

H. HYDROLOGY AND WATER QUALITY

This section provides a discussion of existing conditions related to climate, water resources, hydrology, and water quality within the vicinity of the Larkspur SMART Station Area Plan (Plan) area, including the extent and quality of surface water and groundwater, runoff and drainage patterns, and flood conditions. Following the existing conditions discussion is a summary of the regulatory framework related to water resources. The significance criteria, which are used to determine whether development under the Station Area Plan would result in significant impacts to water resources, are listed. Finally, potential impacts to the water resources and hydrology that could result from development under the Station Area Plan are described. Discussions and analysis associated with infrastructure issues associated with the provision of stormwater facilities are also included in Section IV.L, Utilities and Infrastructure.

1. Setting

Existing conditions related to water resources, hydrology, and water quality are described below.

a. Climate. Marin County has a mild Mediterranean climate with long, dry, warm summers and cool, rainy winters. The majority of precipitation occurs between October and May. The mean annual precipitation in the Plan area is about 31 inches.¹ Violent thunderstorms and other extreme weather conditions are rare. The mean annual temperature is about 58°F.

b. Groundwater Resources. The Plan area is located in the San Francisco Bay Central Hydrologic Planning Area, as defined in the San Francisco Bay Basin Water Quality Control Plan (Basin Plan).² The southern portion of the Plan area's groundwater resources (Sub-area 2) is located within the Ross Valley Groundwater Basin (Subbasin No. 2-28). This basin is bounded by San Francisco Bay to the east and Corte Madera Creek to the north, and has a surface area of approximately 2.8 square miles.³ The northern portion of the Plan area (Sub-areas 1A and 1B) is not in a mapped groundwater basin. Based on a geotechnical investigation conducted at the 2000 Larkspur Landing project site in Sub-Area 1A, groundwater was encountered at approximately 7 to 11 feet below ground surface.⁴

Existing and potential beneficial uses of the Ross Valley Groundwater Basin include municipal and domestic water supply, industrial process water supply, industrial service water supply, and agricultural water supply.⁵ Although the Basin Plan lists it as a beneficial use, groundwater resources in the Plan area are apparently not used for drinking water.⁶

¹ California Department of Water Resources, 2004. *Ross Valley Groundwater Basin, California's Groundwater Bulletin 118*, updated February 27.

² California Regional Water Quality Control Board, 2011. San Francisco Bay Region, *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*, incorporating all amendments as of December 31.

³ California Department of Water Resources, 2003. *Bulletin 118, California's Groundwater*. October.

⁴ Treadwell & Rollo, 2005. *Geotechnical Investigation, Proposed Development, 2000 Larkspur Landing Circle, Larkspur, California*. December 28.

⁵ California Regional Water Quality Control Board, 2011, op. cit.

⁶ Transportation Authority of Marin, 2010. *Water Quality Study Report, Central Marin Ferry Connection*. April.

c. Hydrology and Surface Water Resources. The only surface water resource in the Plan area is Corte Madera Creek, which bisects the Plan area from west to east. San Anselmo Creek and Ross Creek to the northwest join to form Corte Madera Creek, which is the largest stream in Marin County. Corte Madera Creek drains the Ross Valley Watershed, which includes 44 miles of stream channels and has an area of 24.7 square miles.⁷ Corte Madera Creek drains to San Francisco Bay just east of the Plan area, and water levels in the Creek rise and fall in a predictable manner due to the effects of Bay tides.

The Basin Plan lists beneficial uses for the San Francisco Central Bay Region, which includes Corte Madera Creek and the San Francisco Bay.⁸ Existing and potential San Francisco Bay beneficial uses include industrial service supply, industrial process supply, commercial and sport fishing, shellfish harvesting, estuary habitat, fish migration, preservation of rare and endangered species, fish spawning, wildlife habitat, water contact recreation, noncontact water recreation, and navigation.

Corte Madera Creek's existing and potential beneficial uses include cold freshwater habitat, fish migration, preservation of rare and endangered species, fish spawning, warm freshwater habitat, wildlife habitat, water contact recreation, and noncontact water recreation.

d. Stormwater Drainage System. The City of Larkspur storm drainage system is described in the following section. See also Section IV.L, Utilities and Infrastructure.

(1) Existing Conditions. The City of Larkspur has 15 miles of public storm drains, most of which were built in the 1950s and 1960s. They were developed in piecemeal fashion as the City developed and in response to problems as they occurred. As a result, the City's storm drainage system has inconsistent construction quality and varying pipe sizing that has insufficient capacity for current stormwater flows.⁹ Some of the system is located on private property with details not recorded with the City's Public Works Department.

As a result, the drainage system has severe flooding and maintenance problems. Two problems are considered especially common:

- Corrugated metal pipe in the system has rusted, causing drainways to collapse.
- Lack of or underdesigned inlets and pipes result in significant volumes of runoff bypassing the inlets, causing flooding and erosion further downstream.

Although deficiencies are present throughout the system, the City has determined that the most critical problems are present in the areas near Corte Madera Creek that are subject to flooding exacerbated by tidal effects, including low lying areas near the intersection of Lucky Drive and

⁷ Marin County Watershed Program, 2012. *Watershed Descriptions*. Website: www.marinwatersheds.org/ross_valley.html (accessed June 15).

⁸ California Regional Water Quality Control Board, 2011, op. cit.

⁹ Larkspur, City of, 2001. *Larkspur 2050 Capital Expenditure Plan*. March. Appendix D: Streets, Bridges, and Drainage.

Industrial Way (within Sub-area 2), the Greenbrae Marina neighborhood (west of Sub-area 2), and the parking lot at Boardwalk #1 (east of Sub-area 2).¹⁰

An intensive capital improvement program has been proposed to address these deficiencies. The City of Larkspur 2050 Capital Expenditure Plan¹¹ has designated streets, drainage system, and bridges as its second priority and proposes replacement of approximately 4.5 miles of drain pipe over the next 20 years.

