

5.11 FLOODPLAINS

Floodplains are included in the Supplement to the Final Environmental Impact Statement (SEIS) as an assessment category identified in Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*. As discussed in Section 4.5 and shown on **Exhibit 5.11-1, Floodplains**, all of DVO is located in the 100-year floodplain. This section provides an overview of the floodplain conditions and discusses the potential impacts caused by the No Action Alternative and Alternatives B, D, and E of the SEIS.

5.11.1 SIGNIFICANCE CRITERIA

Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and U.S. Department of Transportation (DOT) Order 5650.2, *Floodplain Management and Protection* consider the actions that would adversely affect resources that may occur in a floodplain as described below to be those that would cause notable adverse impacts on natural and beneficial floodplain values and be considered significant impacts, including adverse impacts to:

- Natural moderation of floods;
- Water quality maintenance;
- Groundwater recharge;
- Fish, wildlife, and plant habitat;
- Open space;
- Natural beauty;
- Scientific study;
- Outdoor recreation;
- Agriculture;
- Aquaculture; and
- Forestry.

Additional floodplain analysis requirements are described below.

5.11.1.1 Floodplain Regulatory Requirements

Floodplains are defined by Executive Order (EO) 11988, *Floodplain Management*, as “the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year” (i.e., area inundated by a 100-year flood). U.S. Department of Transportation (DOT) Order 5650.2, *Floodplain Management and Protection*, defines the values served by floodplains to include “natural moderation of floods, water quality maintenance, groundwater recharge, fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, and forestry”.

EO 11988 directs Federal agencies to take actions to reduce the risk of flood loss, minimize flood impacts on human safety, health and welfare, and restore and preserve floodplain natural and beneficial values. To do this, the Order bans approving activities in a floodplain unless:

- (1) No practicable alternative exists; and
- (2) Measures to minimize adverse impacts to the floodplain's natural and beneficial values are included.

