

HYDROLOGY AND WATER QUALITY

4.10 HYDROLOGY AND WATER QUALITY

This chapter describes the potential impacts associated with the adoption and implementation of the proposed project that are related to hydrology and water quality. A summary of the relevant regulatory framework and existing conditions is followed by a discussion of project and cumulative impacts.

4.10.1 ENVIRONMENTAL SETTING

4.10.1.1 REGULATORY FRAMEWORK

Federal Regulations

Clean Water Act

The United States Environmental Protection Agency (USEPA) is the lead federal agency responsible for water quality management. The Clean Water Act (CWA) (codified at 33 United States Code Sections 1251 to 1376) of 1972 is the primary federal law that governs and authorizes water quality control activities by the EPA, as well as the states. Various elements of the CWA, which address water quality, are discussed below.

Permits to dredge or fill waters of the United States are administered by the United States Army Corps of Engineers (USACE) under Section 404 of the CWA. “Waters of the United States” are defined as territorial seas and traditional navigable waters, perennial and intermittent tributaries to those waters, lakes and ponds and impoundments of jurisdictional waters, and wetlands adjacent to jurisdictional waters. The regulatory branch of the USACE is responsible for implementing and enforcing Section 404 of the CWA and issuing permits. Any activity that discharges fill material and/or requires excavation in waters of the United States must obtain a Section 404 permit. Before issuing the permit, the USACE requires that an analysis be conducted to demonstrate that the proposed project is the least environmentally damaging practicable alternative. Also, the USACE is required to comply with the National Environmental Policy Act before it may issue an individual Section 404 permit.

Under Section 401 of the CWA, every applicant for a Section 404 permit that may result in a discharge to a water body must first obtain State Water Quality Certification that the proposed activity will comply with State water quality standards. Certifications are issued in conjunction with USACE Section 404 permits for dredge and fill discharges. In addition, an application for Individual Water Quality Certification and/or Waste Discharge Requirements must be submitted for any activity that would result in the placement of dredged or fill material in waters of the State that are not jurisdictional to the USACE, such as isolated wetlands, to ensure that the proposed activity complies with State water quality standards. In California, the authority to either grant water quality certification or waive the requirement is delegated by the State Water Resources Control Board (SWRCB) to its nine Regional Water Quality Control Boards (RWQCB).

Under federal law, the USEPA has published water quality regulations under Volume 40 of the Code of Federal Regulations. Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question and (2) criteria that protect the

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designated uses. Section 304(a) requires the USEPA to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use. In California, the USEPA has delegated authority to the SWRCB and its RWQCBs to identify beneficial uses and adopt applicable water quality objectives.

When water quality does not meet CWA standards and compromises designated beneficial uses of a receiving water body, Section 303(d) of the CWA requires that water body be identified and listed as “impaired”. Once a water body has been designated as impaired, a Total Maximum Daily Load (TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, nonpoint, and natural sources that a water body may receive without exceeding applicable water quality standards, with a factor of safety included. Once established, the TMDL allocates the loads among current and future pollutant sources to the water body.

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) permit program was established by the CWA to regulate municipal and industrial discharges to surface waters of the United States, including discharges from municipal separate storm sewer systems (MS4). Federal NPDES permit regulations have been established for broad categories of discharges, including point-source municipal waste discharges and nonpoint-source stormwater runoff. NPDES permits generally identify effluent and receiving water limits on allowable concentrations and/or mass emissions of pollutants in the discharge; prohibitions on discharges not specifically allowed under the permit; and provisions that describe required actions by the discharger, including industrial pretreatment, pollution prevention, self-monitoring, and other activities.

Under the NPDES Program, all facilities that discharge pollutants into waters of the United States are required to obtain a NPDES permit. Requirements for stormwater discharges are also regulated under this program. In California, the NPDES permit program is administered by the SWRCB through the nine RWQCBs. The City of San Rafael lies within the jurisdiction of San Francisco Bay RWQCB (Region 2) and is subject to the waste discharge requirements for the Phase II Small MS4 Permit (Order No. 2013-0001-DWQ) and NPDES Permit No. CAS000004, with the last amendment, Order No. WQ 2018-0007-EXEC, issued in March 2018 and the latest amendments taking effect on January 1, 2019.

Under Provision E.12 of the NPDES Permit, the co-permittees use their planning authorities to include appropriate source control, site design, and stormwater treatment measures in new development and redevelopment projects to address both soluble and insoluble stormwater runoff pollutant discharges and prevent increases in runoff flows from new development and redevelopment projects. This goal is accomplished primarily through the implementation of low impact development techniques. In addition, projects that create and/or replace one acre or more of impervious surfaces must comply with the hydromodification requirements specified in the E.12 provisions of the Phase II Small MS4 permit. These requirements include implementing site design measures to achieve infiltration, evapotranspiration, and/or harvesting/reuse of the 85th percentile 24-hour storm runoff event to the extent feasible and treatment of the remaining runoff with bioretention facilities. The hydromodification provisions also require that post-project runoff does not exceed pre-project runoff for the 2-year, 24-hour storm event.

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Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA also issues Flood Insurance Rate Maps (FIRMs) that identify which land areas are subject to flooding. These maps provide flood information and identify flood hazard zones in the community. The design standard for flood protection is established by FEMA. FEMA's minimum level of flood protection for new development is the 100-year flood event, also described as a flood that has a 1-in-100 chance of occurring in any given year. The locations within the 100-year floodplain are provided on Figure 4.10-3.

Additionally, FEMA has developed requirements and procedures for evaluating earthen levee systems and mapping the areas affected by those systems. Levee systems are evaluated for their ability to provide protection from 100-year flood events, and the results of this evaluation are documented in the FEMA Levee Inventory System. Levee systems must meet minimum freeboard standards and must be maintained according to an officially adopted maintenance plan. Other FEMA levee system evaluation criteria include structural design and interior drainage.

As required by the FEMA regulations, all development constructed within the Special Flood Hazard Zone (as delineated on the FIRM) must be elevated so that the lowest floor is at or above the base flood elevation level. The term "development" is defined by FEMA as any human-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials. Per these regulations, if development in these areas occurs, a hydrologic and hydraulic analysis must be performed prior to the start of development and must demonstrate that the development does not cause any rise in base flood elevation levels, because no rise is permitted within regulatory floodways. Upon completion of any development that changes existing Special Flood Hazard Area boundaries, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision, as soon as practicable, but not later than six months after such data become available.

Rivers and Harbors Act of 1899

Under the Rivers and Harbors Act of 1899, the USACE requires permits for activities involving the obstruction of the navigable capacity of any waters of the United States or the construction of any structures in or over navigable waters of the United States, including ports, canals, navigable rivers, or other waters. "Navigable waters" under Section 10 of the Rivers and Harbors Act are defined as "those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce." Pursuant to Section 10 of the Rivers and Harbors Act, the USACE administers this regulatory program separate from the Section 404 program. A Section 10 permit may be required for structures or work outside the limits of navigable waters if the structure or work affects the course, location, condition, or capacity of the water body.

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Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides the basic authority for the United States Fish and Wildlife Service (USFWS) to evaluate impacts to fish and wildlife from proposed water resource development projects. This act requires that all federal agencies consult with the USFWS, the National Marine Fisheries Service, and State wildlife agencies (i.e., the California Department of Fish and Wildlife or CDFW) for activities that affect, control, or modify waters of any stream or bodies of water. Under this act, the USFWS has responsibility for reviewing and commenting on all water resources projects. For example, it would provide consultation to the USACE prior to issuance of a Section 404 permit.

If a project may result in the “incidental take” of a listed species, an incidental take permit is required. An incidental take permit allows a developer to proceed with an activity that is legal in all other respects but that results in the “incidental taking” of a listed species. A habitat conservation plan must also accompany an application for an incidental take permit. The purpose of a habitat conservation plan is to ensure that the effects of the permitted action on listed species are adequately minimized and mitigated.

State Regulations

Porter-Cologne Water Quality Act

The Porter-Cologne Water Quality Act (Water Code sections 13000 et seq.) is the basic water quality control law for California. This act established the SWRCB and divided the state into nine regional basins, each under the jurisdiction of an RWQCB. The SWRCB is the primary State agency responsible for the protection of California’s water quality and groundwater supplies. The RWQCBs carry out the regulation, protection, and administration of water quality in each region. Each regional board is required to adopt a water quality control plan or basin plan that recognizes and reflects the regional differences in existing water quality, the beneficial uses of the region’s ground and surface water, and local water quality conditions and problems. As stated previously, San Rafael is within the jurisdiction of the San Francisco Bay RWQCB (Region 2).

The Porter-Cologne Act also authorizes the SWRCB and RWQCBs to issue and enforce waste discharge requirements, NPDES permits, Section 401 water quality certifications, or other approvals. Other State agencies with jurisdiction over water quality regulation in California include the California Department of Health Services for drinking water regulations, the CDFW, and the Office of Environmental Health and Hazard Assessment.

State Water Resources Control Board

In California, the SWRCB has broad authority over water quality control issues for the State. The SWRCB is responsible for developing statewide water quality policy and exercises the powers delegated to the State by the federal government under the CWA.

Regional authority for planning, permitting, and enforcement is delegated to the nine RWQCBs. The regional boards are required to formulate and adopt water quality control plans for all areas in the region and establish water quality objectives in the plans. The project is within the jurisdiction of the San Francisco Bay RWQCB (Region 2), which regulates surface water and groundwater quality in San Francisco

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Bay. The RWQCB's jurisdiction includes all the San Francisco Bay's segments extending to the mouth of the Sacramento-San Joaquin Delta.

State Water Resources Control Board Construction General Permit

In California, the SWRCB has broad authority over water quality control issues for the State. The SWRCB is responsible for developing statewide water quality policy and exercises the powers delegated to the State by the federal government under the CWA.

Construction activities that disturb one or more acres of land that could impact hydrologic resources must comply with the requirements of the SWRCB Construction General Permit (2009-0009-DWQ) as amended by 2010-0014-DWQ and 2012-0006-DWQ. Under the terms of the permit, applicants must file Permit Registration Documents (PRD) with the SWRCB prior to the start of construction. The PRDs include a Notice of Intent, risk assessment, site map, Storm Water Pollution Prevention Plan (SWPPP), annual fee, and a signed certification statement. The PRDs are submitted electronically to the SWRCB via the Stormwater Multiple Application and Report Tracking System (SMARTS) website.

Applicants must also demonstrate conformance with applicable best management practices (BMPs) and prepare a SWPPP containing a site map that shows the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project site. The SWPPP must list BMPs that would be implemented to prevent soil erosion and discharge of other construction-related pollutants that could contaminate nearby water resources. Additionally, the SWPPP must contain a visual monitoring program, a chemical monitoring program for nonvisible pollutants if there is a failure of the best management practices, and a sediment-monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Some sites (Risk Level 2 and 3) also require implementation of a Rain Event Action Plan 48 hours prior to a 50 percent or greater chance of a precipitation event.

In addition, the SWRCB requires all projects subject to a grading permit or a building permit that has the potential for erosion or significant discharges of sediment and/or construction waste, to submit an Erosion and Sediment Control Plan (ESCP) for approval by the City. The ESCP must describe erosion and sediment control measures that will be implemented during the construction phase as well as final stabilization control measures. The BMPs specified in the ESCP must be implemented year-round and the ESCP format should follow the most recent version of the MCSTOPPP Construction Erosion and Sediment Control Plan Applicant Package. This requirement applies to projects that are less than one acre in size if they require grading permits or building permits that could result in non-stormwater discharges to a storm drain. Projects subject to the SWRCB Construction General Permit may include the ESCP provisions within the SWPPP.

State Water Resources Control Board Trash Amendments

On April 7, 2015, the SWRCB adopted an amendment to the *Water Quality Control Plan for Ocean Waters of California* to control trash and Part 1, Trash Provisions, of the *Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California*. They are collectively referred to as "the Trash Amendments". The Trash Amendments apply to all surface waters of California and include a land-use-

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based compliance approach to focus trash controls on areas with high trash-generation rates. Areas such as high density residential, industrial, commercial, mixed urban, and public transportation stations are considered priority land uses. There are two compliance tracks for Phase I and Phase II MS4 permittees:

- Track 1: Permittees must install, operate, and maintain a network of certified full capture systems in storm drains that capture runoff from priority land uses.
- Track 2: Permittees must implement a plan with a combination of full capture systems, multibenefit projects, institutional controls, and/or other treatment methods that have the same effectiveness as Track 1 methods.

The Trash Amendments provide a framework for permittees to implement their provisions. Full compliance must occur within 10 years of the permit, and permittees must also meet interim milestones such as average load reductions of 10 percent per year. The amendment mandates that the City needs to install catch basin filters on all City catch basins by December 2, 2030.¹ However, the City is concerned about the effect that these filters may have on the performance of the storm drain system.² There currently are some trash devices installed at commercial properties, such as the Northgate Mall, but the City does not maintain these devices.

State Water Resources Control Board General Industrial Permit

The Statewide General permit for Storm Water Discharges Associated with Industrial Activities, Order No. 2014-0057-DWQ and amended by 2015-0122-DWQ (2018) implements the federally required storm water regulations in California for storm water associated with industrial activities that discharge to waters of the United States. This regulation covers facilities that are required by federal regulations or by the RWQCBs to obtain an NPDES permit. Dischargers are required to eliminate nonstorm water discharges, develop SWPPPs that include BMPs, conduct monitoring of stormwater runoff, and submit all compliance documents via the SWRCB's SMARTS program.

California Water Code Section 13751: Water Wells

Section 13751 of the Water Code requires a Well Completion Report (WCR) to be completed by each person who digs, bores, or drills a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well or abandons or modifies an existing well. The WCR should be filed with the California Department of Water Resources (DWR) within 60 days of the date that construction, alteration, abandonment, or destruction of a well is completed.³ Completed WCRs are sent to and maintained at the DWR regional office that serves the area where the well is located.

¹ State Water Resources Quality Control Board. January 7, 2019. Storm Water Program - Trash Implementation Program. https://www.waterboards.ca.gov/water_issues/programs/stormwater/trash_implementation.html

² City of San Rafael Public Work Department. May 8, 2019. Interview with Kevin McGowan, Assistant Public Works Director/City Engineer.

³ California Department of Water Resources, 2020. Well Completion Reports, accessed on July 7, 2020, <https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Completion-Reports>.

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California Coastal Act of 1976

The California Coastal Act of 1976 established three designated coastal management agencies to plan and regulate the use of land and water in the coastal zone: the California Coastal Commission, the San Francisco Bay Conservation and Development Commission (BCDC), and the California Coastal Conservancy. Under California's federally approved Coastal Management Program, the California Coastal Commission manages development along the California coast except for San Francisco Bay, which is overseen by the BCDC. The City of San Rafael is under the jurisdiction of the BCDC for all land within 100 feet of the shoreline. The mission of the California Coastal Conservancy is to purchase, protect, restore, and enhance coastal resources and provide shoreline access. Additional information on the BCDC is discussed in Regional Regulations, below.

California Department of Fish and Wildlife

The CDFW protects streams, water bodies, and riparian corridors through the streambed alteration agreement process under Sections 1601 to 1606 of the California Fish and Game Code. The Fish and Game Code stipulates that it is "unlawful to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake" without notifying the CDFW, incorporating necessary mitigation, and obtaining a streambed alteration agreement. CDFW's jurisdiction extends to the top of banks and often includes the outer edge of riparian vegetation.

Water Conservation in Landscaping Act of 2006

The Water Conservation in Landscaping Act includes the State of California's Model Water Efficient Landscape Ordinance (MWELo), which requires cities and counties to adopt landscape water conservation ordinances. The MWELo was revised in July 2015 via Executive Order B-29-15 to address the ongoing drought and build resiliency for future droughts. State law requires all land use agencies, which includes cities and counties, to adopt a WELO that is at least as efficient as the MWELo prepared by the DWR. The 2015 revisions to the MWELo improve water conservation in the landscaping sector by promoting efficient landscapes in new developments and retrofitted landscapes. The revisions increase water efficiency by requiring more efficient irrigation systems, incentives for grey water usage, improvements in on-site stormwater capture, and limiting the portion of landscapes that can be covered in high-water-use plants and turf. New development projects that include landscape areas of 500 square feet or more are subject to the MWELo. This applies to residential, commercial, industrial, and institutional projects that require a permit, plan check, or design review. The previous landscape size threshold for new development projects ranged from 2,500 square feet to 5,000 square feet.⁴ The size threshold for rehabilitated landscapes has not changed and remains at 2,500 square feet.

Chapter 13.02 of the Marin Municipal Water District (MMWD) Code adopts an ordinance that incorporates updates consistent with the 2015 update. The City of San Rafael has adopted the MMWD

⁴ California Department of Water Resources, 2015. Updated Model Water Efficient Landscape Ordinance, Guidance for California Local Agencies, <https://water.ca.gov/LegacyFiles/wateruseefficiency/landscapeordinance/docs/2015%20MWELo%20Guidance%20for%20Local%20Agencies.pdf>, accessed on March 20, 2019.

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Ordinance, as codified in the San Rafael Municipal Code (SRMC) Section 14.16.370, Water-Efficient Landscape.