(2) Storm Drain Design Standard. The City uses the 10-year storm event as the basis of its storm drain system design, which is consistent with nearby municipalities and standard practice of the industry. This criterion corresponds to the flow level that would allow minimum standing water but prevent flooding of streets and private properties when runoff is collected and conveyed by ditches, storm drain inlets, and pipes without impediment.

e. Flooding. Flooding, flood zones, sea level rise, and other flooding conditions are described below.

(1) Historic Flood Events. Four historic floods, resulting in significant flood damage, have occurred in Larkspur during the last 60 years. These four floods occurred in December 1955, April 1958, January 1973, and January 1982.¹² During the 1955 and 1982 floods, the area was designated a disaster area and received federal aid. Many streets were flooded and residents had to be evacuated. During the 1982 flood, most of the damage was due to mudslides which were caused by extreme precipitation.

Another significant flood, which began on December 31, 2005, prompted the creation of the Ross Valley Watershed Flood Protection and Watershed Program to develop a comprehensive strategy to address the causes and consequences of flooding in the region. The program is led by the County of Marin Department of Public Works and includes the City of Larkspur and towns of Fairfax, Ross, and San Anselmo.

(2) Localized Flooding. As noted above, localized flooding occurs in many parts of the City due to inadequate drainage systems, with the most significant flooding near Corte Madera Creek, which includes the central portion of the Plan area.

(3) FEMA Flood Zones. Sub-area 2 and the southern portion of Sub-areas 1A and 1B, near Corte Madera Creek, are located in the 100-year flood hazard zone, as determined by FEMA.¹³ Flood zones are shown on Figure IV.H-1. Portions of the Plan area near the Bay are also subject to

¹⁰ Ibid.

¹¹ Ibid.

¹² Transportation Authority of Marin, 2010. *Location Hydraulic Study, Central Marin Ferry Connection*. April.

¹³ It should be noted that FEMA is currently updating its flood maps within the Larkspur area.

additional flooding hazards due to storm-induced wave action.¹⁴ The base flood elevation in the Plan area is 9 feet above sea-level.¹⁵

(4) Tidal Flooding. When heavy rains coincide with unusually high tides, tidal flooding can occur. Low-lying areas close to Corte Madera Creek are particularly susceptible. A combination of low barometric pressure, winds, and rain can raise tide levels by as much as 3 feet. If the tide level exceeds the height of the Creek banks, which is possible during severe events, traditional responses to flooding such as pumping are ineffective until the tide recedes.

As part of the Larkspur 2050 Capital Expenditure Plan, the City plans to implement a system of levees, floodwalls, pumps, and flood control gates that would prevent tidal flooding.

(5) Tsunamis and Seiches. A tsunami is a large ocean wave generated by an earthquake in or near the ocean. A seiche is an earthquake-generated wave within an enclosed body of water, such as a reservoir or lake. According to tsunami information maps produced by the California Emergency Management Agency (CalEMA), in a worst-case scenario, a significant portion of Sub-area 1A, the southwestern portion of Sub-area 1B, and all of Sub-area 2 could be inundated during a tsunami.¹⁶ The inundation map is presented as Figure IV-H-2. This inundation map represents areas that could potentially be affected by the worst-case tsunami, and is intended for local jurisdictions to use to aid evacuation planning. The height of a tsunami wave potentially affecting these areas has not been calculated and would depend on a number of variables, most importantly characteristics of the earthquake triggering the wave. CalEMA plans to prepare more detailed and refined tsunami hazard maps for land use planning purposes sometime in the future. No large enclosed bodies of water, likely to generate a seiche, are located in the Plan area vicinity.

(6) Sea Level Rise. A predicted rise in sea levels will exacerbate already existing coastal flooding hazards. Over the last few decades, the rate of sea level rise has been accelerating. Between 1961 and 2003, global sea level rose by an average of 0.07 inch per year, while from 1993 to 2003 the rate has increased to 0.12 inch per year.¹⁷ The San Francisco Bay Plan from the San Francisco Bay Conservation and Development Commission (BCDC)¹⁸ anticipates a rise in Bay waters of 16 inches by 2050 and 55 inches by 2100. Mapping by BCDC has determined that parts of the Plan area could be inundated by sea level rises of these magnitudes. These areas include areas within the 100-year flood zone and adjoining areas, including the southern portions of Sub-area 1A and 1B and all of Sub-area 2.¹⁹

¹⁴ Federal Emergency Management Agency, 2009. *Flood Insurance Rate Map, Marin County, California and Incorporated Areas, Map Number 06051C0459D, Panel 459 of 531*, Effective Date May 4.

¹⁵ Ibid.

¹⁶ California Department of Conservation, Emergency Management Agency, 2009. *Tsunami Inundation Map for Emergency Planning, San Rafael Quadrangle and San Quentin Quadrangle*. July 1.

¹⁷ San Francisco Bay Conservation and Development Commission (BCDC), 2011, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*, October 6.

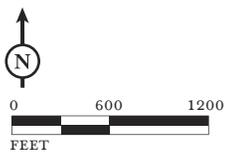
¹⁸ Ibid.

¹⁹ Ibid.



FIGURE IV.H-1

LSA



- 100-Year Flood Zone (approximate location)
- Plan Area Boundary
- SMART Station Location
- Larkspur Ferry Terminal
- City Boundary

City of Larkspur SMART Station Area Plan EIR
100 Year Flood Zone

SOURCES: FEMA, 2009; BMS DESIGN GROUP; LSA ASSOCIATES, INC., 2012.