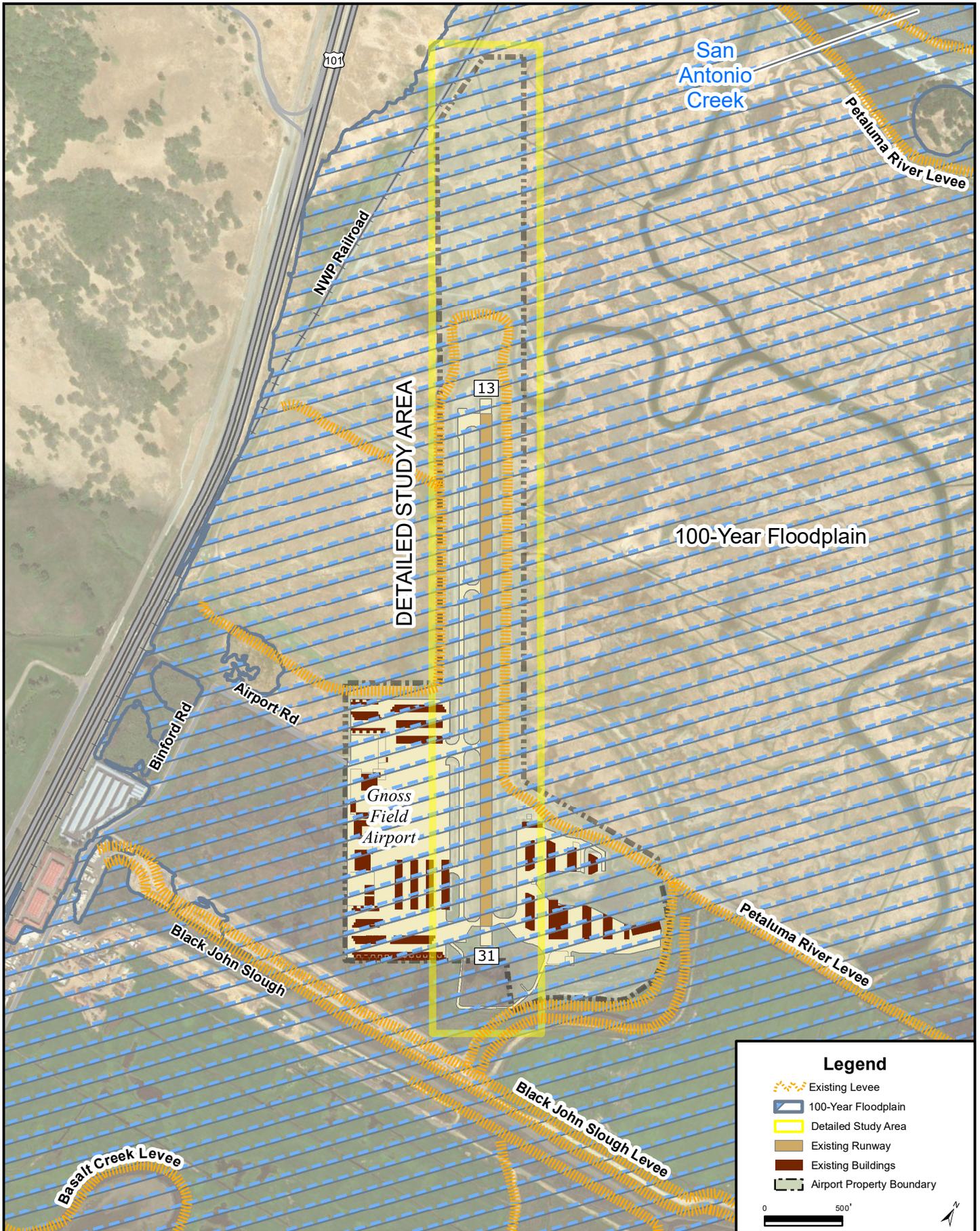
DOT Order 5650.2 contains policies and procedures for carrying out EO 11988. Based on DOT Order 5650.2, if an action includes development within a floodplain, the analysis shall indicate if the encroachment would be a "significant encroachment," that is, whether it would cause one or more of the following impacts:

- (1) The action would have a considerable probability of loss of human life;
- (2) The action would likely have substantial encroachment-associated costs or extent, including interrupting aircraft service or loss of a vital transportation facility (e.g., flooding of a runway or taxiway; important navigational aid out of service due to flooding, etc.); or
- (3) The action would cause notable adverse impacts on natural and beneficial floodplain values.

FAA Order 1050.1F stresses that impacts to floodplains due to development are to be avoided and minimized by all means practicable. The Order also outlines the options to be considered if encroachment into a floodplain cannot be avoided. These options include: consideration of proposed action and alternatives, mitigation measures (such as elevations, special designs, and minimal fill requirements), determination of a significant encroachment, and the determination of location in a special flood hazard area.

The Marin Countywide Plan (MCP) provides guidance and recommendations regarding development within floodplains in order to protect people and property from risks associated with flooding and inundation within the County, notably: Policy EH 3.2, Retain Natural Conditions: Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.¹ Additional detail is available in the MCP including specific goals and implementing programs.

¹ *Marin Countywide Plan, 2.6, Environmental Hazards*. Adopted by the Marin County Board of Supervisors, November 6, 2007.



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5.11.2 FLOODPLAIN CONDITIONS

A Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA), dated March 16, 2016,² was used to establish the boundary of the 100-year floodplain within the Detailed Study Area (DSA). The FIRM shows that the entire DSA lies within the FEMA designated "100-year Floodplain," also known as "Area of Special Flood Hazard Zone AE," which describes areas with a one percent or greater chance of flooding,³ as shown in Exhibit 4-11, *Floodplains*, in Chapter Four, *Affected Environment*.