Regional Regulations

San Francisco Bay Regional Water Quality Control Board

The City of San Rafael is within the jurisdiction of the San Francisco Bay RWQCB (Region 2). The San Francisco Bay RWQCB addresses regionwide water quality issues through the creation and triennial update of the *San Francisco Bay Basin Water Quality Control Plan* (Basin Plan). The Basin Plan was adopted in 1995 and most recently amended May 4, 2017. This Basin Plan designates beneficial uses of the State waters within Region 2, describes the water quality that must be maintained to support such uses, and provides programs, projects, and other actions necessary to achieve the standards established in the Basin Plan.⁵ The *Water Quality Control Policy for the Enclosed Bays and Estuaries of California*, as adopted by the SWRCB in 1995 and last amended in 2018, also provides water quality principles and guidelines to prevent water quality degradation and protect the beneficial uses of waters of enclosed bays and estuaries.⁶ The San Francisco Bay RWQCB also administers the Phase II Small MS4 permit for Marin County and the municipalities within Marin County, including the City of San Rafael. Additional information regarding this permit is provided in the NPDES section on page 4.10-2.

Bay Protection and Toxic Cleanup Program

In 1989, the California legislature established the Bay Protection and Toxic Cleanup Program with the goal of protecting present and future beneficial uses of the Bay and estuarine waters of California. In addition, the program was tasked with identifying toxic hot spots (i.e., localized areas with elevated concentrations of pollutants) and developing prevention and control strategies to remediate the toxic hot spots. As part of this program, in 1993 the San Francisco Bay RWQCB initiated the Regional Monitoring Program. The purpose of the program is to assess regional water quality conditions, characterize patterns and trends of contaminant concentrations and distribution in the water column, and identify general sources of contamination to San Francisco Bay. The program has established a database of water quality and sediment quality in the Bay, particularly with respect to trace elements and organic contaminants.

San Francisco Bay Conservation and Development Commission

The California Coastal Act carries out its mandate locally through the BCDC. BCDC's jurisdiction for San Francisco Bay includes all sloughs, marshlands between mean high tide and five feet above mean sea level, tidelands, submerged lands, and land within 100 feet of the shoreline. This includes the San Pablo Bay and San Rafael Bay shorelines within the Environmental Impact Report (EIR) Study Area, but BCDC's

⁵ San Francisco Bay RWQCB, 2017 *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin*, https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf, accessed on June 22, 2020.

⁶ State Water Resources Control Board, 1995. *Water Quality Control Policy for the Enclosed Bays and Estuaries of California, as Adopted by Resolution No. 95-84 on November 16, 1995*. Latest revision on June 5, 2018.

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jurisdiction ends at the mouth of San Rafael Creek/Canal. The precise boundaries are clarified by BCDC upon request.

The current BCDC policy allows for the protection of existing and planned development from flooding by the placement of fill, encourages innovative means of dealing with flood danger, and states that local governments will determine how best to deal with development projects inland of BCDC's jurisdiction, which extends 100 feet inland from the shoreline. The provisions of BCDC's *San Francisco Bay Plan* do not apply outside BCDC's jurisdiction for purposes of implementing the California Environmental Quality Act (CEQA).⁷

The new BCDC policies require sea level rise risk assessments to be conducted when planning shoreline areas or designing large shoreline projects within BCDC's jurisdiction. Risk assessments are not required for repairs of existing facilities, interim projects, small projects that do not increase risks to public safety, and infill projects within existing urbanized areas. Projects within the shoreline band, the area within 100 feet of the shoreline, need only address risks to public access.

As a permitting authority along the San Francisco Bay shoreline, BCDC is responsible for granting or denying permits for any proposed fill, extraction of materials, or change in the use of any water, land, or structure within BCDC's jurisdiction. Permits may be granted or denied only after public hearings and after the process for review and comment has been completed by the City (or by the County for projects within unincorporated areas). BCDC will approve the permit if it is determined that the project is in accordance with defined standards for use of the shoreline, provisions for public access, and advisory review of appearance.

Projects within BCDC jurisdiction that involve bay fill must be consistent with the policies of the BCDC's *San Francisco Bay Plan* on the safety of fills and shoreline protection. Land elevation changes caused by tectonic activity or consolidation/compaction of soft soils, such as bay muds, is variable around the San Francisco Bay. Consequently, some parts of the San Francisco Bay may experience a greater relative rise in sea level than other areas. According to BCDC policies, new projects built on fill or near the shoreline should be set back from the edge of the shore so that the project will not be subject to dynamic wave energy; be built so the bottom floor of structures will be above a 100-year flood elevation that takes future sea level rise into account for the expected life of the project; be specifically designed to tolerate periodic flooding; or employ other effective means of addressing the impacts of future sea level rise and storm activity.

Marin County Stormwater Pollution Prevention Program

Marin County's 11 cities and towns, including the City of San Rafael and the County of Marin began addressing stormwater pollution in the early 90s. In 1993 they created the Marin County Stormwater Pollution Prevention Program (MCSTOPPP). The following goals are key to implementing the MCSTOPPP:

⁷ San Francisco Bay Conservation and Development Commission, 2011. *Resolution No. 11-08: Adoption of Bay Plan Amendment Adding New Climate Change Findings and Policies to the Bay Plan.*

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- Prevent stormwater pollution.
- Protect and enhance water quality in creeks and wetlands.
- Preserve beneficial uses of local waterways.
- Comply with State and federal regulations.

Each MCSTOPPP member agency implements a local stormwater pollution prevention program and funds the countywide MCSTOPPP, which provides for the coordination and consistency of approaches between the local stormwater programs.⁸ MCSTOPPP also provides technical assistance to member agencies and the public and implements an outreach and education program. Resources are also provided for construction projects, including the MCSTOPPP Erosion and Sediment Control Plan Applicant Package, which must be submitted to the applicable municipality for review and approval prior to the start of construction. Minimum control measures for small (<1 acre) construction projects are provided. If dewatering will occur, the project applicant must follow the MCSTOPPP trench dewatering BMPs. Post-construction stormwater requirements are also provided at MCSTOPPP's website, which includes projects that create and/or replace more than 2,500 square feet of impervious area.⁹

Bay Area Stormwater Management Agencies Association

The Bay Area Stormwater Management Agencies Association (BASMAA) is a consortium of the following nine San Francisco Bay Area municipal stormwater programs:

- Alameda Countywide Clean Water Program
- Contra Costa Clean Water Program
- Fairfield-Suisun Urban Runoff Management Program
- Marin County Stormwater Pollution Prevention Program
- Napa Countywide Stormwater Pollution Prevention Program
- San Mateo Countywide Water Pollution Prevention Program
- Santa Clara Valley Urban Runoff Pollution Prevention Program
- Sonoma County Water Agency
- Vallejo Sanitation and Flood Control District

BASMAA was initiated by local governments in response to the NPDES permitting program for stormwater to promote regional consistency and to facilitate efficient use of public resources. BASMAA encourages information sharing and cooperation and develops products and programs that are more cost-effective when produced regionally than could be accomplished locally.¹⁰ The BASMAA Post-construction Manual includes standards and requirements applicable to development projects within the city of San Rafael and the EIR Study Area. The Manual provides a low impact development approach to implementing Provision E.12 of the Phase II Small MS4 permit, which requires postconstruction stormwater BMPs. Provision E.12

⁸ County of Marin, 2019, About MCSTOPPP <https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/about-mcstoppp>, accessed on March 20, 2019.

⁹ County of Marin, 2020. Development Projects/Post Construction Stormwater Management. Accessed at <https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/development/new-and-redevelopment-projects?panelnum=2> on October 5, 2020.

¹⁰ Bay Area Stormwater Management Agencies Association, The Mission of BASMAA <http://basmaa.org/About-BASMAA>, accessed on March 20, 2019.

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requires single-family homes that create and/or replace 2,500 square feet of impervious surface or small projects that create and/or replace between 2,500 and 5,000 square feet of impervious surface to implement at least one BMP to reduce runoff. Regulated projects that create and/or replace 5,000 square feet or more of impervious surface must implement site design and runoff reduction BMPs and prepare a Stormwater Control Plan (SCP).

Marin County Flood Control and Water Conservation District

The mission of the Marin County Flood Control and Water Conservation District (MCFCWCD) is to reduce the risk of flooding for the protection of life and property within Marin County. The MCFCWCD is responsible for the planning, design, construction, operation, and maintenance of facilities such as stormwater pump stations, detention basins, bypass drains, creeks, ditches, and levees.

Multiple flood control district zones have been established within the MCFCWCD to address specific flooding problems across Marin County. These zones do not cover the entire county and are, for the most part, concentrated in the county's eastern urbanized corridor. Zone 6 is in the city limits and encompasses the residential area known as the San Rafael Meadows. Zone 6 was created in the 1960s to address frequent flooding in the low-lying area just west of US-101 across from the Marin County Civic Center. Zone 6 is overseen by a five-member advisory board. In the early 2000s, construction of a new subdivision rerouted stormwater around the community, eliminating a significant source of flooding in the zone. Work within Zone 6 includes an annual vegetation maintenance program along 0.75 mile of Gallinas Creek.

Zone 7 is located outside the city limits and encompasses the area known as Santa Venetia that is in the EIR Study Area. Zone 7 was created in 1962 to address creek and tidal flooding within the low-lying neighborhood of Santa Venetia. Santa Venetia was one of the first developments in Marin County to be constructed on fill over Bay mud and, due to the low initial elevation of the fill and compression of the underlying Bay mud, the area has subsided and is now below the high tide level. Work in Zone 7 includes regular servicing of 14 pumps at five pump stations, maintenance of five portable pumps, maintenance of 1.9 miles of flood protection levees, maintenance of tide gates and trash racks, and an annual vegetation maintenance program along 0.85 mile of Gallinas Creek.¹¹

Local Regulations

San Rafael General Plan 2020

The City of San Rafael 2020 General Plan goals, policies, and programs relevant to hydrology and water quality are primarily in the Sustainability, Safety, and Air and Water Quality Elements. As part of the proposed General Plan 2040, some existing General Plan goals, policies, and programs would be amended or substantially changed and new policies would be added. A comprehensive list of policy changes is provided in Appendix B, Proposed General Plan Goals, Policies, and Programs, of this Draft EIR. Applicable goals, policies, and programs are identified and assessed for their effectiveness and potential to result in an adverse physical impact later in this chapter under Section 4.10.3, Impact Discussion.

¹¹ Marin County Flood Control and Water Conservation District, 2020. About the Flood Control Zones. Accessed at <https://www.marinwatersheds.org/flood-protection/flood-control-zones#undefined6> on June 23, 2020.

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San Rafael Municipal Code

The SRMC includes various directives to minimize adverse impacts to water quality and prevent flooding in San Rafael. The SRMC is organized by title, chapter, and section. Sections of the SRMC related to hydrology and water quality impacts include Title 3, Finance and Taxation, Title 9, Health and Sanitation, Title 11, Public Works, Title 17, Waters and Waterways, and Title 18, Protection of Flood Hazard Areas, as follows:

- **Chapter 3.32, Public Facilities Development Fees.** This chapter establishes fees for new construction in the City to pay for needed public facilities and improvements. The fees are used to:
 - Pay for the planning, design, and construction of designated public facilities.
 - Reimburse the City for public facilities constructed by the City with local funds from other sources.
 - Reimburse developers who have constructed designated public facilities that exceed the capacity needed to mitigate impacts of the individual development project.
 - Pay for and/or reimburse costs of development and ongoing administration of the fee program.
- **Chapter 9.12, Offensive Wastes and Growths.** Section 9.12.020 of this chapter prohibits the dumping of garbage or sewage into the San Rafael Canal within the limits of the city or into any tidewater tributary to the canal or any slough, creek, inlet, ditch, or body of water fed by the San Rafael Canal.
- **Chapter 9.24, Well Standards.** This chapter protects groundwater and surface water by establishing standards regulating the construction, placement, reconstruction, and destruction of water wells, water supply sources, test holes, cathodic protection wells, and monitoring wells in the city. Section 9.24.070, Prohibition, prohibits the use of well water for more than one residential lot if the well is located within the MMWD's service area.
- **Chapter 9.30, Urban Runoff Pollution Prevention.** This chapter sets forth stormwater controls to be implemented to protect and enhance watercourses and fish and wildlife habitat by:
 - Minimizing discharges other than stormwater runoff to storm drains or watercourses.
 - Responding to the discharge of spills, preventing and controlling the discharge of spills to storm drains or watercourses, and prohibiting dumping or disposal of materials other than stormwater.
 - Reducing pollutants in stormwater discharges to the maximum extent practicable.
 - Requiring operators of construction sites, new or redeveloped land, and industrial and commercial facilities to install, implement, or maintain appropriate BMPs.
 - Maintaining predevelopment stormwater runoff rates and preventing nonpoint-source pollution whenever possible, through stormwater management controls and ensuring that these management controls are properly maintained.

Section 9.30.140, Construction-Phase BMPs, specifies construction-phase BMPs to prevent the discharge of contaminants to stormwater during construction, and Section 9.39.150 requires an ESCP to be prepared for review and approval by the City. Section 9.30.151, Land Development Standards for Permanent Stormwater Controls for New and Redevelopments, requires submittal and implementation of an SCP, subject to approval by the City and in accordance with the BASMAA Post-construction Manual and the Phase II Small MS4 Permit.

- **Chapter 9.40, Regulatory Fee for Clean Stormwater Activities.** This chapter ensures the future health, safety, and general welfare of the citizens of the city by establishing a funding source to provide enforcement of the City's Urban Runoff Pollution Prevention Ordinance, to provide maintenance and

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repair of the city's stormwater drainage facilities, to provide capital improvements to the city's storm drainage system, and to provide other clean stormwater activities.

- **Chapter 11.30, Watercourses.** This chapter prohibits any person from diverting, obstructing, or altering any watercourse, drainage channel, or drainage basin in the city, except in cases approved by the Department of Public Works and/or the City Engineer.
- **Chapter 14.18, Parking Standards.** This chapter provides landscaping requirements for new or renovated parking lots with more than five spaces. Included in the chapter is Section 14.18.160 (j), Biofiltration. These are measures to minimize the discharge of pollutants to the storm drain system, including the use of permeable pavers, bioswales, at-grade curbs, and opening in curbs to allow the filtration of runoff through landscaped areas.
- **Chapter 17.10, Dumping, Dredging, and Construction Within Tidal Waterways.** This chapter prohibits any dumping, dredging, uncontrolled filling, excavation, or construction in all portions of San Pablo Bay and San Rafael Bay, tidelands, shorelines, waterways, canals, beaches, or salt marshes within the city unless a Tidelands Permit is filed and approved.
- **Title 18, Protection of Flood Hazard Areas.** Regulations within Title 18 to minimize public and private losses due to flood conditions and is consistent with FEMA's National Flood Insurance Program. To accomplish its purposes, this title includes methods and provisions to:
 - Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities.
 - Require that uses vulnerable to floods be protected against flood damage at the time of initial construction.
 - Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters.
 - Control filling, grading, dredging, and other development that may increase flood damage.
 - Prevent or regulate the construction of flood barriers that will unnaturally divert flood waters or may increase flood hazards in other areas.

Local Hazard Mitigation Plan

The San Rafael Local Hazard Mitigation Plan (LHMP), adopted in November 2017, is a guide to hazard mitigation within the city and serves as a tool to help decision-makers direct hazard mitigation activities and resources. In the context of an LHMP, mitigation is an action that reduces or eliminates long-term risk to people and property from hazards, including flooding and sea level rise. Table 4.10-1 lists the LHMP actions to help reduce the risk of these hazards.

TABLE 4.10-1 LOCAL HAZARD MITIGATION PLAN MITIGATION ACTIONS RELEVANT TO WATER QUALITY

Number	Mitigation Action
Action 15	Elevate/Raise Low Lying Roadways.
Action 16	Elevate Critical Infrastructure.
Action 17	Improvements to Existing Berms, Levees and Flood Control Systems.
Action 18	Continued involvement in the BayWAVE county-wide vulnerability assessment (Phase 1 and 2); Implement resulting strategies from Phase 2 of the program.
Action 19	Develop a Climate Adaptation Plan and Implement Resulting Strategies.

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TABLE 4.10-1 LOCAL HAZARD MITIGATION PLAN MITIGATION ACTIONS RELEVANT TO WATER QUALITY

Number	Mitigation Action
Action 20	Freitas Ditch Riparian and Flood Improvement Project.
Action 21	Spinnaker Point Levee Assessment Study.
Action 31	Develop and Maintain a Community Rating System (CRS).
Action 32	Beach Drive Structural Flood Protection.
Action 33	Adopt a Drain Program.
Action 34	City Pump Station Analysis and Improvements.
Action 35	City Storm Drain System Analysis and Improvements.
Action 36	City Flood Alert System.
Action 37	Gallinas Creek Dredging.
Action 38	San Rafael Canal Dredging.

Source: City of San Rafael San Rafael Local Hazard Mitigation Plan, adopted in June 2017.

4.10.1.2 EXISTING CONDITIONS

Topography

The EIR Study Area extends from 1,800 feet above sea level in the coastal mountains to sea level at the tidal marshes and baylands on the eastern edge of the city. The higher, hilly portions of the EIR Study Area include the Terra Linda and Sleepy Hollow Open Space Areas in the northwest corner, Southern Heights Ridge on the southwestern edge, and Black Canyon and San Pedro Mountain in the eastern portion. The lower, flatter portions of the EIR Study Area include the Downtown Precise Plan Area and the Canal neighborhood. Santa Venetia, in the unincorporated area along Gallinas Creek, also is at a low elevation and subject to flooding.