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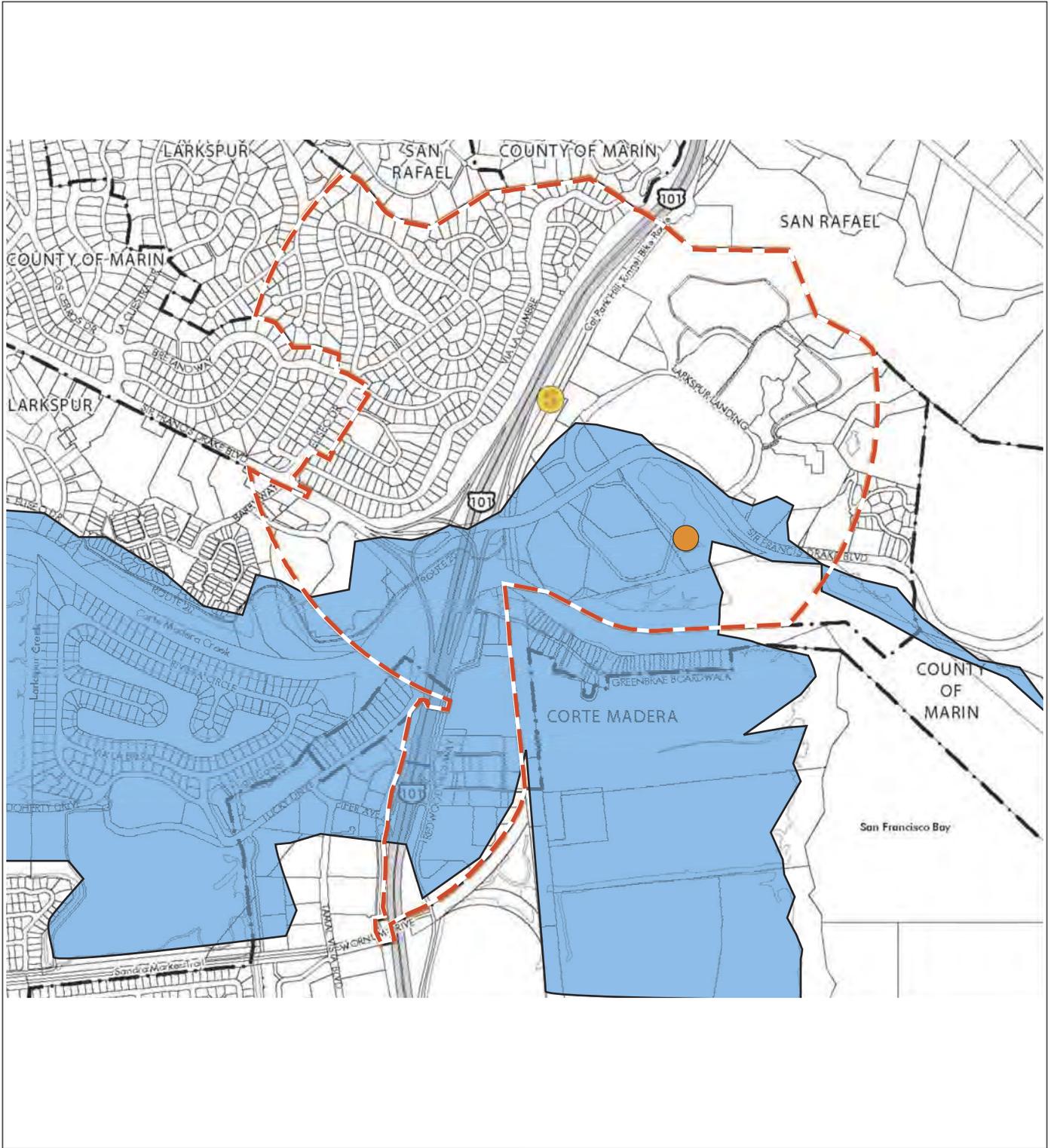
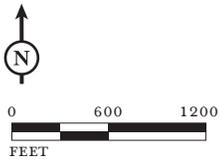


FIGURE IV.H-2

LSA

- Tsunami Inundation Areas (approximate location)
- Plan Area Boundary
- SMART Station Location
- Larkspur Ferry Terminal
- City Boundary



[NOTE: Information in this graphic represents the worst-case scenario intended for evacuation planning]

Sea levels could rise an additional 22 to 35 inches by the end of the century as global climate change continues.²⁰ Although these projections are on a global scale, the rate of sea level rise along California's coast is relatively consistent with the worldwide average rate observed over the past century. Therefore, it is reasonable to assume that changes in worldwide sea level rise will also be experienced along California's coast.²¹

Sea level rise of this magnitude would increasingly threaten California's coastal regions with more intense coastal storms, accelerated coastal erosion, threats to vital levees, and disruption of inland water systems, wetlands and natural habitats. Rising sea levels and more intense storm surges could increase the risk for coastal flooding.

Because of scientific uncertainties, it is difficult to predict with a high degree of accuracy the sea level rise that will impact Marin County residents. The San Francisco Bay Conservation and Development Commission's (BCDC) most recent assessment assumes a 1.8° to 5.4° F (1° to 3° C) rise in global temperature over the next century and a corresponding sea level rise in San Francisco Bay of 16 inches by mid-century and 55 inches by 2100.²² Sea level rise of this magnitude would have dramatic impacts on residences, businesses, schools, and public infrastructure located near the shoreline. Inundation maps created by BCDC integrate geographic information system software data from the U.S. Geological Survey and sea level rise projections to assess the vulnerability of Bay Area communities to different level rise scenarios. A 16-inch rise in sea level would result in the flooding of 180,000 acres of shoreline, which is roughly equivalent to today's 100-year floodplain. A 55-inch rise in sea level would flood over 213,000 acres of shoreline, putting billions of dollars of private and public development at risk. Figure IV.H-3 shows shoreline areas vulnerable to sea level rise.