Presently, FEMA is not authorized to consider future potential rises in sea level in its preparation of FIRMs. However, in 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act, which included a provision establishing a Technical Mapping Advisory Council (TMAC). The TMAC is charged with reviewing national flood mapping activities, developing recommendations that "incorporate the best available climate science to assess flood risks," and producing a report on the "impacts of climate sciences and future conditions and how they may be incorporated into the mapping program."⁴ Implementation of this law and its provision regarding the objectives of the TMAC could potentially allow FEMA to incorporate predictions of future sea level rise into its flooding risk assessments.

Other agencies are already authorized to consider sea level rise during project planning. Within the past six years, the US Army Corps of Engineers (USACOE) has issued two directives regarding consideration of predicted levels of sea level rise in the analysis and design of all of its Civil Works projects, which include flood control projects.⁵ In addition, numerous Federal, State of California, and regional organizations are currently studying the potential effects of sea level rise and its implications for land use, flood control, and other public infrastructure and habitat conservation. These include the National Academy of Sciences/National Research Council (NRC), the National Oceanic and Atmospheric Administration (NOAA), FEMA, the US Geological Survey (USGS), USACOE, the US Fish and Wildlife Service (USFWS), the California Natural Resources Agency, the Coastal and Ocean Resources Working Group for the California Climate Action Team (CO-CAT), the San Francisco Bay Conservation and Development Commission (BCDC), and the Point Reyes Bird Observatory (PRBO). Several multi-agency initiatives that address climate change, sea level rise impacts and adaptation strategies are also underway, including the

² Federal Emergency Management Agency, *Flood Insurance Rate Map*, Community Number 0601730175D. Available online at: <https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd> Accessed June 21, 2018.

³ *Definitions of FEMA Flood Zone Designations*, On-line at: <https://www.fema.gov/flood-zones>. Retrieved June 21, 2018.

⁴ Federal Emergency Management Agency, *Technical Mapping Advisory Council*, Available online at: <https://www.fema.gov/technical-mapping-advisory-council> Accessed July 19, 2018.

⁵ *Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs*, Circular No. 1165-2-212, USACE, Washington, DC, July 2009; and *Sea Level Change Considerations for Civil Works Programs*, Circular No. 1165-2-212, USACE, Washington, DC, Oct. 2011.

California Vulnerability and Adaptation Study,⁶ Adapting to Rising Tides project,⁷ the California Coastal Analysis and Mapping Project (CCAMP), which includes the Open Pacific Coast Study and the San Francisco Bay Area Coastal Study,⁸ the CASCaDE (Computational Assessments of Scenarios of Change for the Delta Ecosystem) project,⁹ and the *Our Coast- Our Future* project.¹⁰ Also, the California Landscape Conservation Cooperative (CA LCC) and its Climate Commons project provide access to up-to-date climate change data and related resources tailored to conservation efforts.¹¹

A regional system of manmade ditches and levees constructed along the Petaluma River provides flood protection for the Airport and surrounding areas. In addition, the Airport has its own levees on Airport property to provide further protection for the runway, taxiway, aircraft parking areas, and the administrative offices. However, the FIRM shows the entire Airport property to be located within the 100-year floodplain because the Airport and regional system of levees does not meet the physical criteria identified in the National Flood Insurance Program (NFIP) requirements as described in Title 44 CFR § 65.10. Therefore, for the purposes of this SEIS, all of DVO is considered to be located within the 100-year floodplain, but consideration will be given during the impact evaluation to the existing system of ditches and levees that help protect the Airport from flooding.