Regional Hydrology

The EIR Study Area is located within three watersheds, as shown on Figure 4.10-1 and described below. Water typically flows from the northwest to the southeast through natural and urbanized creeks.

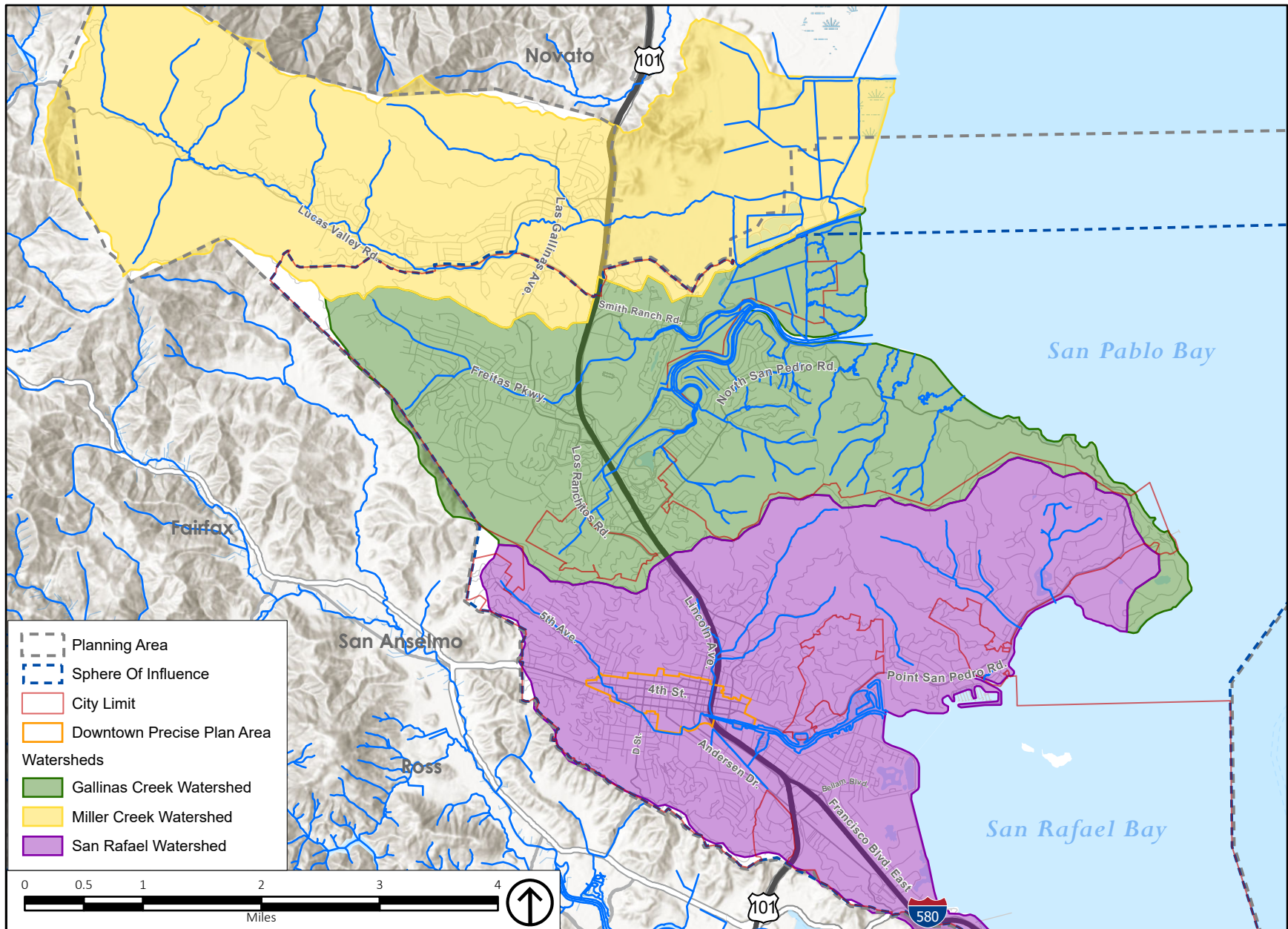
- Miller Creek Watershed.** The Miller Creek Watershed is in the northern portion of the EIR Study Area, immediately north of the Gallinas Creek Watershed. The watershed encompasses 12 square miles and flows eastward from the western end of the Lucas Valley, through Miller Creek Estates and Marinwood, to the Baylands at the Northwest Pacific Railroad Bridge.¹² Elevations range from 1,880 feet at Big Rock Ridge to sea level at San Pablo Bay.¹³ The upper watershed is located in Marin County Open Space, and the riparian habitat is somewhat degraded. The lower watershed flows through narrow, leveed channels into San Pablo Bay.¹⁴

¹² Marin Watershed Program, 2019 *Miller Creek*, <https://www.marinwatersheds.org/creeks-watersheds/miller-creek>, accessed on April 29, 2019.

¹³ City of San Rafael, 2004, *San Rafael General Plan 2020, Draft EIR*, Chapter 10, Hydrology, Water Quality, and Flood Hazards.

¹⁴ Marin Watershed Program, 2019, *Miller Creek Watershed, History and Habitat*, <https://www.marinwatersheds.org/miller-creek-watershed-history-and-habitat>, accessed on April 29, 2019.

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Source: ESRI, 2017; County of Marin, 2009; City of San Rafael, 2019; PlaceWorks, 2019.

Figure 4.10-1
Watersheds

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- **Gallinas Creek Watershed.** The Gallinas Creek Watershed is located between the Miller Creek and San Rafael Creek watersheds. The watershed encompasses 5.6 square miles that is split into two drainage areas, the North Fork and the South Fork of Gallinas Creek.¹⁵ The North Fork is the larger of the two and flows from the ridgeline through Santa Margarita Valley and the Terra Linda neighborhood to the South Gallinas slough near McInnis Park. Because of tidal influences on the North Fork of Gallinas Creek, the low-lying communities of Santa Venetia, Marin Lagoon, and Contempo Marin are protected by flood control levees. The South Fork originates in the San Rafael Hills and San Pedro Ridge and flows through San Rafael Meadows and Santa Venetia into the Gallinas Slough. Elevations of the Gallinas Creek Watershed range from 1,100 feet in the western portion to sea level in the eastern portion of the drainage area.¹⁶ The upper slopes of the watershed are County-owned open space, and the creek is tidally influenced and channelized east of US-101.¹⁷ A significant portion of the watershed consists of tidal marshes, and the marshes adjacent to San Pablo Bay contain man-made levees.
- **San Rafael Creek Watershed.** The San Rafael Creek Watershed is the southernmost of the three watersheds and is located south of the Gallinas Creek Watershed. The watershed encompasses 11 square miles, including the Downtown Precise Plan Area, and is densely developed from the hills to the filled wetlands.¹⁸ San Rafael Creek originates in the hills above Tamalpais Cemetery and flows through highly urbanized areas before forming the San Rafael Canal in the vicinity of Second Street at US-101. The upper stream corridor consists of short stretches of open stream channels, underground culverts, and trapezoidal open channels. San Rafael Creek eventually enters San Rafael Bay at Pickleweed Park.¹⁹ Elevations of the San Rafael Creek Watershed range from 1,100 feet in the hills above Tamalpais Cemetery to sea level at the San Rafael Bay.²⁰ The San Rafael Creek Watershed encompasses several tributary watersheds, including Irwin Creek, Black Canyon Creek, Sister's Creek, and Mahon Creek. In the eastern portion of the watershed, Glenwood Creek and Peacock Gap Creek drain directly to San Rafael Bay. San Rafael Bay lies between Point San Quentin to the south and Point San Pedro to the north and is a wide, shallow mudflat that is an embayment of San Pablo Bay.

Local Hydrology

Stormwater runoff within the EIR Study Area is conveyed to the San Pablo Bay and the San Rafael Bay via natural drainage channels and the City's and County's storm drain system. The storm drain system within the City of San Rafael consists of 20 miles of corrugated metal pipes, 84 miles of concrete pipe, and 12 miles of plastic pipe. The storm drain system has 3,800 drain inlets, 20 major headwalls, and 745 smaller

¹⁵ Marin Watershed Program, 2019, *Gallinas Creek, Zone 6: San Rafael Meadows & Zone 7: Santa Venetia & CSA 6: Gallinas Creek, 2019* at <https://www.marinwatersheds.org/creeks-watersheds/gallinas-creek#undefined1>, accessed on April 29, 2019..

¹⁶ City of San Rafael, 2004, *San Rafael General Plan 2020, Draft EIR, Chapter 10, Hydrology, Water Quality, and Flood Hazards*.

¹⁷ Marin Watershed Program, 2019, *Gallinas Creek Watershed, History and Habitat*, <https://www.marinwatersheds.org/gallinas-creek-watershed-history-and-habitat>, accessed on April 29, 2019.

¹⁸ Marin Watershed Program, 2019, *San Rafael Creek*, <https://www.marinwatersheds.org/creeks-watersheds/san-rafael-creek#undefined1>, accessed on April 29, 2019.

¹⁹ Marin Watershed Program, 2019, *San Rafael Creek*, <https://www.marinwatersheds.org/creeks-watersheds/san-rafael-creek#undefined1>, accessed on April 29, 2019.

²⁰ City of San Rafael, 2004, *San Rafael General Plan 2020, Draft EIR, Chapter 10, Hydrology, Water Quality, and Flood Hazards*.

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headwalls.²¹ The City also maintains approximately 35 miles of open ditches and culverts and 12 stormwater pump stations.²² Stormwater pipelines in San Rafael range from 4 to 60 inches in diameter. Reinforced box culverts are also part of the storm drain system. A more detailed discussion of the storm drain system is provided in Chapter 4.17, Utilities and Service Systems, of this Draft EIR.

The City is responsible for maintaining the storm drains and certain waterways within City easements. Property owners are responsible for storm drains that are located on their properties.²³ The MCFCWCD operates and maintains stormwater pump stations, detention basins, bypass drains, creeks, ditches, and levees that are outside of the city limits but within the EIR Study Area. A more detailed discussion of these zones and the maintenance programs is provided in the section on Flood Zones, below. San Rafael Canal from Grand Avenue Bridge to San Rafael Bay is maintained by the USACE because it is classified a navigable waterway. The USACE conducts periodic dredging in the canal to remove accumulated sediment and keep the waterway accessible for commercial and recreational traffic.²⁴

Groundwater

Two groundwater basins identified in the DWR Bulletin 118 are within the EIR Study Area, specifically the San Rafael Valley and Novato Valley Basins. The locations of these groundwater basins are shown on Figure 4.10-2. However, existing groundwater resources within the EIR Study Area are very limited due to a lack of substantial underlying groundwater aquifers and poor groundwater quality. In addition, SRMC Section 9.24.070, Prohibition, prohibits the use of well water for more than one residential lot if the well is located within the MMWD's service area. Groundwater use within the MMWD's service area is limited to small, domestic use through private groundwater wells. The MMWD has studied the potential for municipal groundwater use since the 1970s, and the results of these studies have shown that the potential for municipal groundwater use within the boundaries of the MMWD service area is very limited due to limited production capabilities, water quality constraints, and potential water rights issues. As a result of these studies, groundwater is not currently used or planned to be used as a municipal water supply source by the MMWD, though private groundwater wells are used in the study area.²⁵

Regional groundwater quality data is very limited for the EIR Study Area. Groundwater quality is generally considered adequate for domestic and irrigation uses; however, localized areas experience poor groundwater quality. Saline intrusion continues to be an issue in areas bordering San Pablo Bay.

²¹ City of San Rafael Public Work Department, May 8, 2019, Email correspondence with Mark Wright, Operations and Maintenance Manager.

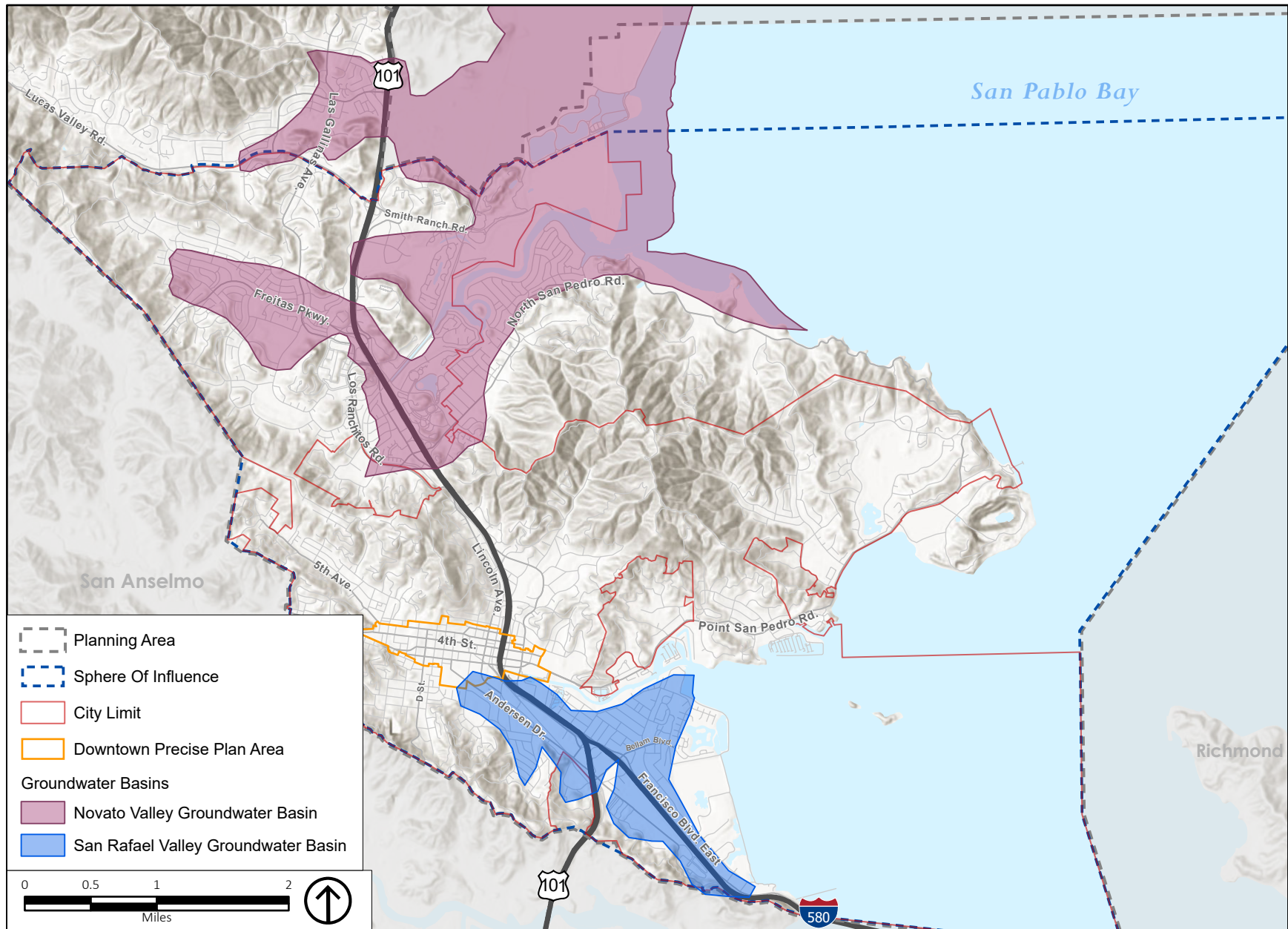
²² City of San Rafael Public Work Department, May 8, 2019, Interview with Kevin McGowan, Assistant Public Works Director/City Engineer.

²³ City of San Rafael Public Work Department, May 8, 2019, Interview with Kevin McGowan, Assistant Public Works Director/City Engineer.

²⁴ US Army Corps of Engineers - San Francisco District, *San Rafael Creek*, <https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Projects-by-Category/Projects-for-Navigable-Waterways/San-Rafael-Creek---/>, accessed on May 10, 2019.

²⁵ Marin Municipal Water District, June 2016, *Urban Water Management Plan, 2015 Update*, <http://marinwater.org/DocumentCenter/View/3828/MMWD-2015-UWMP-Final---Report-Only?bidId=>.

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Source: CA Department of Water Resources, 2020; ESRI, 2017; County of Marin, 2009; City of San Rafael, 2019; PlaceWorks, 2019.

Figure 4.10-2
Groundwater Basins

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Although use of groundwater for domestic purposes is limited within the EIR Study Area, shallow groundwater is present beneath a large portion of the city, ranging in depths from 3 to 10 feet below ground surface.^{26,27} Shallow groundwater depths vary with large rainfall events, periods of drought, and tidal influences near shorelines. In addition, groundwater levels are at the highest levels (i.e., closest to the ground surface) during the rainy season and decreasing during the drier months. As sea levels rise, the intrusion of salt water along the coastline will push the fresh groundwater layer up, creating a rise in groundwater levels. If the groundwater rises to the surface, it can create emergent flooding and ponds. Because a large portion of the development within San Rafael is built on artificial, unconsolidated fill, shallow groundwater could contribute to a higher liquefaction risk during a seismic event. Rising groundwater can also cause inflow and infiltration into wastewater pipes.