According to the BCDC, changes in climate may cause increased storm activity, which in combination with higher sea level, may cause even greater flooding. It is expected that extreme storm events will cause most of the shoreline damage from flooding. Rising sea levels could impact the delivery of petroleum products, electricity, and drinking water to Bay Area residents and businesses. Residents may also suffer if wastewater treatment is compromised by inundation from rising sea levels, given that a number of treatment plants discharge to the Bay.

The BCDC, in partnership with the federal National Oceanic and Atmospheric Administration (NOAA), is sponsoring the Adapting to Rising Tides (ART) pilot program which aims to aid local governments in planning for sea level rise over the next century. The ART program has developed assessment of existing conditions and vulnerabilities and is currently developing and evaluating adaptation strategies.

A recent BCDC-led study of three marshes in the Corte Madera Baylands (Hearst Marsh, North Muzzi Marsh, and Muzzi Marsh), located east of Sub-area 2, examined strategies for using tidal

²⁰ California Climate Change Center, 2006, op. cit.

²¹ California, State of, 2006. Department of Water Resources. *Progress on Incorporating Climate Change into Management of California's Water Resources*. July.

²² San Francisco Bay Conservation and Development Commission, 2011. *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*. Website: www.bcdc.ca.gov/BPA/LivingWithRisingBay.pdf (accessed June 2012). October.

marshes to protect areas further inland from effects of sea level rise.²³ Tidal marshes and mudflats naturally attenuate wave height and energy. Natural effects have resulted in raising surface elevations in the Corte Madera Baylands approximately 0.1 inch per year, slightly less than current rates of sea level rise. The study concluded that by protecting marshes and tidal mudflats from erosion, improving sediment pathways, and increasing transition zones between the marsh and adjacent uplands, these natural effects can be enhanced and some effects of sea level rise may be ameliorated.²⁴

(7) Dam Inundation Areas. The Phoenix Lake Dam is located approximately 3.25 miles west of the Plan area. The California Governor's Office of Emergency Services has indicated that the portions of the Plan area adjacent to Corte Madera Creek could be inundated in the event of the failure of this dam.²⁵ The dam inundation map is presented as Figure IV.H-4. This failure is not considered likely. Although constructed in 1905, the dam is inspected yearly by the California Division of Dam Safety and is also regularly maintained and improved by the Marin Municipal Water District (MMWD), which owns the dam. A flood-control and seismic safety retrofit of the dam is currently underway and scheduled to be completed in 2015.²⁶

Miwok Park contains a manmade reservoir, Tubb Lake, near the northeastern boundary of Sub-area 1A. The dam forming the reservoir was constructed about 100 years ago to provide water for a brick factory. The City of Larkspur, the owner of the dam, is maintaining the dam and its associated components. A CEQA analysis for the 2000 Larkspur Landing Circle Project, located near Tubb Lake, determined that the potential for dam inundation was less-than-significant.²⁷

f. Water Quality. A review of published information by the California Department of Water Resources did not identify any information regarding the quality of groundwater in the Ross Valley Groundwater Basin that underlies the Plan area, though limited reports in 1972 suggested that salt-water intrusion may have affected groundwater quality in the lower portions of the basin.²⁸

Like many San Francisco Bay Area urban creeks, Corte Madera Creek is on the Clean Water Act (CWA) Section 303(d) list of impaired waters due to diazinon, and is subject to the Total Maximum Daily Load (TMDL) for diazinon and pesticide-related toxicity. The TMDL for all San Francisco Bay Area urban creeks was incorporated as a Basin Plan amendment by the San Francisco Bay Regional Water Quality Control Board (Water Board) in November 2005 through Order R2-2005-0063, which was ultimately approved by EPA in May 2007. As the TDML was being developed by the Water Board, it became clear that replacements for diazinon (such as pyrethroids) would pose similar water quality and sediment concerns as diazinon, so the TDML was designed to address pesticide-related aquatic toxicity in general. Corte Madera Creek has no other listing of impairments.

²³ BCDC, 2013. *Corte Madera Baylands: Conceptual Sea Level Rise Adaption Strategy*, May 8.