5.11.3 FUTURE CONDITIONS: 2024

This section addresses the effects of future operations and construction on existing floodplains in the vicinity of DVO. The year 2024 represents the anticipated year of construction completion and commencement of operation of the proposed runway extension. Alternative B (Sponsor's Proposed Project), Alternative D, and Alternative E would include development within the 100-year floodplain. As discussed in the Final Environmental Impact Statement (EIS), off-site alternatives such as using another airport or another mode of transportation are not practicable as they do not meet the project purpose. No on-site alternatives other than extending the runway at DVO by a minimum of 300 feet to a total runway length of 3,600 feet would meet the project's purpose and need, which is to allow existing aircraft, as represented by the family grouping of critical aircraft at DVO, to operate

⁶ *Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area*, the Third California Climate Change Assessment, referred to as the Vulnerability and Adaptation Study, prepared by UC Berkeley, S. Moser Research & Consulting and Stanford University for the California Energy Commission, July 2012.

⁷ The Adapting to Rising Tides (ART) project is a collaborative planning effort initiated by BCDC, in partnership with NOAA's Coastal Services Center, Caltrans, the Metropolitan Transportation Commission, and local Bay Area governments to assist communities in developing sea level rise adaptation strategies, sustainable infrastructure and ecosystem protection.

⁸ *San Francisco Bay Area Coastal Study- California Coastal Analysis and Mapping Project*, FEMA digital brochure, Sept. 2014, available at: http://www.r9map.org/Documents/120904_FEMA-Brochure_SFBayArea_web.pdf, accessed July 2018.

⁹ A USGS program in collaboration (and funded by) the State of CA's Delta Stewardship Council, available at: <http://cascade.wr.usgs.gov/index.shtm>, accessed July 2018.

¹⁰ The Our Coast-Our Future project is a collaboration between PRBO, USGS and NOAA with the goal of developing analytical decision- support tools for climate change assessment and for assessing vulnerabilities to natural and build environments.

¹¹ CA LCC website: <http://www.californialcc.org/>, accessed July 2018.

without operational weight restrictions under hot weather conditions. In addition, FAA design standards require a 300-foot runway safety area at each end of the 3,600-foot runway to meet FAA airport design standards. Therefore, it is not practicable to implement Alternative B, D, or E without constructing the proposed runway extension in an area currently in the 100-year floodplain.

The purpose of the runway extension project does not include providing 100-year flood protection for Gness Field Airport and neighboring property owners in either the short or long term. Such an effort would require regional flood protection planning, including the consideration of how an increase in the elevation of mean sea level would affect the evaluation and implementation of regional flood control efforts. Implementing a regional flood control program that includes addressing sea level rise is not required to complete Alternate B (Sponsor's Proposed Project), Alternative D, or Alternative E, and is beyond the scope of this SEIS. Marin County is updating its Countywide Plan to address sea level rise as part of ongoing county planning efforts.

As discussed in more detail in this section, implementation of Alternative A (No Action), Alternative B (Sponsor's Proposed Project), Alternative D, or Alternative E would not result in a significant impact on floodplains.

**Alternative A:
No Action**

Under Alternative A (No Action), there would be no new development in the existing 100-year floodplain. DVO would remain within a 100-year floodplain but would also continue to receive flood protection from the system of ditches and levees. Because there would be no construction to directly alter the existing floodplain or cause secondary impacts or changes in hydrology, there would be no significant encroachment or environmental impact as a result of implementing Alternative A.

**Alternative B:
Extend Runway to the Northwest by 1,100 Feet (Sponsor's Proposed Project)**

This alternative includes the proposed 1,100-foot extension of Runway 13, the extension of the parallel taxiway adjacent to the runway, and the extension of the levee and drainage ditch adjacent to Runway 13. All of these improvements would occur within the 100-year floodplain. In order to determine if these improvements would result in a significant encroachment in accordance with DOT Order 5650.2, and therefore, each of the three issues associated with such encroachments is addressed below:

- (1) *The action would not have a considerable probability of loss of human life.*

Implementation of Alternative B would not result in a high probability of loss of human life. Alternative B does not result in the construction of any new buildings or structures designed for human habitation within the 100-year floodplain. Alternative B does not alter the available access to and from the Airport. Alternative B does not change the ability to use the Airport during a

flood event. Alternative B would not increase the likelihood of flood-induced spills of hazardous materials.