If construction dewatering is required with future development within the EIR Study Area, the City must be contacted. Staff will determine whether groundwater can be discharged to the storm drain system and what measures must be taken to reduce sediment in the discharge. Some dewatering discharges may require a NPDES permit for the San Francisco Bay RWQCB. More information regarding construction dewatering is available from MCSTOPPP: BMPs for Trench Dewatering.²⁸

Climate

The EIR Study Area experiences a semiarid, Mediterranean climate, which consists of hot, dry summers with low humidity and very mild winters. The area receives about 35.6 inches of rain annually, which is primarily recorded during the five-month stretch between October and April. The winter average low temperature is about 41 degrees Fahrenheit and the average summer high temperature is about 82 degrees Fahrenheit.²⁹

Water Quality

Surface water quality is affected by point-source and nonpoint-source pollutants. Point source pollutants are emitted at a specific point, such as a pipe, and nonpoint-source pollutants are typically generated by surface runoff from diffuse sources, such as streets, paved areas, and landscaped areas. Point-source pollutants are controlled with pollutant discharge regulations or water discharge requirements. Nonpoint-source pollutants are more difficult to monitor and control, although they are important contributors to surface water quality in urban areas.

Stormwater runoff pollutants vary based on land use, topography, the amount of impervious surface, the amount and frequency of rainfall, and irrigation practices. Runoff in developed areas typically contains oil,

²⁶ Gregg Drilling, 2020. Northern California Groundwater Depth Chart. Accessed at <http://www.greggdrilling.com/resources/> on October 6, 2020.

²⁷ State Water Resources Control Board, 2020. GeoTracker – site locations with groundwater wells within San Rafael undergoing remediation. Accessed at <https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=San+Rafael%2C+CA> on October 6, 2020.

²⁸ MCSTOPPP, 2020. Marin County Stormwater Pollution Prevention Program – Best Management Practices for Trench Dewatering. Accessed at https://www.marincounty.org/-/media/files/departments/pw/mcstoppp/development/trenchingswreqmcsstopppfinal6_09.pdf?la=en on October 6, 2020.

²⁹ Foster Morrison, 2017, *City of San Rafael Local Hazard Mitigation Plan*, Page 2-3.

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grease, and metals accumulated in streets, driveways, parking lots, and rooftops, as well as pesticides, herbicides, particulate matter, nutrients, animal waste, and other oxygen-demanding substances from landscaped areas. The highest pollutant concentrations usually occur at the beginning of the wet season during the “first flush,” when early rainfall flushes out pollutants that have accumulated on hardscape surfaces during the preceding dry months.

The San Francisco Bay RWQCB monitors surface water quality through implementation of the Basin Plan and designates beneficial uses for surface water bodies and groundwater within Marin County and San Rafael. The beneficial uses for surface water bodies and groundwater within the EIR Study Area are listed in Table 4.10-2.

TABLE 4.10-2 DESIGNATED BENEFICIAL USES OF WATER BODIES IN THE EIR STUDY AREA

WATER BODY	DESIGNATED BENEFICIAL USE
Surface Water	
Gallinas Creek	COLD, RARE, WARM, WILD, REC-1, REC-2
Miller Creek	COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2
San Rafael Creek	COLD, WARM, WILD, REC-1, REC-2, NAV
San Pablo Bay	IND, COMM, SHELL, EST, MIGR, RARE, SPWN, WILD, REC-1, REC-2, NAV
Groundwater	
San Rafael Valley	MUN, PRO, IND, AGR – Potential Uses
Novato Valley	MUN, PRO, IND, AGR – Potential Uses

Notes: Municipal and Domestic Water Supply (MUN), Industrial Process Water Supply (PRO), Industrial Service Water Supply (IND), Agricultural Supply (AGR), Freshwater Replenishment (FRSH), Groundwater Recharge (GWR), Cold Freshwater Habitat (COLD), Fish Migration (MIGR), Preservation of Rare and Endangered Species (RARE), Fish Spawning (SPWN), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC-1), Noncontact Water Recreation (REC-2).

Source: San Francisco Bay RWQCB, 2017. *Water Quality Control Plan (Basin Plan)*.

In addition to the establishment of beneficial uses and water quality objectives, another approach to improve water quality is a watershed-based methodology that focuses on all potential pollution sources and not just those associated with point sources. If a body of water does not meet established water quality standards under traditional point source controls, it is listed as an impaired water body under Section 303(d) of the Clean Water Act. For 303(d) listed water bodies, a limit is established that defines the maximum amount of pollutants that can be received by that water body. Listed impaired water bodies in the EIR Study Area and their associated pollutants of concern are presented in Table 4.10-3.

Once a water body has been placed on the 303(d) list of impaired waters, states are required to develop a TMDL threshold to address each pollutant causing impairment. A TMDL defines how much of a pollutant a water body can tolerate and still meet water quality standards. A TMDL has been approved by the EPA for mercury in Central San Francisco Bay and diazinon in San Rafael Creek, Miller Creek, and Gallinas Creek.

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TABLE 4.10-3 LISTED IMPAIRED WATER BODIES IN SAN RAFAEL

Name	Pollutants of Concern		
San Rafael Creek	▪ Diazinon ^a		
Miller Creek	▪ Diazinon		
Gallinas Creek	▪ Diazinon		
Central San Francisco Bay	▪ Chlordane ^b	▪ Furan Compounds ^d	▪ PBDEs ^f
	▪ DDT ^a	▪ Invasive Species	▪ Selenium ^g
	▪ Dieldrin ^a	▪ Mercury	▪ Trash
	▪ Dioxin Compounds ^c	▪ PCBs ^e	
San Pablo Bay	▪ Chlordane	▪ Dioxin Compounds	▪ Mercury
	▪ DDT	▪ Furan Compounds	▪ PCBs Selenium
	▪ Dieldrin	▪ Invasive Species	▪ Trash

Notes:

^a Used as an insecticide.

^b Used as a pesticide.

^c Burning processes, such as commercial or municipal waste incineration, backyard burning, and the use of fuels, such as wood, coal, or oil, produce dioxins. The compounds collect in high concentrations in soils and sediments.

^d Furan is used in the formation of lacquers and as a solvent for resins.

^e PCBs were used widely in electrical equipment like capacitors and transformers. They were banned in the US in 1979.

^f PBDEs are fire retardant chemicals.

^g The greatest use of selenium compounds is in electronic and photocopier components, but they are widely used in other products as well. Selenium releases to the environment have been primarily from copper smelting industries.

Source: State Water Resource Control Board, 2019, Impaired Waters.

Flood Zones

FEMA determines floodplain zones to assist cities in mitigating flooding hazards through land use planning. FEMA also outlines specific regulations for any construction within a 100-year floodplain. The 100-year floodplain is defined as an area that has a 1 percent chance of being inundated during a 12-month period. FEMA also prepares maps for 500-year floods, which mean that in any given year, the risk of flooding in the designated area is 0.2 percent.

In some locations, FEMA also provides measurements of base flood elevations for the 100-year flood, which is the minimum height of the flood waters during a 100-year event. Base flood elevation (BFE) is reported in feet above sea level. Depth of flooding is determined by subtracting the land's height above sea level from the base flood elevation. Areas within the 100-year flood hazard area that are financed by federally backed mortgages are subject to mandatory federal insurance requirements and building standards to reduce flood damage.

There are two main types of flooding that occur in the EIR Study Area: (1) tidal flooding and (2) watershed flooding. Tidal and watershed flooding can also occur simultaneously.

- **Tidal flooding** can occur due to extreme high tides, storm surge, and/or heavy rains in combination with high tides. The result is water that overflows the top bank elevation of tidal sloughs or channels, or the crest of levees. The filling of former baylands along the coastline allowed for urban development, and the higher land elevations initially protected the areas from flooding. However, subsequent subsidence of the bayland fill reduced the level of flood protection. Levees were constructed to protect the subsided areas from tidal flooding. The two major areas susceptible to tidal flooding in the EIR Study Area are along the lower portions of Gallinas Creek and San Rafael Creek,

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including the Canal neighborhood.³⁰ Levee overtopping and subsequent tidal flooding has occurred in the communities of Santa Venetia and low-lying areas of eastern San Rafael.³¹ Tidal flooding has also occurred along Point San Pedro Road.

- **Watershed flooding** occurs with the development of former floodplains, and an increase in stormwater flow rates with an increase in impervious surfaces. Excessive rainfall amounts over a short period of time can also result in flash flooding. Mud and debris slides may occur in the hillside areas. The primary causes of watershed flooding are the local streams and rivers overtopping their banks during extreme rainfall events, coupled by the inability of the topography and City's storm drain system to handle the stormwater runoff from these events.³²

In north San Rafael, Gallinas Creek is a major source of flooding. Other problem areas include Oleander Road, Los Gamos Road, and other roads in low-lying areas. The following areas may become isolated during heavy flooding: Point San Pedro Road near North Marin Yacht Club, Peacock Gap, and China Camp areas. Flooding has also occurred in the past on the southern tributaries to San Rafael Creek, in the Bret Harte/Picnic Valley and Irwin Street neighborhoods, and Lucas Valley Road near the intersection with Highway 101. Flooding also poses a serious threat to East San Rafael due to subsidence and consolidation of the bay muds. Much of the development in this area was constructed at or has subsided below the FEMA 100-year flood elevation.³³ The community of Santa Venetia, which is segregated from Las Gallinas Creek by levees, has experienced flooding, which has been exacerbated by hillslope debris obstructing inlet channels and pump station inlets. According to the City, numerous parcels and roads within the EIR Study Area that are not included in the FEMA 100- and 500-year floodplain maps may be subject to flooding during heavy rains.³⁴

A map of the EIR Study Area locations that are within the 100-year floodplains is shown on Figure 4.10-3. The 100-year flood zone is also known as a Special Flood Hazard Area; homeowners with mortgages within the Special Flood Hazard Area are required to be protected by flood insurance. Zone A on the 100-year floodplain map includes Zones AE and AH. Zone AE is defined as an area subject to inundation by the 100-year flood event where BFEs have been calculated. Zone AH is defined as an area subject to inundation by the 100-year flood with shallow flooding (usually areas of ponding)—average depths between one and three feet—and with BFEs derived from hydraulic analyses. Also included on the map are Zones VE, defined as coastal high hazard areas, which extend offshore to the inland limit that is subject to high-velocity wave action. The boundary of Zone VE is generally based on wave heights (3 feet or greater) or wave run-up depths (3 feet or greater).

As shown on Figure 4.10-3, most of the land south of Point San Rafael Road is within the 100-year floodplain and is subject to overflow from San Rafael Creek and/or tidal flooding.³⁵

³⁰ Foster Morrison Consulting, 2017. *San Rafael Local Hazard Mitigation Plan*. Dated June 2017.

³¹ County of Marin, 2005. *Flooding, Technical Background Report*. Marin Countywide Plan. Dated November 2005.

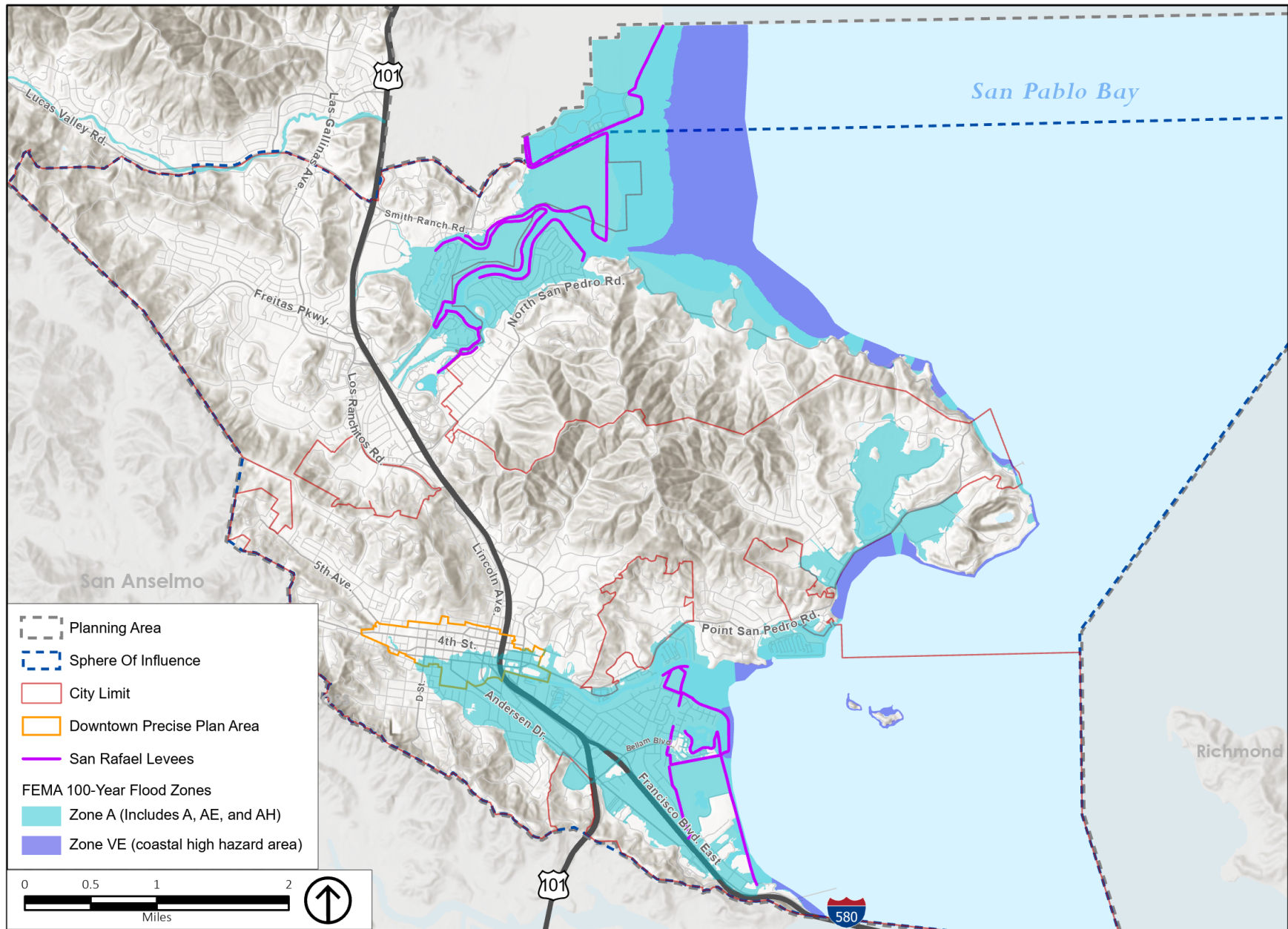
³² City of San Rafael, 2017. *San Rafael Local Hazard Mitigation Plan*. Dated June 2017.

³³ City of San Rafael, 2017. *San Rafael Local Hazard Mitigation Plan*. Dated June 2017.

³⁴ City of San Rafael, 2017. *San Rafael Local Hazard Mitigation Plan*. Dated June 2017.

³⁵ Federal Emergency Management Agency, Various *FIRM Maps Including 06081C0306E to 06081C309E*, <http://msc.fema.gov/portal>, accessed on April 29, 2019.

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Source: City of San Rafael, 2019; County of Marin, 2009; ESRI, 2017; FEMA, 2017; National Levee Database, 2020; PlaceWorks, 2019.

Figure 4.10-3
FEMA 100-Year Flood Zones

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The area north of North San Pedro Road is also within the 100-year floodplain and subject to overflows from Las Gallinas Creek and/or tidal flooding. The eastern portion of San Rafael in the Peacock Gap neighborhood is within the 100-year floodplain, and the southern portion of the Downtown Precise Plan Area is also within the 100-year floodplain.

The DWR is in the process of developing “best available maps” (BAM) that display 100-year, 200-year, and 500-year floodplains for all counties in the state. Different than the FEMA maps, which are used to support the National Flood Insurance Program, the BAMs are provided for informational purposes, and the 100-year floodplains are a composite of multiple mapping sources from FEMA, USACE, and DWR. This provides the community and residents with an additional tool for understanding potential flood hazards that are not currently mapped as a regulated floodplain. The BAMs for the EIR Study Area are still in the process of development, and only the 100-year floodplains are currently mapped. The maps can be found at <https://gis.bam.water.ca.gov/bam/>.

In the downstream reaches of Miller Creek, Gallinas Creek, and San Rafael Creek, the tidal influence of San Pablo Bay reduces the floodwater conveyance potential of the channels. As a result, flood control measures, including levees and stormwater pumping stations, have been implemented to reduce the potential for flooding and facilitate the removal of stormwater during flood events. Levees are located along the creek outlets and many of the bayfront areas. Levees reduce but do not eliminate the risk to individuals or structures behind them. Overtopping failure occurs when the flood water level rises above the crest of the levee.

The locations of levees in San Rafael are also shown on Figure 4.10-3. The levee system in the northern portions of the city extends from Miller Creek outlet to Gallinas Creek outlet and includes levees along the north side of McInnis County Park. In the southern portion of the city, the levee system extends from Pickleweed Park eastward along San Rafael Canal to I-580 along the shoreline.³⁶

Although various locations within the EIR Study Area are protected from flooding by levees, FEMA’s policy is to disregard any flood protection benefit provided by a levee if that levee is not certified as meeting NFIP standards for freeboard and geotechnical stability.³⁷ There are no levees in the City of San Rafael that are currently certified. However, the City, in conjunction with MCFCWCD and the USACE, is in the process of improving some of the levees, such as the Gallinas Creek Levee.