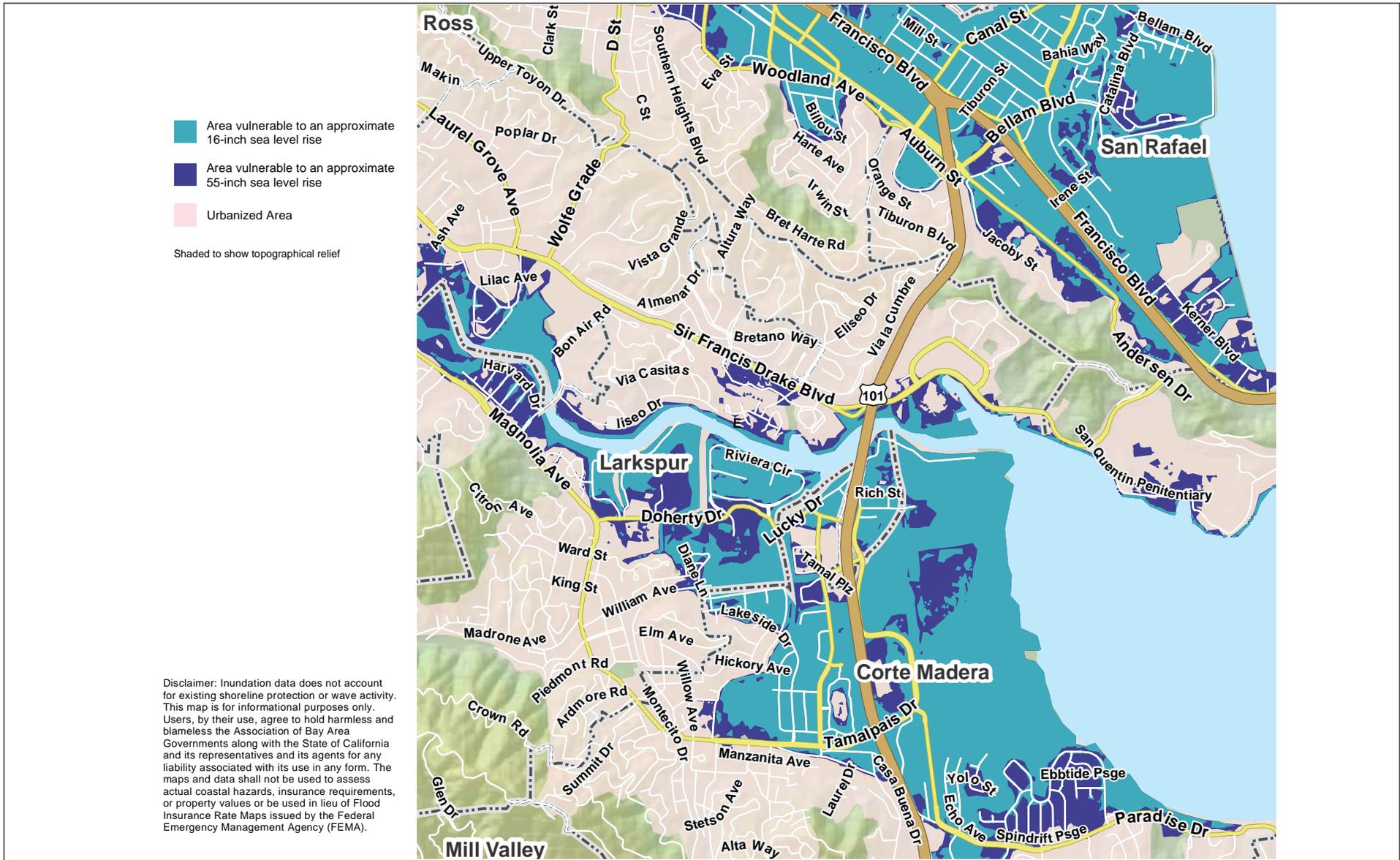
²⁴ Ibid.

²⁵ Ibid.

²⁶ Marin County Watershed Program, 2013. *Phoenix Lake IRWM Retrofit 2012 Project*. Website: www.marinwatersheds.org/documents_and_reports/documents-reports.html (accessed May 16).

²⁷ Turnstone Consulting, 2004. *Expanded Initial Study, 2000 Larkspur Landing Circle Project*. October 20.

²⁸ California Department of Water Resources, 2004, op. cit.



LSA

FIGURE IV.H-3

NOT TO SCALE



City of Larkspur SMART Station Area Plan EIR
 Shoreline Areas Vulnerable to Sea Level
 Rise in the San Francisco Bay Region

SOURCES: SIEGEL AND BACHARD, 2002; KNOWLES, 2008; ABAG GEOGRAPHIC INFORMATION SYSTEMS, 2013.

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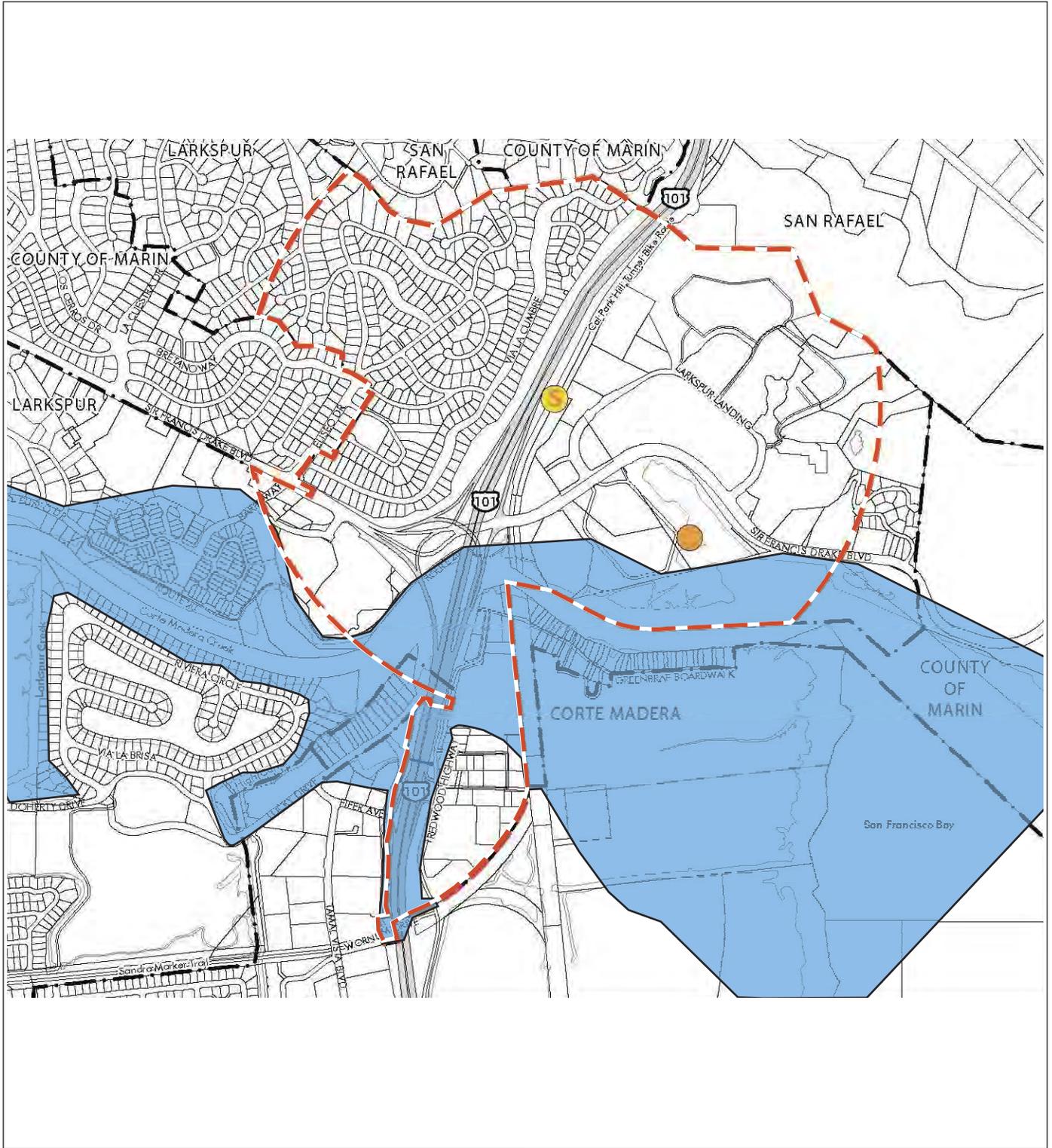
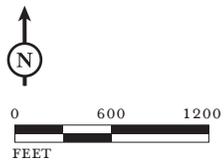