- (2) *The action would not have substantial encroachment-associated costs or extent.*

Implementation of Alternative B would occur within a 100-year floodplain, but the existing ditch and levee system would be extended to provide flood protection for the runway, taxiway, aircraft parking areas, and administrative offices. As a result, the Airport would be at no greater risk for flood damage than under Alternative A.

The development included under Alternative B would occur within a large contiguous floodplain that encompasses the Airport and continues east until reaching the Petaluma River. The size of the contiguous area is approximately 3,875 acres. Alternative B would extend the existing levee and ditch system, runway and taxiway to the northwest, and result in an additional 13 acres of land being protected by a levee. Impounding this relatively small area (less than one percent of contiguous area) would not result in new areas being subject to 100-year floods, nor would it result in existing areas subject to 100-year floods becoming more prone to floods.

- (3) *The action would not cause notable adverse impacts on natural and beneficial floodplain values.*

Implementation of Alternative B would result in the development of additional land and extension of the ditch and levee system in the floodplain. However, due to the large size of the floodplain in and around the Airport, there would be no adverse impacts on the natural and beneficial floodplain values. Based on analysis in this section and in other sections of this SEIS, Alternative B would not result in significant impacts to agricultural activities, aquacultural activities, aquatic or terrestrial organisms, flood control, groundwater recharge, or water quality.

Alternative B would enclose approximately 13 additional acres of the existing 100-year floodplain within the DVO Airport levee system. Implementation of Alternative B would result in a 13-acre encroachment on the approximately 3,875-acre 100-year floodplain in the vicinity of DVO, a less than one percent encroachment. Although this represents a floodplain encroachment, these 13 acres would remain within the 100-year floodplain as the DVO Airport levees do not meet FEMA 100-year flood protection standards.

As this 13-acre encroachment would not result in a considerable probability of loss of human life; likely future damage associated with the encroachment would not be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and would not result in a notable adverse impact on natural and beneficial floodplain values, this floodplain encroachment is not considered a significant floodplain encroachment in accordance with DOT Order 5650.2.

The MCP provides guidance and recommendations regarding development within floodplains in order to protect people and property from risks associated with flooding and inundation within the County, notably: Policy EH 3.2, Retain Natural Conditions: Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.¹²

As Alternative B results in a 13-acre encroachment on the existing 100-year floodplain, and Alternative E (discussed in an upcoming section) results in a six-acre encroachment on the existing 100-year floodplain, Alternative B has greater floodplain impacts than Alternative E. EO 11998 and DOT Order 5650.2 require that short and long-term impacts to the 100-year floodplain be minimized to the extent practicable. Implementation of Alternative B would not cause notable adverse impacts on natural and beneficial floodplain values on the existing 100-year floodplain. Therefore, implementation of Alternative B would not result in a significant impact on the 100-year floodplain.

**Alternative D:
Extend Runway to the Northwest by 860 Feet and to the Southeast by 240 Feet**

This alternative includes the proposed 860-foot extension of Runway 13 to the northwest, 240-foot extension of Runway 31 to the southeast, the extension of the parallel taxiway adjacent to the runway, and the extension of the levee and drainage ditch around the runway. All of these improvements would occur within the 100-year floodplain. In order to determine if these improvements would result in a significant encroachment, each of the three issues are addressed below:

- (1) *The action would not have a considerable probability of loss of human life.*

Implementation of Alternative D would not result in a high probability of loss of human life. Alternative D does not result in the construction of any new buildings or structures designed for human habitation within the 100-year floodplain. Alternative D does not alter the available access to and from the Airport. Alternative D does not change the ability to use the Airport during a flood event. Alternative D would not increase the likelihood of flood-induced spills of hazardous materials.