The MCFCWCD has designated two of the areas in the 100-year floodplain as flood control zones; these include Zone 6: San Rafael Meadows and Zone 7: Santa Venetia.³⁸ In Zone 6, there are no pump stations, levees, floodwall, or critical infrastructure except for creeks and drainage ditches, which typically do not flood as long as the channels are maintained and kept clear of growth and debris. This area is not within the 100-year floodplain. In 2004, Redwood Village was developed within the southern portion of this zone. The stormwater infrastructure was rerouted around the Corrillo Drive neighborhood, eliminating a

³⁶ FEMA, 2018, *FEMA Flood Zones (Map Service)*.

³⁷ FEMA, 2015. *Levee Certification vs. Levee Accreditation*. Accessed at <https://www.fema.gov/media-library/assets/documents/22957> on February 25, 2016.

³⁸ Marin County Flood Control & Water Conservation District, 2019, *Flood Control Zones*, <http://www.marinwatersheds.org/flood-protection/flood-control-zones#undefined5>, accessed on April 29, 2019.

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significant cause of flooding in Zone 6.³⁹ Zone 7, Santa Venetia, has subsided due to the compression of Bay mud and is now below the high tide level. Work in Zone 7 includes regular servicing of 14 pumps at 5 pump stations, maintenance of 1.9 miles of flood protection levees, maintenance of tide gates and trash racks, and an annual vegetation maintenance program along 0.85 mile of Gallinas Creek.

Within the EIR Study Area, Conservation Corps North Bay performs annual vegetation maintenance work in creeks and ditches under the direction of the City. Sediment removal is performed on an as-needed basis before, during, and after storms. The Conservation Corps North Bay inspects and clears facilities as needed and is also available for sandbagging and/or tarping levees and creek banks, as requested.⁴⁰

Dam Inundation Zones

There are four dams in Marin County that are in the vicinity of the city. The dam inundation areas of three of the dams show discharges with dam failure to the northwest and away from the City. The closest dam to the study area is the Phoenix Lake dam, which is approximately two miles southwest of the EIR Study Area. However, the Phoenix Lake dam has a dam inundation zone along Corte Madera Creek southwest of the EIR Study Area.⁴¹ There are no dam inundation zones within the EIR Study Area.

Sea Level Rise

A rise in average global temperatures due largely to an increase in greenhouse gas emissions is expected to be accompanied by a rise in global sea levels. California Executive Order S-13-2008 states that all State agencies planning construction projects in areas vulnerable to sea level rise must consider a range of sea level rise scenarios for the years 2050 and 2100 to assess project vulnerability and, to the extent feasible, reduce expected risks from sea level rise.⁴² The *State of California Sea-Level Rise Guidance, 2018 Update* incorporates the most recent scientific findings from the Ocean Protection Council (OPC).⁴³ OPC predicts a range of sea level rise for San Pablo and San Francisco Bays based on risk-aversion scenarios. Risk aversion is defined as the strong inclination to avoid taking risks in the face of uncertainty.⁴⁴ Using medium-high risk aversion, OPC projects sea level rise in the San Pablo and San Francisco Bay Area to be 1.9 feet by

³⁹ Marin County Flood Control and Water Conservation District, May 28, 2019, Correspondence with Gerhard Epke, Senior Program Coordinator.

⁴⁰ County of Marin Public Works, 2019, *Marin Watershed Program Projects*.
<http://www.marinwatersheds.org/resources/projects/2015-2016-maintenance-storm-preparedness-zone-6-san-rafael-meadows>, accessed on April 29, 2019.

⁴¹ California Division of Safety of Dam, 2020, *California Dam Breach Inundation Maps*,
https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2, accessed May 10, 2020.

⁴² State of California, *Executive Order S-13-08*, <http://gov.ca.gov/news.php?id=11036>, accessed on November 17, 2015.

⁴³ California Natural Resources Agency, California Ocean Protection Council, 2018,
http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf.

⁴⁴ California Natural Resources Agency, California Ocean Protection Council, 2018, *State of California Sea-Level Rise Guidance, 2018 Update*, http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf.

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2050 and between 5.7 and 6.9 feet by 2100.⁴⁵ Most shoreline damage from sea level rise will occur as a result of coastal storms in combination with higher sea levels, which can temporarily raise sea levels by an additional two feet. The key factors that contribute to coastal flooding include high tides, storm surge, high waves, and high runoff rates from rivers and creeks.⁴⁶

Marin County has recently completed a sea level rise vulnerability assessment with a broad coalition of civic leaders, elected officials, and concerned citizens to better understand and prepare for the potential impacts of sea level rise related to flooding and inundation and coastal storms.⁴⁷ The vulnerability assessment includes both incorporated and unincorporated areas of Marin County and assesses impacts to land use, buildings, transportation networks, utilities, recreation, and emergency services. Storm and tidal impacts are already occurring, and according to the *Marin Sea Level Rise Vulnerability Assessment*, approximately 2,121 acres, over 1,798 living units, 41 miles of road, 475 commercial parcels, and approximately 18 percent of all buildings in San Rafael will be affected by sea level rise by 2100.⁴⁸

San Rafael recently completed their *Sea-Level Rise Adaptation Study*, which assessed existing flood risks with future sea level rise projections, developed reasonable adaptations for the City's shoreline, evaluated the cost and benefits of adaptation measures, and created a phased adaptation plan to guide implementation. This study integrated the *Marin Sea Level Rise Vulnerability Assessment* with FEMA flood hazard zones and hydraulic monitoring to determine sea level rise and flood hazards in six specific areas: Bayfront South, Canal South, Canal North, Loch Lomond, Point San Pedro Road, and Las Gallinas.⁴⁹

Figure 4.10-4 and Figure 4.10-5 show the projected sea level rise citywide for 2050 and 2100, respectively. Figure 4.10-6 and Figure 4.10-7 show the projected sea level rise coinciding with the 100-year storm surge for 2050 and 2100, respectively. As shown, neighborhoods along the mouth of Gallinas Creek, the Bahia Vista and Canal neighborhoods, and areas near Point San Pedro are vulnerable to flooding from sea level rise and coastal storms by 2050. By 2100, the inundation area will spread farther inland along Gallinas Creek and San Rafael Creek, increasing the vulnerability of US-101 to regular flooding and inundation.

⁴⁵ California Natural Resources Agency, California Ocean Protection Council, 2018, *State of California Sea-Level Rise Guidance, 2018 Update*, http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A OPC_SLR_Guidance-rd3.pdf

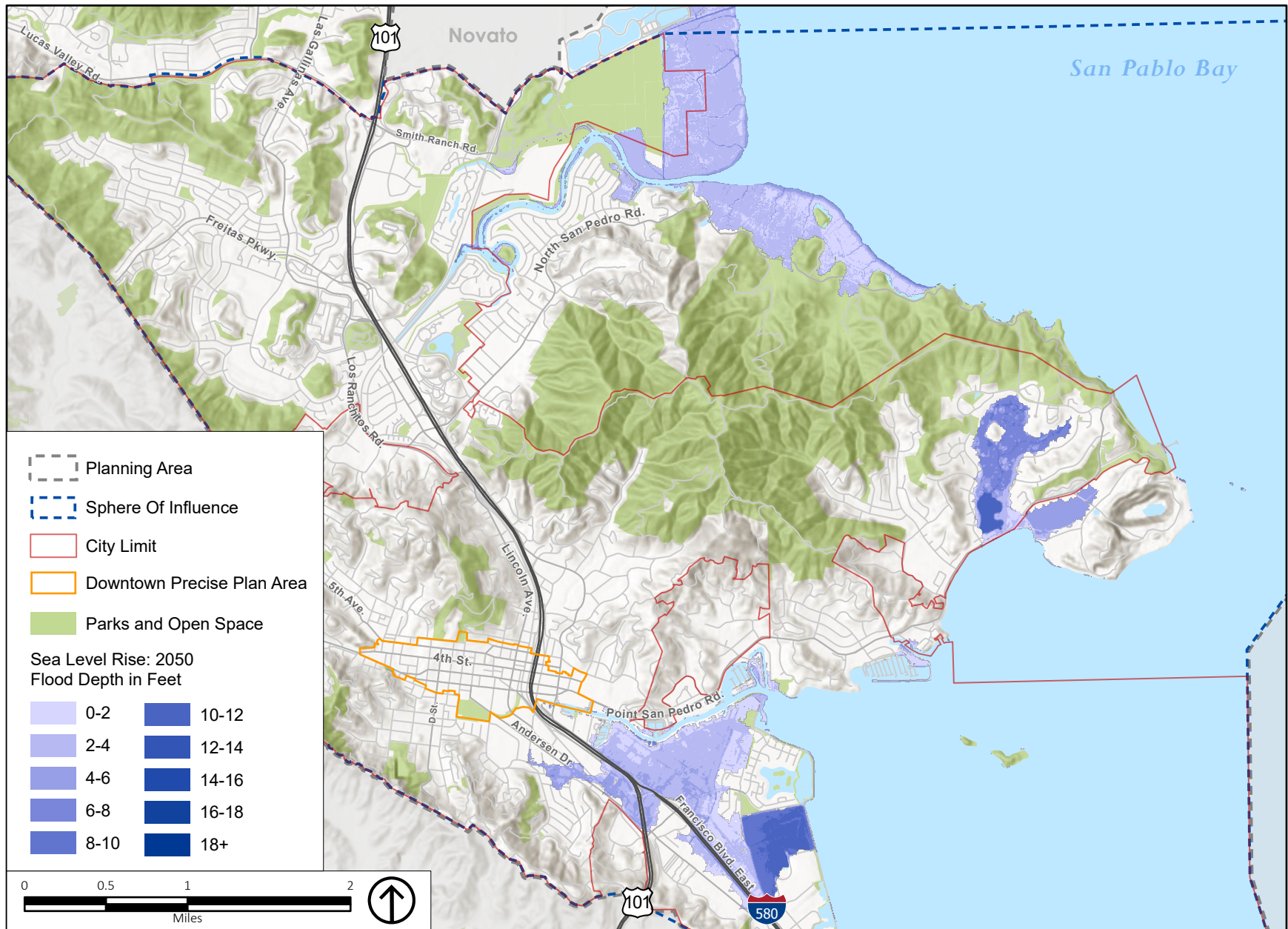
⁴⁶ San Francisco Bay Conservation and Development Commission, 2011, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*.

⁴⁷ BVB Consulting LLC, 2017, *Marin Shoreline Sea Level Rise Vulnerability Assessment*.

⁴⁸ BVB Consulting LLC, 2017, *Marin Shoreline Sea Level Rise Vulnerability Assessment: San Rafael Community Profile*, Page 259.

⁴⁹ Environmental Science Associates, 2020, *San Rafael Sea-Level Rise Adaptation Study*, <https://storage.googleapis.com/proudcity/sanrafaelca/uploads/2020/10/San-Rafeal-SLR-Vulnerability-Study-2020Jun19.pdf>.

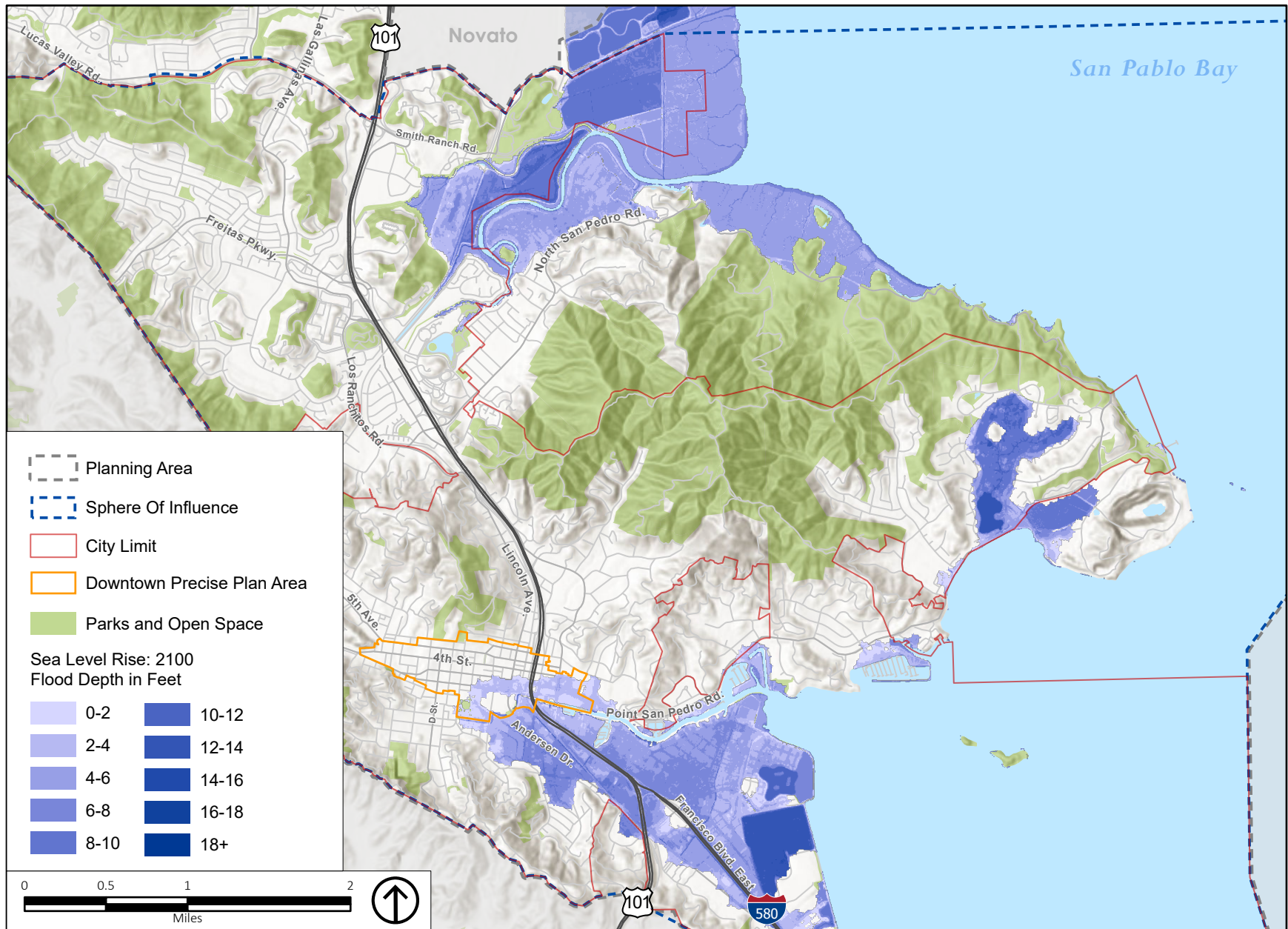
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-4
 Sea Level Rise in 2050

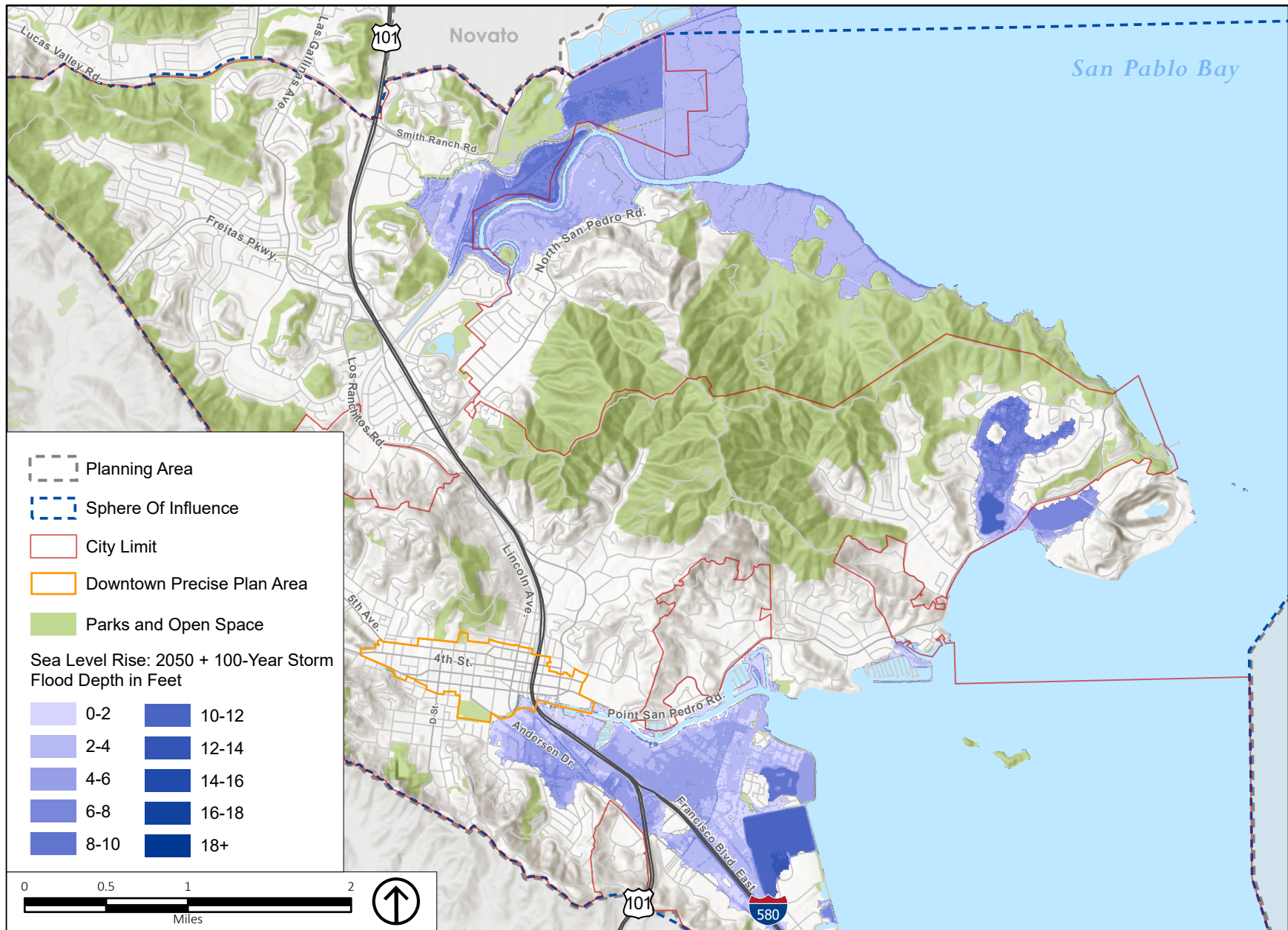
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-5
 Sea Level Rise in 2100