FIGURE IV.H-4

LSA



- Water Inundation Area (approximate location)
- Plan Area Boundary
- SMART Station Location
- Larkspur Ferry Terminal
- City Boundary

SOURCES: CALIF. GOVERNOR'S OES; CITY OF LARKSPUR, 2011;
BMS DESIGN GROUP; LSA ASSOCIATES, INC., 2012.

City of Larkspur SMART Station Area Plan EIR
Phoenix Dam Inundation Area

g. Regulatory Framework. Applicable federal, State, and local regulations, and local management programs and plans related to hydrology and water quality in the Plan area are described below.

(1) Municipal Stormwater Program Requirements. Pursuant to Section 402 of the CWA and the Porter-Cologne Water Quality Control Act, municipal stormwater discharges in Marin County are regulated under the statewide National Pollutant Discharge Elimination System (NPDES) General Permit for the Discharge of Storm Water from Small Municipal Separate Storm Sewer Systems (Small MS4 Permit). Prior to being regulated under the Small MS4 Permit, the municipalities in Marin County formed the Marin County Stormwater Pollution Prevention Program (MCSTOPPP) for the purpose of developing a countywide program to satisfy the requirements of the CWA and Basin Plan. The MCSTOPPP also developed a Stormwater Management Plan (Action Plan 2010) to comply with the requirements of the Small MS4 Permit. The Action Plan 2010 includes Performance Standards for the program elements that must be addressed under the Small MS4 Permit: municipal maintenance activities (including road repair and maintenance); illicit discharge controls; new development, redevelopment, and construction site controls; industrial and commercial discharge controls; and public information and participation. Local Small MS4 Permit activities (MCSTOPPP) are overseen by the Water Board.

An updated Small MS4 Permit (Order No. 2013-0001-DWQ) will go into effect July 1, 2013. This updated permit includes a number of post-construction stormwater management criteria for new development and redevelopment projects including Site Design and Low Impact Development (LID) runoff requirements. After June 30, 2015, this will require the use of runoff reduction and treatment measures for development and redevelopment projects that create or replace more than 5,000 square feet of impervious surface. MCSTOPPP is currently developing the administrative tools to implement these changes in the MS4 permit.

(2) Construction General Permit. Pursuant to CWA Section 402 and the Porter-Cologne Water Quality Control Act, the SWRCB adopted an *NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit) (Order No. 2009-0009-DWQ, NPDES No. CAR000002) on September 2, 2009. To obtain coverage under the Construction General Permit, the discharger must provide via electronic submittal, a Notice of Intent, a Storm Water Pollution Prevention Plan (SWPPP), and other documents required by Attachment B of the Construction General Permit.

Construction activities subject to the Construction General Permit include clearing, grading, and disturbances to the ground, such as grubbing or excavation, that result in soil disturbances of at least 1.0 acre of total land area (or smaller sites that are part of a common plan of development or sale that disturbs more than 1.0 acre of land surface). A SWPPP must be prepared by a Qualified SWPPP Developer that meets the certification requirements in the Construction General Permit. The purpose of the SWPPP is: (1) to help identify the sources of sediment and other pollutants that could affect the quality of stormwater discharges; and (2) to describe and ensure the implementation of Best Management Practices (BMPs) to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges resulting from construction activity. The Construction General Permit mandates certain requirements based on the risk level of the project (Level 1, Level 2, or Level 3), which is based on the risk of sediment discharge and the receiving water risk.

The SWPPP must also include a Construction Site Monitoring Program. The monitoring program includes, depending on the project risk level, visual observations of site discharges, water quality monitoring of site discharges (pH, turbidity, and non-visible pollutants, if applicable), and receiving water monitoring (pH, turbidity, suspended sediment concentration, and bioassessment).

The performance standard in the Construction General Permit is that dischargers shall minimize or prevent pollutants in stormwater discharges and authorized non-stormwater discharges through the use of controls, structures, and management practices that achieve Best Available Technology (BAT) for treatment toxic and non-conventional pollutants and Best Conventional Technology (BCT) for treatment of conventional pollutants.²⁹ The permit also imposes numeric action levels and numeric effluent limits for pH and turbidity (for Level 2 and Level 3 risk dischargers).

Local General Construction Permit activities are overseen by the Water Board.

