
24	210+50	Right	366	Redwood	78"

Table 4: Tree Removal

3.09. PROJECT CONSTRUCTION

The rehabilitation of SFDB will be performed by a general engineering contractor licensed by the State of California. The selection of a contractor will be completed through a public bid process managed by the County of Marin Public Works Department and will be based on experience and cost. Given the complexity of the project, the contract documents will contain detailed information regarding material requirements, environmental resource protection, and construction phasing.

ENVIRONMENTAL RESOURCE PROTECTION

Protection of environmental resources during construction will be the contractor's responsibility. The following items have been identified as key issues:

Erosion and Sediment Control

The contractor will be required to stockpile all building materials in a single location far from creeks or tributaries. All stockpiles will be covered to prevent erosion and erosion control devices shall be installed to prevent the transport of sediment. During excavation, water will be applied to reduce dust. All pavement located in the work zone

shall be regularly swept. During saw cutting, all debris shall be vacuumed immediately. At the completion of construction, all disturbed areas will be hydro seeded with a native seed mix.

Noise

All construction equipment will be required to have industry standard muffling devices. Furthermore, work creating excessive noise will be coordinated to limit impact.

Equipment Refueling and Maintenance

All construction equipment will be regularly inspected for leaks. In addition, all refueling and maintenance will be conducted at one location where spill protection can be provided.

Tree Protection

When working adjacent to existing trees, excavation will be completed by hand methods. An arborist will be present to inspect this work in order to minimize the risk of injury to the trees.

CONSTRUCTION PHASING

To facilitate the construction of SFDB, one lane of traffic must be closed during some working hours. As there is no practical detour around the work zone, one-way traffic, controlled by flagging personnel, would be allowed to pass. Access to driveways in the work zone would be provided during construction. However, access may be restricted during paving operations for as much as four hours. The staging necessary to complete the project may include the following:

Stage 1: Saw cut along centerline of the roadway to separate concrete slab from the west and east bound lanes.

Stage 2: Crews grind asphalt from the existing concrete slab.

Stage 3: Crews remove and replace culverts along the roadway. Temporary asphalt paving is placed. Localized pavement failures are removed and replaced.

Stage 4: Crews begin working in a westerly direction from Shafter Bridge with the pavement cracking, compacting, or grinding operation. A single lift of asphalt concrete pavement is placed prior to the end of each work day to allow for two way traffic. During the workday, the east bound lane is used for controlled two way traffic.

Stage 5: Crews begin working in an easterly direction from Platform Bridge Road with the pavement cracking, compacting, or grinding operation. A single lift of asphalt concrete pavement is placed prior to end of each work day to allow for two way traffic. During the workday, the west bound lane is used for controlled two way traffic.

Stage 6: The final asphalt lift is applied by crews working in a westerly direction from Shafter Bridge. During the workday, the east bound lane is used for controlled two way traffic

Stage 7: The final asphalt lift is applied by crews working in an easterly direction from Platform Bridge Road. During the workday, the west bound lane is used for controlled two way traffic

Stage 8: Final signing and striping is applied to the roadway.

It is expected that the project would require construction duration of approximately 200 working days or 6 months. Construction would need to commence during dry weather as the early stages require excavation into native soils. Native soils exposed to rain can make construction extremely difficult. Construction would need to be complete prior to cold temperatures as asphalt concrete cannot be placed in atmospheric temperatures below 50 degrees Fahrenheit. Thus, it would be preferred to start construction in May and complete by October.