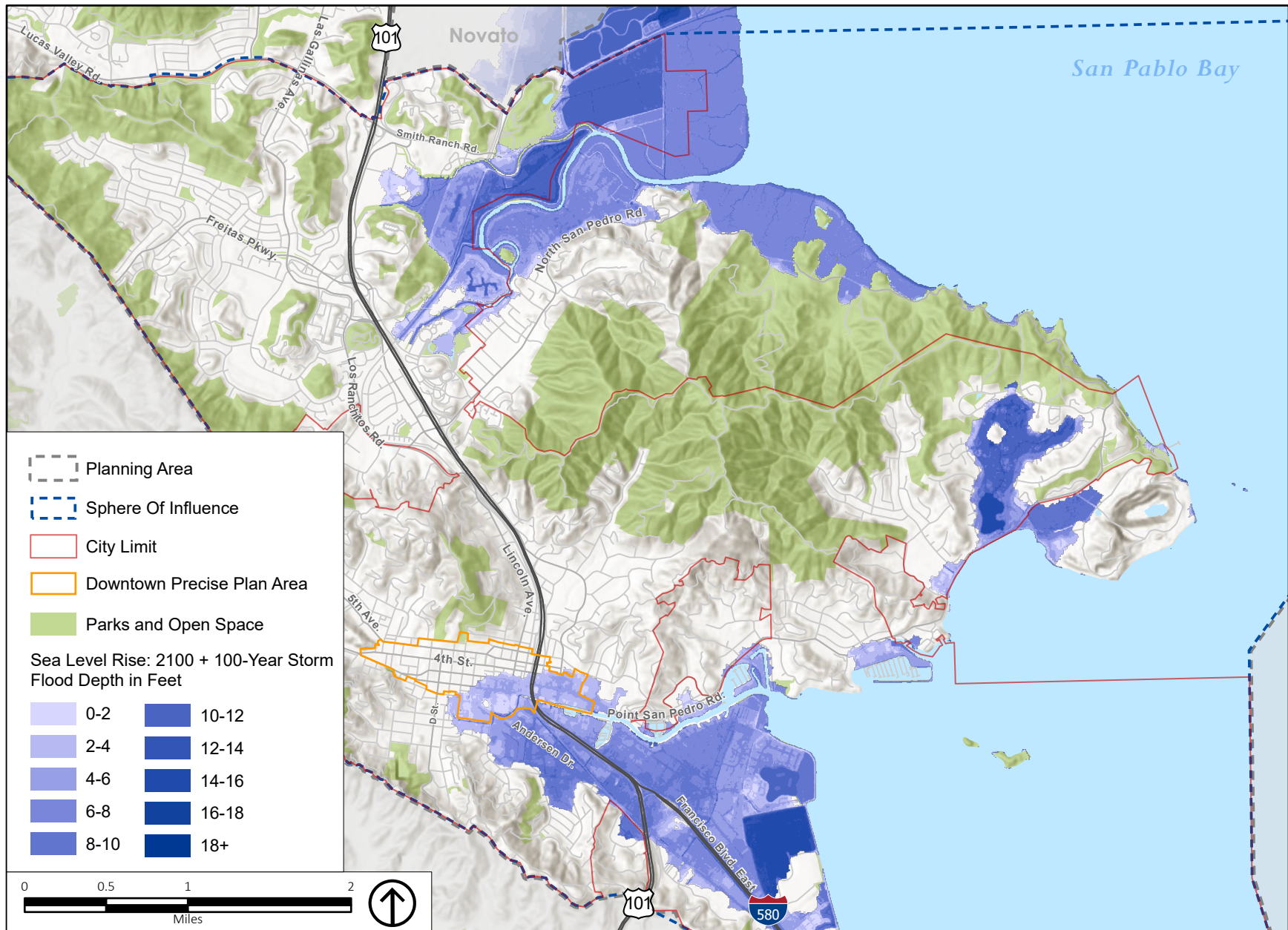
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-6
 Sea Level Rise in 2050 + 100-Year Storm Surge

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Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-7
 Sea Level Rise in 2100 + 100-Year Storm Surge

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Tsunami

A tsunami is a series of traveling ocean waves generated by a rare, catastrophic event, including earthquakes, submarine landslides, and submarine or shoreline volcanic eruptions. Tsunamis can travel over the ocean surface at speeds of 400 to 500 miles per hour or more, and wave heights at the shore can range from inches to 50 feet. Factors influencing the size and speed of a tsunami include the source and magnitude of the triggering event, as well as off-shore and on-shore topography. A bayfront levee system currently protects portions of the city from high tides and waves; however, this could be overtopped by a tsunami.⁵⁰ According to the California Office of Emergency Services and Science Application for Risk Reduction tsunami inundation maps, the northern and southern shorelines of San Rafael and a portion of the Downtown Precise Plan Area are within the tsunami inundation zone.⁵¹ The 1964 Alaska earthquake resulted in a tsunami that caused \$1 million in damages in Marin County and damaged boats in Loch Lomond Marina in San Rafael.⁵² As shown on Figure 4.10-8, areas near the outlets of Gallinas Creek and San Rafael Creek, McInnis Park, and the coastal areas of the Canal, Loch Lomond, Glenwood, and Peacock Gap neighborhoods are within the tsunami inundation zone. The inundation zone extends inland from the Marin Yacht Club and Pickleweed Park to include a small portion of the Downtown Precise Plan Area. Marin County and the City of San Rafael are part of the tsunami warning system that would be implemented to evacuate and protect citizens in the unlikely event that a tsunami occurs.⁵³

Seiche

A seiche is an oscillation wave generated in a closed or partially closed body of water, which can be compared to the back-and-forth sloshing in a bathtub. Seiches can be caused by winds, changes in atmospheric pressure, underwater earthquakes, tsunamis, or landslides into the water body. Bodies of water such as bays, harbors, reservoirs, ponds, and swimming pools can experience seiche waves up to several feet in height during a strong earthquake. However, for a seiche to occur in San Pablo or San Francisco Bay, the wave frequency of a tsunami would have to match the resonance frequency of the bay or harbor. The typical frequency of a tsunami is ten minutes to an hour, and the resonance frequency of the San Pablo and San Francisco Bay is somewhere between one to ten hours. Therefore, tsunamis have frequencies too short to resonate within the San Pablo and San Francisco Bay and a seiche is unlikely. However, since small harbors have a resonance frequency of 10 to 30 minutes, it is possible that a seiche could occur in San Rafael harbors, given a large magnitude earthquake.⁵⁴ There are no large bodies of water within the EIR Study Area that could trigger a seiche. Seiches associated with either Phoenix Lake or Bon Tempe Lake would have a seiche inundation zone much smaller than that of the dam inundation zone, and because the dam inundation zones do not reach the EIR Study Area, the possibility of a seiche impacting the city is negligible.

⁵⁰ Foster Morrison. 2017. City of San Rafael Local Hazard Mitigation Plan, Page 4-90.

⁵¹ California Office of Emergency Services, 2009. *Tsunami Inundation Map for Emergency Planning, State of California – County of San Mateo, Redwood Point Quadrangle, Palo Alto Quadrangle.*

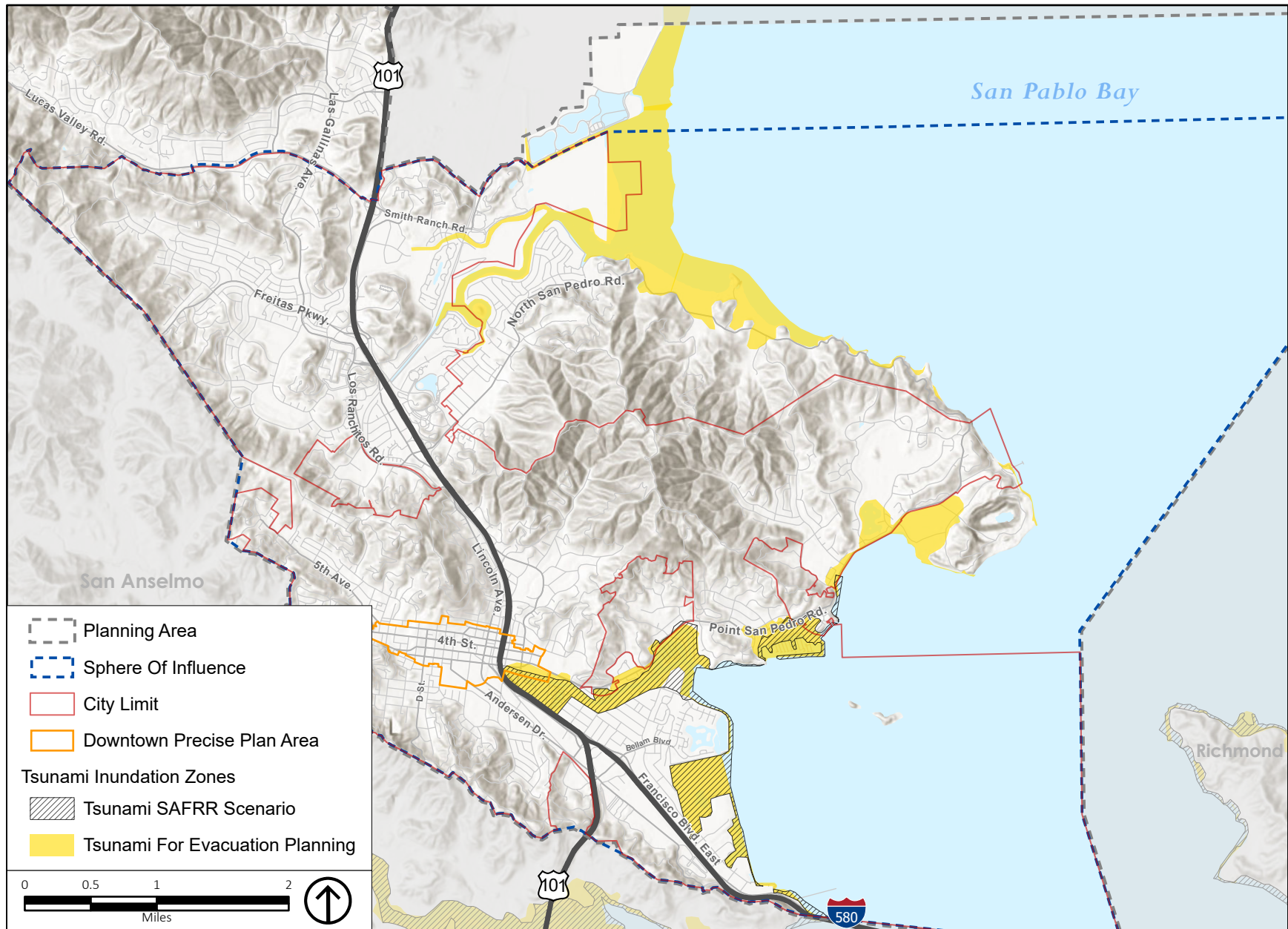
⁵² Foster Morrison, 2017. City of San Rafael Local Hazard Mitigation Plan, page 4-90.

⁵³ Marin County Sheriff's Office of Emergency Services. 2015. Tsunami Annex.

<https://www.marinsheriff.org/assets/downloads/01.30.2015-Tsunami-AnnexUH.pdf>

⁵⁴ Mika McKinnon, 2011. Tsunamis in Bays. Accessed at <https://geomika.com/blog/2011/03/14/tsunami-in-bays/> on June 24, 2020.

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Source: CalEMA, CGS, and USC, 2009; ESRI, 2017; County of Marin, 2009; City of San Rafael, 2019; PlaceWorks, 2019.

Figure 4.10-8
Tsunami Inundation Zones

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Downtown Precise Plan Area

The Downtown Precise Plan Area is relatively flat, with sloping portions on the northern and western ends near Boyd Memorial Park and the West End neighborhood.⁵⁵ The Downtown Precise Plan Area is serviced by the same stormwater facilities that were described for the EIR Study Area as a whole. Stormwater pipelines in the Downtown Precise Plan Area range from 4 to 48 inches in diameter. A more detailed discussion of the storm drain system within the Downtown Precise Plan Area is provided in Chapter 4.17, Utilities and Service Systems, of this Draft EIR. A map of the portions of the Downtown Precise Plan Area that are within the 100-year floodplain is provided on Figure 4.10-9. As shown on the figure, the southern portion of the Downtown Precise Plan Area is within the 100-year floodplain. Figure 4.10-10 and Figure 4.10-11 show the projected sea level rise for the Downtown Precise Plan Area for the years 2050 and 2100, respectively. The Downtown Precise Plan Area is not impacted by sea level rise in 2050 but the southern and eastern portions of the Downtown Precise Plan Area are projected to experience significant flooding in 2100. Figure 4.10-12 and Figure 4.10-13 show the projected sea level rise coinciding with a 100-year storm surge for 2050 and 2100, respectively. As shown, by 2050 the area south of Second Street near US-101 is vulnerable to flooding with projected sea level rise plus a 100-year storm surge. By 2100, the area vulnerable to sea level rise and storm surge will spread farther north and west into the Downtown Precise Plan Area. As shown on Figure 4.10-14, the southeastern corner of the Downtown Precise Plan Area is within the tsunami inundation zone and inland neighborhoods are not in the zone.

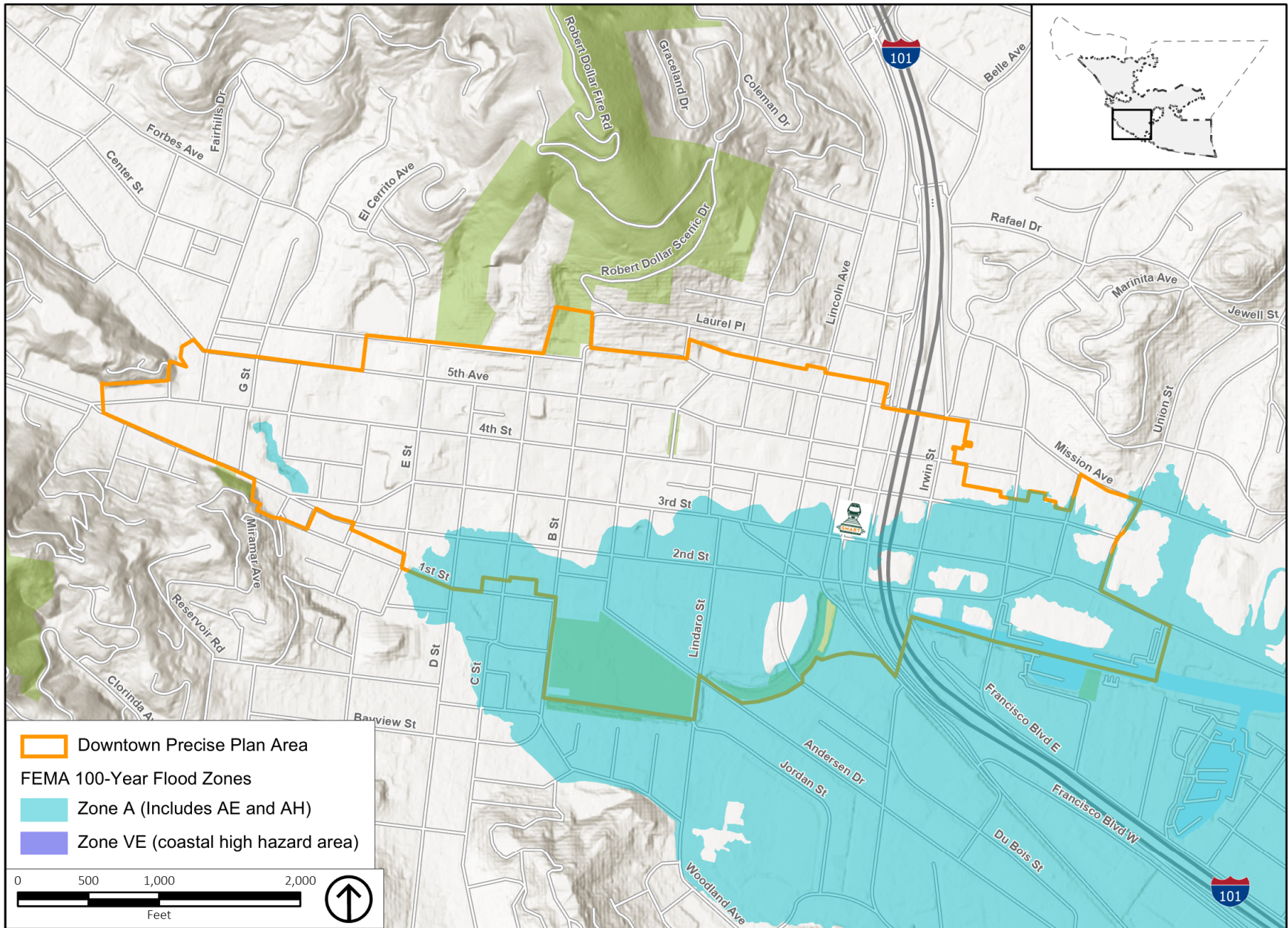
4.10.2 STANDARDS OF SIGNIFICANCE

Pursuant to Appendix G, Environmental Checklist Form, of the CEQA Guidelines, implementation of the proposed project would result in significant hydrology and water quality impact if it would:

1. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality.
2. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.
3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
 - i) Result in substantial erosion or siltation on- or off-site;
 - ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
 - iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
 - iv) Impede or redirect flood flows.
4. Risk release of pollutants due to project inundation if in a flood hazard, tsunami, or seiche zones.
5. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.
6. Result in significant cumulative impacts related to hydrology and water quality.