(3) City of Larkspur General Plan. The City's 1990 General Plan contains the following policies and action programs regarding hydrology and water quality:

Health and Safety Element

Goal 3: Avoid development in areas prone to natural hazards.

- Policy e: Allow land uses in areas prone to natural hazards only with appropriate mitigation.
 - Action Program [6]: Continue to regulate development to assure the adequate mitigation of safety hazards on sites having a history or threat of slope instability, seismic activity (including liquefaction, subsidence, and differential settlement), flooding, or fire.

Goal 4: Protect Larkspur from the risk of flood damage.

- Policy f: Seek to have the Corte Madera Creek flood control improvements completed upstream from Larkspur.
 - Action Program [7]: Work with the Marin County Flood Control District, the Army Corps of Engineers, and the Town of Ross to develop and implement an improvement plan that protects against flooding.
- Policy g: Work with other cities in the Ross Valley to develop a comprehensive master plan for flood control and management of Corte Madera Creek.
- Policy h: Regulate land uses in flood-prone areas and allow development in those areas only with appropriate mitigation.
 - Action Program [8]: Establish standards for minimum grades and minimum finished floor elevations that take into consideration the rising sea level during the expected life of the project.
- Policy i: Continue to upgrade the City's drainage system.

²⁹ As defined by the EPA, Best Available Technology (BAT) is a technology-based standard established by the CWA as the most appropriate means available on a national basis for controlling the direct discharge of toxic and non-conventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable. Best Conventional Technology (BCT) is a technology-based standard that applies to treatment of conventional pollutants, such as total suspended solids.

- Action Program [9]: Implement the recommendations of the 1988 Storm Drain Master Plan study.
- Action Program [10]: Construct flood walls and a tide gate in the area east of Highway 101.
- Action Program [11]: Balance required protection measures with the need to protect environmental resources, and do so in such a way as to integrate design improvements with the protection of natural resources.
- Action Program [12]: Require site plans to locate structures outside or above the 100-year flood zone wherever possible.
- Action Program [26]: Adopt standards for geologic and geotechnical reports that outline the type and extent of investigation required for various stages of the development process, for various geologic and soils conditions, and for the type of land use and structure proposed.
 - (a) Proposed development should include detailed plans for drainage facilities. These plans should incorporate a hydrologic and, where appropriate, a geomorphic evaluation of existing drainage courses and City drainage facilities that will be impacted by the project. The evaluation should demonstrate the adequacy of these systems. After adequacy is demonstrated, the drainage facilities should be connected to City storm drains.

(4) Ross Valley Flood Protection and Watershed Program. The Ross Valley Watershed and Flood Protection Program (RVFPWP), a project of the MCDPW, was established after the 2005 New Years' Eve flood at the request of impacted communities. The RVFPWP includes participation from MCDPW as well as Fairfax, Larkspur, Ross, San Anselmo, and Flood Zone No. 9. In 2011, the RVFPWP completed a Capital Improvement Plan to provide improved flood protection to the watershed. Proposed capital projects would allow Corte Madera Creek to contain the 100-year flood by enlarging the channel, removing or modifying structures within three critical reaches of the Creek, and attenuating flood flows in five large detention basins.³⁰ These projects are intended to be implemented over the next 10 to 20 years.

2. Impacts and Mitigation Measures

This section provides an assessment of the potential adverse impacts related to hydrology and water quality within the Plan area. It begins with the criteria of significance, which establishes the threshold for determining whether an impact is significant. The latter part of this section identifies potential impacts and evaluates how they relate to development that may take place under the Station Area Plan. Where potentially significant impacts are identified, mitigation measures are recommended.

a. Criteria of Significance. Implementation of the Station Area Plan would have a significant impact on hydrology and water quality if it were to result in:

- Exposure of people or structures to a high risk of loss, injury, or death involving flooding, including flooding as a result of failure of a levee or dam;

³⁰ Marin County Flood Control and Water Conservation District, 2011. *Capital Improvement Plan Study for Flood Damage Reduction and Creek Management in Flood Zone 9/Ross Valley*. May.

- Placement of structures or improvements within a 100-year flood hazard area as mapped on the FEMA Flood Insurance Rate Map City of Larkspur, Marin County, California (Community Panel #065040 0001B) or any other flood hazard delineation map;³¹
- Creation or contribution of runoff water that would exceed the capacity of an existing or planned stormwater drainage system;
- Substantial alteration of the existing drainage pattern of the site or Plan area, including the alteration of the course of either marine or fresh water, or a substantial increase in the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite;
- The discharge of sediment or contaminants into surface water or wetlands, other adverse changes in surface water quality, or that could result in a violation of water quality standards or waste discharge standards;
- Substantial degradation or depletion of groundwater supplies or substantial interference with groundwater recharge, lowering of the local groundwater table level, or changes in the direction or rate flow of groundwater 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); or
- The contamination of a public water supply or other substantial degradation of water quality.

b. Impacts Analysis. The following sections provide an evaluation and analysis for the potential less-than-significant, significant and cumulative impacts of the Station Area Plan for each of the criteria of significance listed above.

(1) Failure of Levee or Dam. Parts of the Plan area could be inundated by the failure of the Phoenix Lake dam and a small dam forming Tubb Lake. Both dams are currently being maintained by their owners, the MMWD and City of Larkspur, respectively, and therefore the potential for flooding due to a dam failure would be remote, and related impacts would be less than significant.

(2) Housing Within a 100-Year Flood Hazard Area and Other Flooding Hazards. New development under the Plan could place housing and other new construction in flood zones, including within the 100-year flood hazard boundary. Existing federal and State programs address potential flooding impacts. FEMA is responsible for mapping flood hazard zones. State law AB 162, among other provisions, requires the annual review of flood hazard zones.