- (2) *The action would not have substantial encroachment-associated costs or extent.*

Implementation of Alternative D would occur within a 100-year floodplain, but the existing ditch and levee system would be extended to provide flood protection for the runway, taxiway, aircraft parking areas, and administrative offices. As a result, the Airport would be at no greater risk for flood damage than under Alternative A.

¹² *Marin Countywide Plan, 2.6, Environmental Hazards.* Adopted by the Marin County Board of Supervisors, November 6, 2007.

The development included under Alternative D would occur within a large contiguous floodplain that encompasses the Airport and continues east until reaching the Petaluma River. The size of the contiguous area is approximately 3,875 acres. Alternative D would extend the existing levee and ditch system, runway and taxiway to the northwest, resulting in an additional 12 acres of land being protected by the DVO Airport levees to the northwest of the runway. To the south, the levee would stay in its current location; however, construction of the runway and taxiway extension would result in an additional three acres of encroachment into the floodplain. The combination of the two areas would result in a total of 15 acres of encroachment within the floodplain. Impounding this relatively small area (less than one percent of contiguous area) would not result in new areas being subject to 100-year floods, nor would it result in existing areas subject to 100-year floods becoming more prone to floods.

- (3) *The action would not cause notable adverse impacts on natural and beneficial floodplain values.*

Implementation of Alternative D would result in the development of additional land and extension of the ditch and levee system in the floodplain. However, due to the size of the floodplain in and around the Airport, there would be no adverse impacts on the natural and beneficial floodplain values. Based on analysis in this section and in other sections of this SEIS, Alternative D would not result in significant impacts to agricultural activities, aquacultural activities, aquatic or terrestrial organisms, flood control, groundwater recharge, or water quality.

Alternative D would enclose approximately 12 additional acres of the existing 100-year floodplain within the DVO Airport levee system and construct another three acres of runway and taxiway structure. The three acres of runway and taxiway structure would be located on the southern end of the runway and would also include the Runway Safety Area (RSA). Implementation of Alternative D would result in a 15-acre encroachment on the approximately 3,875-acre 100-year floodplain in the vicinity of DVO, a less than one percent encroachment. Although this represents a floodplain encroachment, these 15 acres would remain within the 100-year floodplain as the DVO Airport levees do not meet FEMA 100-year flood protection standards.

As this 15-acre encroachment would not result in a considerable probability of loss of human life; likely future damage associated with the encroachment would not be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and would not result in a notable adverse impact on natural and beneficial floodplain values, this floodplain encroachment is not considered a significant floodplain encroachment in accordance with DOT Order 5650.2.

The MCP provides guidance and recommendations regarding development within floodplains in order to protect people and property from risks associated with flooding and inundation within the County, notably: Policy EH 3.2, Retain Natural Conditions: Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.¹³

As Alternative D results in a 15-acre encroachment on the existing 100-year floodplain, and Alternative E (discussed in the next section) results in a six-acre encroachment on the existing 100-year floodplain, Alternative D has greater floodplain impacts than Alternative E. EO 11998 and DOT Order 5650.2 require that short and long-term impacts to the 100-year floodplain be minimized to the extent practicable. Implementation of Alternative D would not cause notable adverse impacts on natural and beneficial floodplain values on the existing 100-year floodplain. Therefore, implementation of Alternative D would not result in a significant impact on the 100-year floodplain.

**Alternative E:
Extend Runway to the Northwest by 300 Feet**

This alternative includes the proposed 300-foot extension of Runway 13, the extension of the parallel taxiway adjacent to the runway, and the extension of the levee and drainage ditch adjacent to Runway 13. All of these improvements would occur within the 100-year floodplain. In order to determine if these improvements would result in a significant encroachment, each of the three issues are addressed below:

- (1) *The action would not have a considerable probability of loss of human life.*

Implementation of Alternative E would not result in a high probability of loss of human life. Alternative E does not result in the construction of any new buildings or structures designed for human habitation within the 100-year floodplain. Alternative E does not alter the available access to and from the Airport. Alternative E does not change the ability to use the Airport during a flood event. Alternative E would not increase the likelihood of flood-induced spills of hazardous materials.