⁵⁵ ESRI 2013, *Terrain: Slope Map*, <http://tpc.maps.arcgis.com/home/item.html?id=a1ba14d09df14f42ad6ca3c4bceb3b4>, accessed on April 29, 2019.

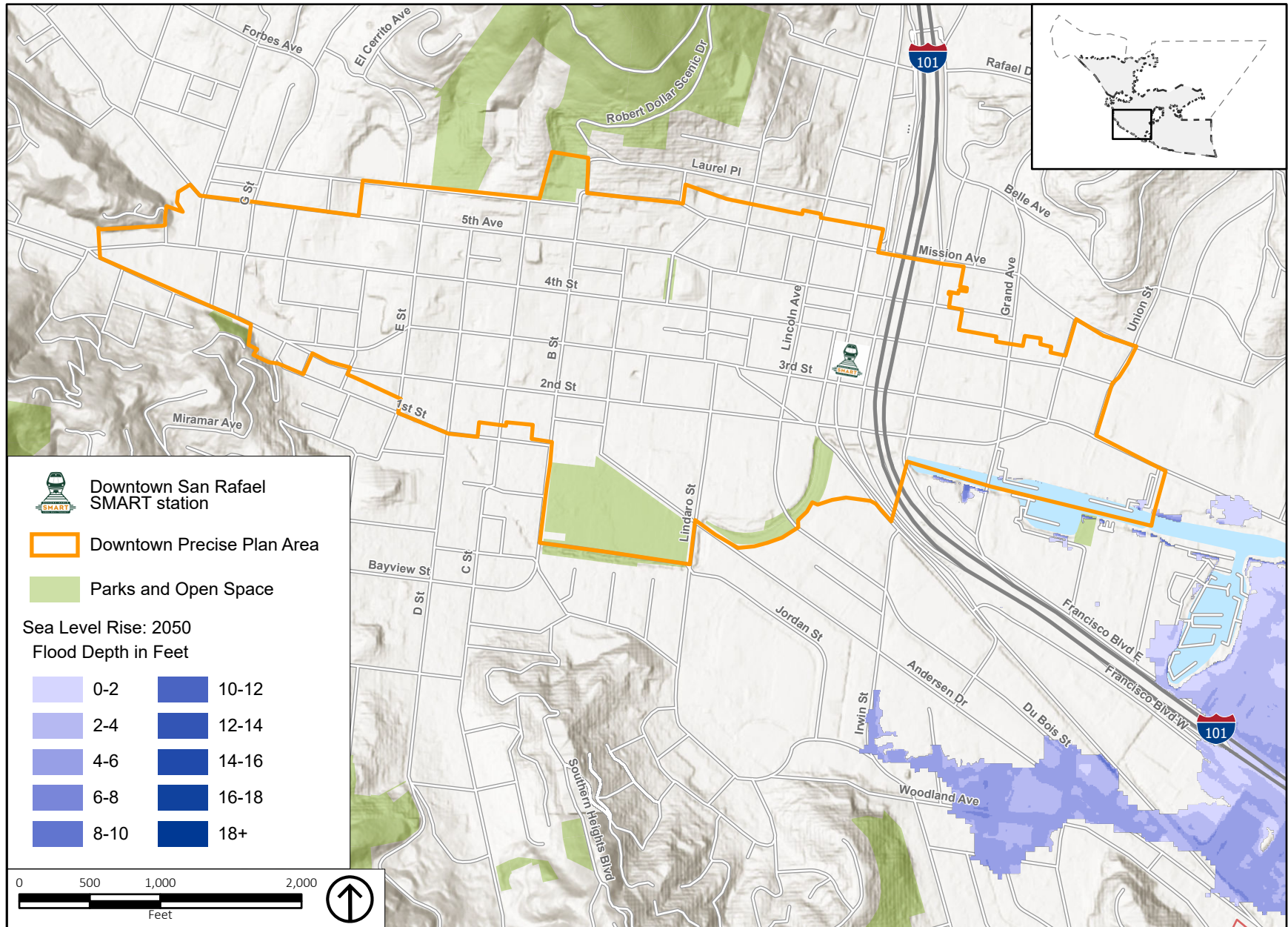
HYDROLOGY AND WATER QUALITY



Source: ESRI, 2017; County of Marin, 2009; City of San Rafael, 2019; FEMA, 2017; PlaceWorks, 2019.

Figure 4.10-9
Downtown FEMA 100-Year Flood Zones

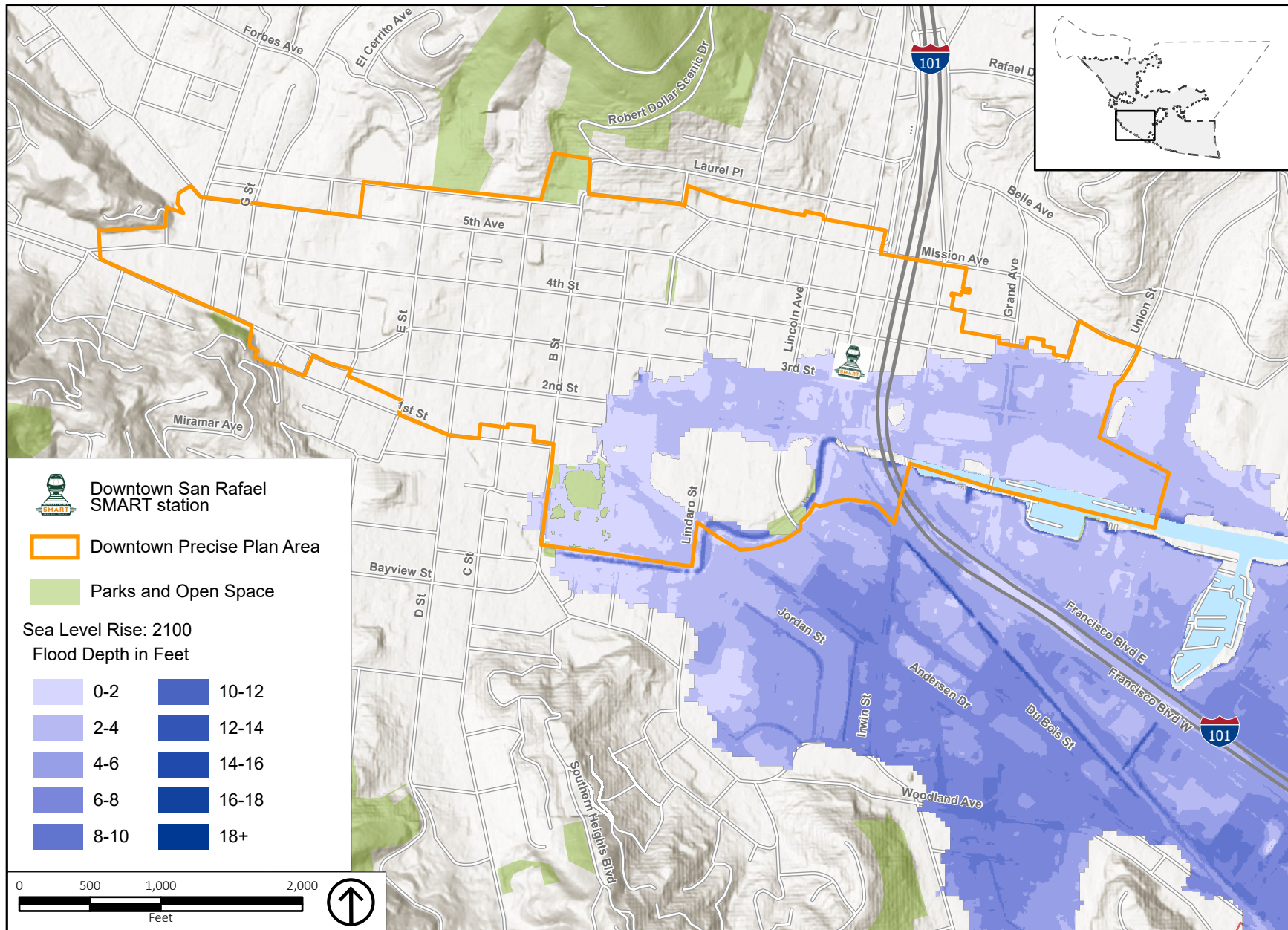
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-10
 Downtown Sea Level Rise in 2050

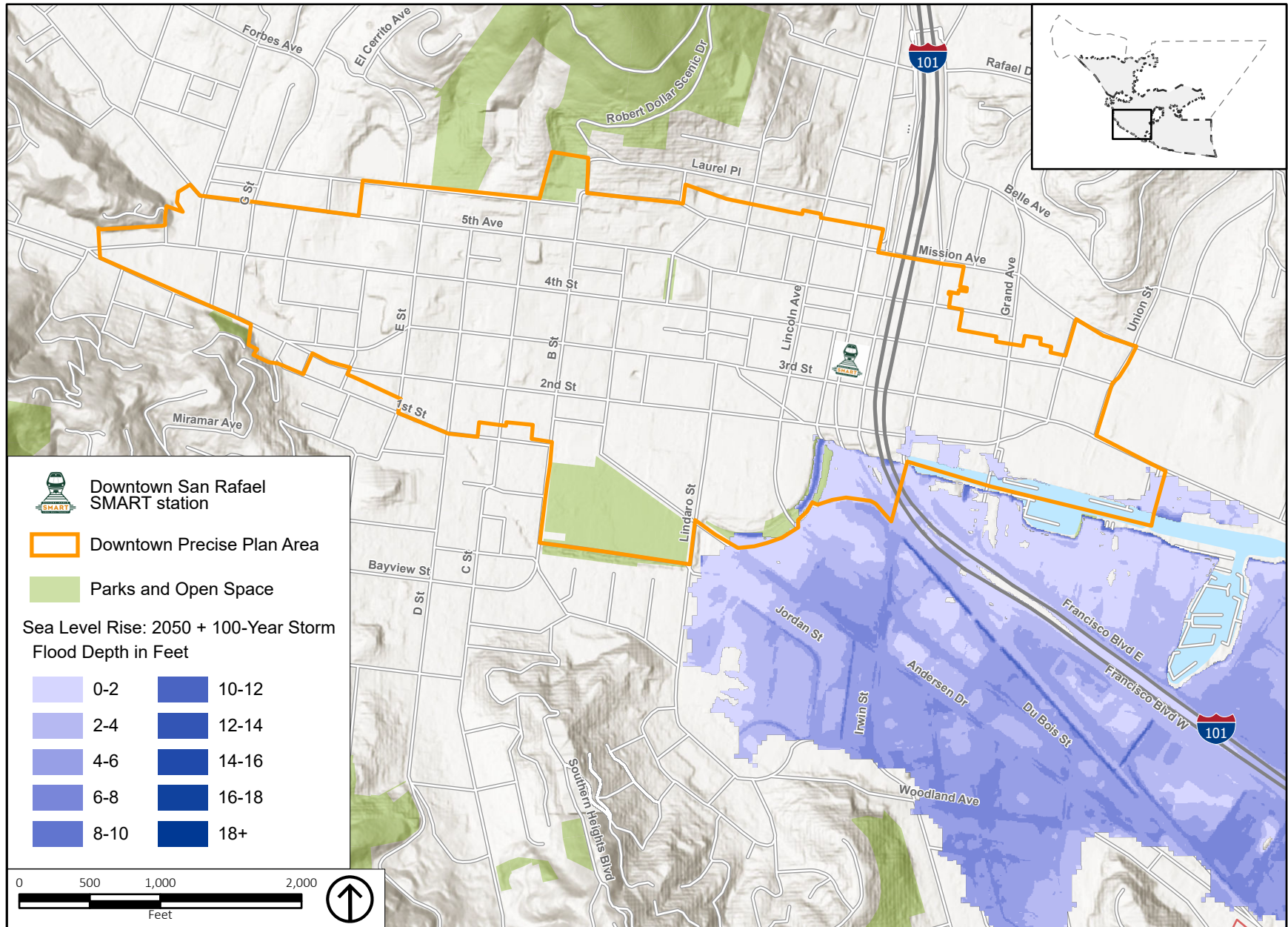
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-11
 Downtown Sea Level Rise in 2100

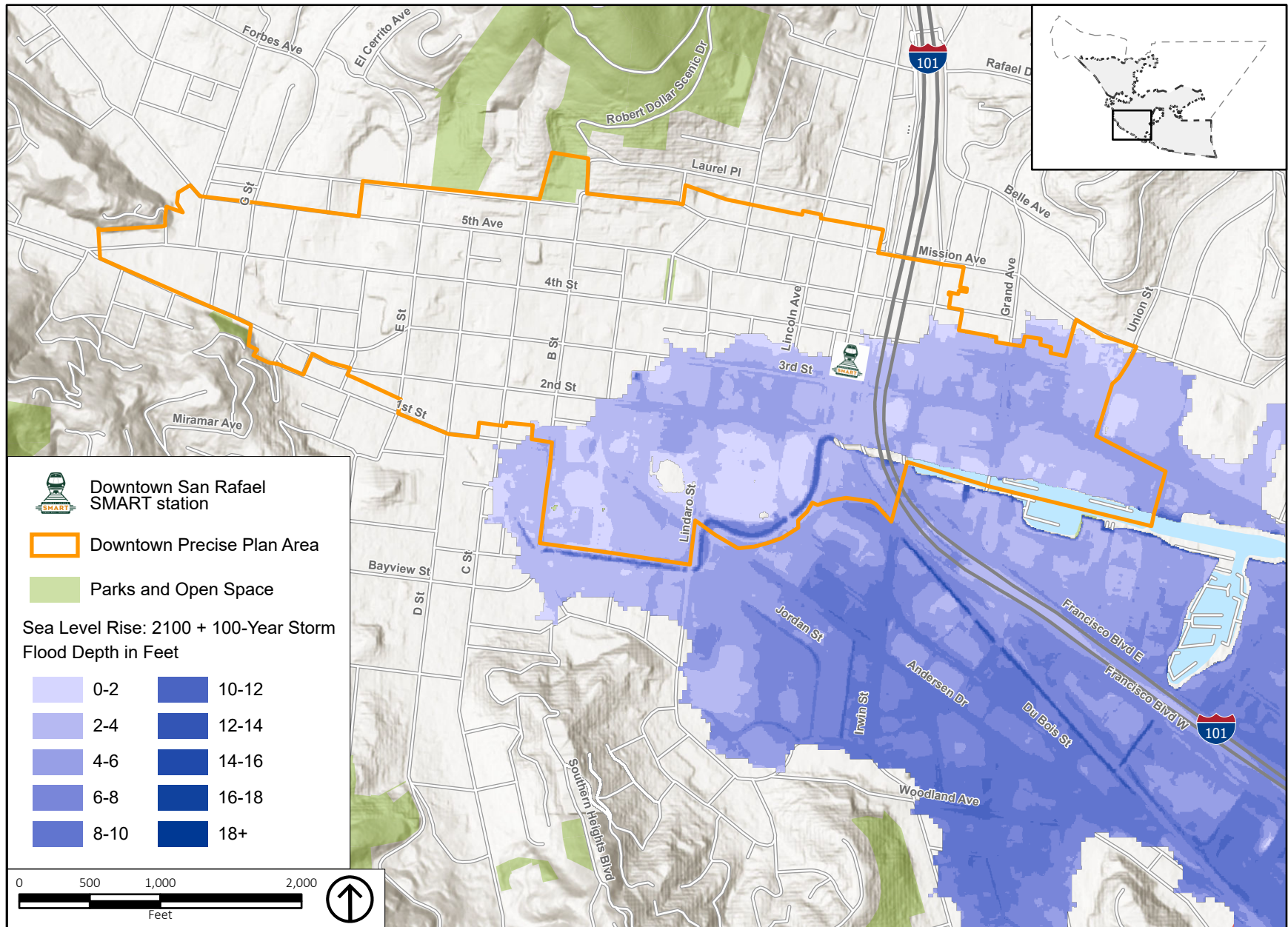
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-12
 Downtown Sea Level Rise in 2050 + 100-Year Storm Surge