Existing City provisions for flood hazard reduction (contained in Chapter 15.18.050 of the Larkspur Municipal Code) require additional structural anchoring, use of flood resistant construction materials and methods, and elevation of all residential floors to above the base flood level for all construction in a mapped flood hazard zone. Construction in coastal high hazard zones is subject to additional requirements, including certification of a registered engineer and architect that proposed structures will resist flotation, collapse, and lateral movement from potential wind and water loads during a coastal flooding event.

³¹ The City also requires that finished floor elevations be at least 1 foot above the 100-year floor elevation.

While current programs and regulations would adequately mitigate existing flood hazards, they do not address the potential for the exacerbation of these hazards due to projected sea level rise. As noted in the setting section, a sea level rise of 55 inches has been predicted by 2100, within the potential operational lifetime of new development in the Plan area. Mapping shows that several low lying portions of the Plan area, which are currently mapped in 100-year flood hazard zones, could be affected by a sea level rise of this magnitude. This is a potentially significant impact.

Impact HYDRO-1: Implementation of the Station Area Plan could result in substantial risk related to exacerbated flooding hazards as a result of predicted sea level rise. (S)

Implementation of the following mitigation measure would ensure that impacts related to new development flooding hazards would be less than significant.

Mitigation Measure HYDRO-1: The City shall amend the General Plan to include the following policy in the Health and Safety Element:

Development projects within a mapped flood hazard zone shall incorporate measures to protect future residents and users from exacerbation of flood hazards due to sea level rise. This shall include certification by a professional engineer or architect that floor elevations and other building requirements for construction in a flood hazard zone shall remain protective of persons and property in the event of a 55-inch sea level rise. (LTS)

(3) Contribute Runoff Water or Polluted Runoff Exceeding Stormwater System Capacity. Development associated with the Station Area Plan may increase and alter the area and location of impervious surfaces, which has the potential to increase stormwater runoff volumes, potentially resulting in hydromodification impacts (degradation of water quality in creeks related to higher erosive flows). Construction activities, operation of new development, and associated changes in runoff patterns also have the potential to introduce contaminants to stormwater. However, existing stormwater permit programs address this potential impact. An infrastructure needs analysis conducted for the Plan³² concluded that future development in the Plan area would have a negligible impact on the City storm drainage system due to regulatory requirements.³³ Therefore, compliance with existing NPDES permits for construction and post-construction as well as compliance with the updated MS4 permit for development after June 2015 would be expected to reduce stormwater flows and pollutant loads over existing conditions, as projects are developed, and reduce this impact to a less-than-significant level. No additional mitigation is required.

(4) Alter Existing Drainage Patterns Affecting Surface Water Courses or Creating Flooding. As noted in the above section, development associated with the Station Area Plan has the potential to increase and alter impervious surfaces, which could increase stormwater runoff volumes, potentially resulting in hydromodification impacts (degradation of water quality in creeks related to higher erosive flows). However, existing stormwater permits would require new development to ensure that impacts related to stormwater under the Station Area Plan would be less than significant.

³² BMS Design Group, 2013. *Infrastructure Needs Analysis Technical Report, Larkspur Station Area Plan*. December 10.

³³ Ibid.

Please refer to Section IV.L, Utilities and Infrastructure, for additional discussion regarding the City's stormwater collection system.

(5) Violate Water Quality Standards. New development associated with the Station Area Plan would be subject to existing water quality regulations and programs, as described in the Regulatory Framework section above. These programs establish water quality standards and provide enforcement and specific new development projects would be required to comply with these programs. Compliance with existing regulatory programs would ensure that water quality impacts related to Station Area Plan development would be less than significant and no additional mitigation measures are required.

(6) Degrade or Deplete Groundwater Supplies or Recharge. Changes in impervious surface as part of proposed Station Area Plan development would be minor compared to the 24.7 square miles of the Ross Valley Watershed, and no significant changes in groundwater recharge would be expected as a result of development associated with the Station Area Plan. No groundwater use would be anticipated as a result of development under the Station Area Plan. MMWD provides water supply for the Plan area. MMWD does not rely on groundwater for water supply, as most of MMWD water originates from rainwater within MMWD watershed areas, with a small amount imported from the Russian River.³⁴ Therefore, groundwater impacts would be less than significant and no additional mitigation measures are required.

(7) Contamination of Water Supply or Degradation of Water Quality. As noted under criteria (5), above, existing regulatory requirements would reduce water quality impacts from development associated with the Station Area Plan to a less-than-significant level and no additional mitigation measures are required.

c. Cumulative Impacts of the Station Area Plan. Some of the impacts discussed in this section, such as flooding, are site-specific. Although development has the potential to increase greenhouse gas emissions which may accelerate sea level rise and increase flooding hazards, development under the Station Area Plan would be subject to local and regional planning efforts such as the City of Larkspur Climate Action Plan that would reduce cumulative impacts related to sea level rise to a less-than-significant level. More detail is provided in Section IV.D, Global Climate Change. However, construction under the Station Area Plan, in combination with construction of other areas within the Ross Valley Watershed, could increase erosion and sedimentation and degrade storm water runoff quality during the construction activities if grading and excavations occur during the wet season. Implementation of existing regulatory requirements, including preparation and implementation of Stormwater Pollution Prevention Plans, are required under current NPDES regulations. These measures would reduce potential construction-period cumulative impacts to a less-than-significant level. Redevelopment of sites, in accordance with existing stormwater requirements, would require the treatment and retention of stormwater during the operational phase of areas developed under the Station Area Plan. Therefore, the project would not make a significant cumulative contribution to adverse hydrology and water quality impacts within the watershed.

³⁴ Marin Municipal Water District, 2012. *Fact Sheet*. Website: www.marinwater.org/documents/District_Fact_Sheet_2012.pdf (accessed May 20, 2013).