- (2) *The action would not have substantial encroachment-associated costs or extent.*

Implementation of Alternative E would occur within a 100-year floodplain, but the existing ditch and levee system would be extended to provide flood protection for the runway, taxiway, aircraft parking areas, and administrative offices. As a result, the Airport would be at no greater risk for flood damage than under Alternative A.

¹³ *Marin Countywide Plan, 2.6, Environmental Hazards.* Adopted by the Marin County Board of Supervisors, November 6, 2007.

The development included under Alternative E would occur within a large contiguous floodplain that encompasses the Airport and continues east until reaching the Petaluma River. The size of the contiguous area is approximately 3,875 acres. Alternative E would extend the existing levee and ditch system, runway and taxiway to the northwest, resulting in an additional 4.8 acres of land being protected by the DVO Airport levees to the northwest of the runway. To the south, the levee would stay in its current location. While construction of the runway and taxiway extension would result in an additional 1.5 acres of pavement, there would be an additional 0.3 acres of pavement removal. Therefore, there would be a net encroachment of 1.2 acres into the floodplain. The combination of the two areas would result in a total of six acres of encroachment within the floodplain. Impounding this relatively small area (less than one percent of contiguous area) would not result in new areas being subject to 100-year floods, nor would it result in existing areas subject to 100-year floods becoming more prone to floods.

- (3) *The action would not cause notable adverse impacts on natural and beneficial floodplain values.*

Implementation of Alternative E would result in the development of additional land and extension of the ditch and levee system in the floodplain. However, due to the size of the floodplain in and around the Airport, there would be no adverse impacts on the natural and beneficial floodplain values. Based on analysis in this section and in other sections of this SEIS, Alternative E would not result in significant impacts to agricultural activities, aquacultural activities, aquatic or terrestrial organisms, flood control, groundwater recharge, or water quality.

Alternative E would enclose approximately 4.8 additional acres of the existing 100-year floodplain within the DVO Airport levee system and construct another 1.2 acres of runway and taxiway structure. The 1.2 acres of runway and taxiway structure would be located on the southern end of the runway and would also include the RSA. Implementation of Alternative E would result in a six-acre encroachment on the approximately 3,875-acre 100-year floodplain in the vicinity of DVO, a less than one percent encroachment. Although this represents a floodplain encroachment, these six acres would remain within the 100-year floodplain as the DVO Airport levees do not meet FEMA 100-year flood protection standards.

As this six-acre encroachment would not result in a considerable probability of loss of human life; likely future damage associated with the encroachment would not be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and would not result in a notable adverse impact on natural and beneficial floodplain values, this floodplain encroachment is not considered a significant floodplain encroachment in accordance with DOT Order 5650.2.

The MCP provides guidance and recommendations regarding development within floodplains in order to protect people and property from risks associated with flooding and inundation within the County, notably: Policy EH 3.2, Retain Natural Conditions: Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.¹⁴

Alternative E results in a six-acre encroachment on the existing 100-year floodplain. Alternative B and D result in a 13-acre and 15-acre encroachment on the existing 100-year floodplain, respectively. Therefore, Alternative E has fewer floodplain impacts than Alternative B and D. Alternative E represents the project alternative that meets the project purpose while minimizing short and long-term impacts to the 100-year floodplain as required by EO 11998 and DOT Order 5650.2. Implementation of Alternative E would not cause notable adverse impacts on natural and beneficial floodplain values on the existing 100-year floodplain. Therefore, implementation of Alternative E would not result in a significant impact on the 100-year floodplain.

¹⁴ *Marin Countywide Plan, 2.6, Environmental Hazards.* Adopted by the Marin County Board of Supervisors, November 6, 2007.

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