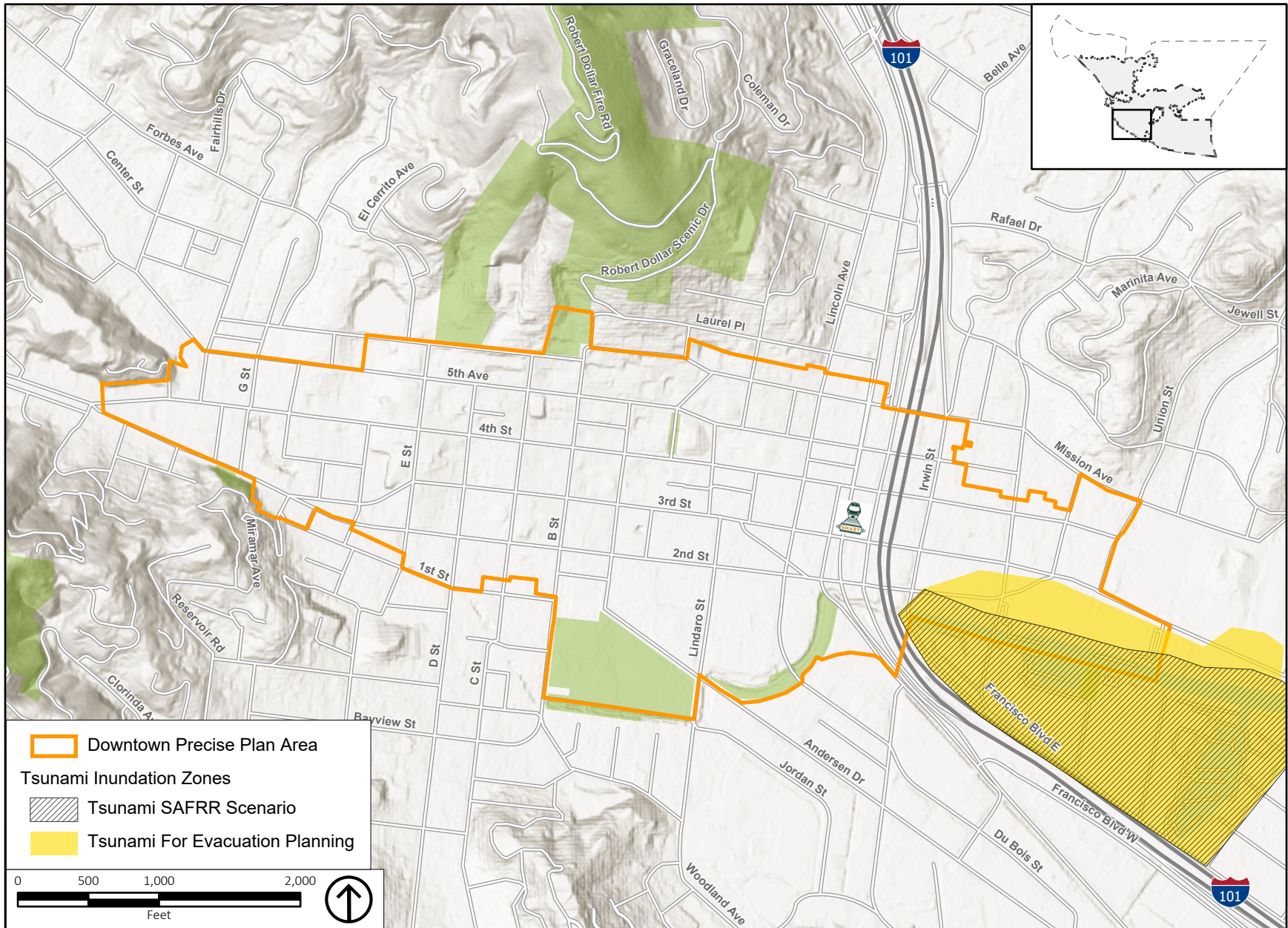
HYDROLOGY AND WATER QUALITY



Source: City of San Rafael, 2019; CoSMoS, 2016; County of Marin, 2009; ESRI, 2017; PlaceWorks, 2019.

Figure 4.10-13
 Downtown Sea Level Rise in 2100 + 100-Year Storm Surge

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Source: ESRI, 2017; County of Marin, 2009; City of San Rafael, 2019; PlaceWorks, 2019.

Figure 4.10-14
Downtown Tsunami Inundation Zones

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4.10.3 IMPACT DISCUSSION

HYD-1	Implementation of the proposed project could violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality.
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General Plan 2040

Discharges from Construction Sites to Stormwater

Buildout of the proposed General Plan 2040 would involve soil disturbance, construction, and operation of developed land uses that could generate pollutants affecting stormwater. Clearing, grading, excavation, and construction activities associated with the proposed General Plan 2040 have the potential to impact water quality through soil erosion and increasing the amount of silt and debris carried in runoff. Additionally, the use of construction materials, such as fuels, solvents, and paints, may present a risk to surface water quality. Finally, the refueling and parking of construction vehicles and other equipment on-site during construction may result in oil, grease, or related pollutant leaks and spills that may discharge into the storm drain system.

To minimize these potential impacts, future development pursuant to the proposed General Plan 2040 would require compliance with the Construction General Permit (CGP) Water Quality Order 2009-0009-DWQ (as amended by Order No. 2010-0014-DWQ and 2012-006-DWQ), which includes the preparation and implementation of a SWPPP. A SWPPP requires the incorporation of BMPs to control sediment, erosion, and hazardous materials contamination of runoff during construction and prevent contaminants from reaching receiving water bodies. The SWRCB mandates that projects that disturb one or more acres of land must obtain coverage under the Statewide CGP. The CGP also requires that prior to the start of construction activities, the project applicant must file PRDs with the SWRCB, which includes a Notice of Intent, risk assessment, site map, annual fee, signed certification statement, SWPPP, and post-construction water balance calculations. The construction contractor is required to maintain a copy of the SWPPP at the site and implement all construction BMPs identified in the SWPPP during construction activities. Prior to the issuance of a grading permit, the project applicant is required to provide proof of filing of the PRDs with the SWRCB. Categories of potential BMPs that would be implemented for the proposed General Plan 2040 are described in Table 4.10-4.

Submittal of the PRDs and implementation of the SWPPP throughout the construction phase of development pursuant to the proposed General Plan 2040 will address anticipated and expected pollutants of concern from construction activities. Furthermore, future projects would abide by the requirements of SRMC Chapter 9.30, which specifies construction-phase BMPs to prevent the discharge of contaminants to stormwater during construction and requires an ESCP to be prepared for review and approval by the City. As a result, water quality impacts associated with construction activities would be less than significant.

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TABLE 4.10-4 CONSTRUCTION BEST MANAGEMENT PRACTICES TO PREVENT EROSION

Category	Purpose	Examples
Erosion Controls and Wind Erosion Controls	<ul style="list-style-type: none"> Use project scheduling and planning to reduce soil or vegetation disturbance (particularly during the rainy season) Prevent or reduce erosion potential by diverting or controlling drainage Prepare and stabilize disturbed soil areas 	Scheduling, preservation of existing vegetation, hydraulic mulch, hydroseeding, soil binders, straw mulch, geotextile and mats, wood mulching, earth dikes and drainage swales, velocity dissipation devices, slope drains, streambank stabilization, compost blankets, soil preparation/roughening, and non-vegetative stabilization
Sediment Controls	<ul style="list-style-type: none"> Filter out soil particles that have been detached and transported in water 	Silt fence, sediment basin, sediment trap, check dam, fiber rolls, gravel bag berm, street sweeping and vacuuming, sandbag barrier, straw bale barrier, storm drain inlet protection, manufactured linear sediment controls, compost socks and berms, and biofilter bags
Wind Erosion Controls	<ul style="list-style-type: none"> Apply water or other dust palliatives to prevent or minimize dust nuisance 	Dust control soil binders, chemical dust suppressants, covering stockpiles, permanent vegetation, mulching, watering, temporary gravel construction, synthetic covers, and minimization of disturbed area
Tracking Controls	<ul style="list-style-type: none"> Minimize the tracking of soil offsite by vehicles 	Stabilized construction roadways and construction entrances/exits, and entrance/outlet tire wash
Nonstorm Water Management Controls	<ul style="list-style-type: none"> Prohibit discharge of materials other than stormwater, such as discharges from the cleaning, maintenance, and fueling of vehicles and equipment Conduct various construction operations, including paving, grinding, and concrete curing and finishing, in ways that minimize non-stormwater discharges and contamination of any such discharges 	Water conservation practices, temporary stream crossings, clear water diversions, illicit connection/discharge, potable and irrigation water management, and the proper management of the following operations: paving and grinding, dewatering, vehicle and equipment cleaning, fueling and maintenance, pile driving, concrete curing, concrete finishing, demolition adjacent to water, material over water, and temporary batch plants
Waste Management and Controls (i.e., good housekeeping practices)	<ul style="list-style-type: none"> Manage materials and wastes to avoid contamination of stormwater 	Stockpile management, spill prevention and control, solid waste management, hazardous waste management, contaminated soil management, concrete waste management, sanitary/septic waste management, liquid waste management, and management of material delivery storage and use

Source: Compiled by PlaceWorks from information provided in the California Stormwater Quality Association's Construction BMP Handbook.

Discharges from Developed Land Uses (Post-construction) to Stormwater

With the proposed land use changes, development resulting from the proposed General Plan 2040 may result in long-term impacts to the quality of stormwater and urban runoff, subsequently impacting downstream water quality. Developments can potentially create new sources for runoff contamination through changing land uses. As a consequence, developments within the EIR Study Area as a whole may have the potential to increase the post-construction pollutant loadings of certain constituent pollutants associated with the proposed land uses and their associated features, such as landscaping and plaza areas.

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To help prevent long-term impacts associated with land use changes and in accordance with the requirements of the BASMAA Post-Construction Manual and the Phase II Small MS4 permit (Order No. 2013-0001-DWQ), designated new development and significant redevelopment projects must incorporate low-impact development (LID)/site design and BMPs to address post-construction stormwater runoff. Table 4.10-5 summarizes the minimum requirements for new projects or redevelopment projects.

In addition, projects that create and/or replace one acre or more of impervious surfaces must comply with the hydromodification requirements specified in the E.12 provisions of the Phase II Small MS4 permit. These requirements include implementing site design measures to achieve infiltration, evapotranspiration, and/or harvesting/reuse of the 85th percentile 24-hours storm runoff event to the extent feasible and treatment of the remaining runoff with bioretention facilities. The hydromodification provisions also require that post-project runoff does not exceed pre-project runoff for the 2-year, 24-hour storm event.

TABLE 4.10-5 PHASE II MS4 PERMIT REQUIREMENTS

Type of Project	Project Requirements
Single-Family Homes^{a, b} Projects that create or replace 2,500 square feet (SF) or more of impervious surface.	Implement at least one measure to reduce runoff, for example by dispersing runoff to landscape or using pervious pavements. Additional Requirements: <ul style="list-style-type: none"> ▪ Limit clearing, grading, and soil compaction. ▪ Minimize impervious surfaces.
Small Projects^b Projects that create or replace between 2,500 and 5,000 SF of impervious surface.	<ul style="list-style-type: none"> ▪ Conserve natural areas of the site as much as possible consistent with local General Plan policies. ▪ Comply with stream setback ordinances/requirements. ▪ Protect slopes and channels against erosion.
Regulated Projects , other than single-family homes, ^a that create or replace 5,000 SF or more of impervious surface. ^c	Site Design/Runoff Reduction Measures (above), plus: <ul style="list-style-type: none"> ▪ Route remaining runoff to bioretention or other facilities sized and designed according to the criteria in Chapter 4 of the BASMAA Post-Construction Manual. ▪ Identify potential sources of pollutants and implement corresponding source control measures in Appendix A of the BASMAA Post-Construction Manual. ▪ Provide for ongoing maintenance of bioretention facilities.

Notes:

^a Single-family homes (determined by planning department) that are not part of a larger plan of development.

^b Single Family Homes or Small Projects may be required to follow requirements for Regulated Projects where deemed appropriate by the municipality based on the nature and extent of the proposed project

^c Includes roads and linear utility projects that create 5,000 SF or more of newly constructed, contiguous impervious surface.

Source: Bay Area Stormwater Management Agencies Association (BASMAA) Post-Construction Manual, 2019.

All regulated projects are required to prepare a Stormwater Control Plan or “SCP” that demonstrates that the project incorporates site design measures and treatment facilities that will:

- Minimize imperviousness
- Retain or detain stormwater
- Slow runoff rates
- Reduce pollutants in post-development runoff

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In particular, the SCP would show that all runoff from impervious areas is either dispersed to landscape or routed to a properly designed LID treatment facility.⁵⁶ LID is an approach to land development (or redevelopment) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features and minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles, such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions.

Since the proposed General Plan 2040 does not include specific or detailed development plans, SCPs are not required at this time. New development and redevelopment projects within the EIR Study Area will be required to prepare SCPs consistent with the guidance in the BASMAA Post-Construction Manual and the Phase II MS4 permit at the time of project application.

As part of the statewide mandate to reduce trash within receiving waters, the City is required to adhere to the requirements of the California Trash Amendments. The requirements include the installation and maintenance of trash screening devices at all public curb inlets, grate inlets, and catch basin inlets. The trash screening devices must be approved by the local agency and be consistent with the minimum standards of the Trash TMDL.

Additionally, all development pursuant to the proposed General Plan 2040 shall comply with the requirements of the SRMC, which prohibits illicit connections to the storm drainage system and forbids prohibited discharges. All development that discharge storm water associated with industrial activity shall also comply with the requirements of the General Industrial Permit (Order No. CAS000001). Development that involves the installation or decommissioning of water wells shall do so in accordance with Section 13751 of the Water Code. As stated previously, the SRMC Section 9.30.151 requires submittal and implementation of an SCP for new or significant redevelopment projects, subject to approval by the City and in accordance with the BASMAA Post-Construction Manual and the Phase II Small MS4 Permit.

The proposed Conservation and Climate Change (C), Safety and Resilience (S), and Community Services and Infrastructure (CSI) Elements contain goals, policies, and programs that require local planning and development decisions to consider impacts to water quality. The following General Plan goals, policies, and programs would serve to minimize potential adverse impacts on water quality and wastewater discharge:

Goal C-3: Clean Water. Improve water quality by reducing pollution from urban runoff and other sources, restoring creeks and natural hydrologic features, and conserving water resources.

⁵⁶ Bay Area Stormwater Management Agencies Association, January 2019, *BASMAA Post-Construction Manual*, <https://www.countyofnapa.org/DocumentCenter/View/3780/Bay-Area--Stormwater-Management-Agencies-Association-BASMAA-Post-Construction-Manual-PDF>, accessed May 10, 2020.

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- **Policy C-3.1: Water Quality Standards:** Continue to comply with local, state and federal water quality standards.
 - **Program C-3.1A: Interagency Coordination.** Coordinate with the local, state, and federal agencies responsible for permitting discharges to San Rafael's creeks and surface waters, monitoring water quality, and enforcing adopted water quality standards and laws.
- **Policy C-3.2: Reduce Pollution from Urban Runoff:** Require Best Management Practices (BMPs) to reduce pollutants discharged to storm drains and waterways. Typical BMPs include reducing impervious surface coverage, requiring site plans that minimize grading and disturbance of creeks and natural drainage patterns, and using vegetation and bioswales to absorb and filter runoff.
 - **Program C-3.2A: Countywide Stormwater Program.** Continue to participate in the countywide stormwater pollution prevention program and comply with its performance standards.
 - **Program C-3.2B: Reducing Pollutants in Runoff.** Continue to reduce the discharge of harmful materials to the storm drainage system through inspections, enforcement programs, reduced use of toxic materials, and public education.
 - **Program C-3.2C: Construction Impacts.** Continue to incorporate measures for stormwater runoff control, management, and inspections in construction projects and require contractors to comply with accepted pollution prevention planning practices. Provisions for post-construction stormwater management also should be included.
 - **Program C-3.2D: System Improvements.** Improve storm drainage performance through regular maintenance and clean-out of catch basins, installation of trash capture devices, a City street sweeping program, and prioritizing Trash Reduction Implementation measures, including installation of trash capture devices. When existing drainage lines are replaced, design changes should be made as needed to increase capacity to handle intensifying storms and expected sea level rise impacts.
 - **Program C-3.2E: Pesticide and Fertilizer Management.** On City property, reduce or eliminate the use of toxic pesticides and fertilizers. Ensure that the application of pesticides follows all applicable rules and regulations and is performed through a transparent process in which the public receives early notification.
 - **Program C-3.2F: Monitoring.** Support ongoing water quality testing in San Rafael's creeks and waterways to evaluate the effectiveness of existing programs and determine where additional pollution control measures may be needed.
- **Policy C-3.3: Low Impact Development:** Encourages construction and design methods that retain stormwater on-site and reduce runoff to storm drains and creeks.
 - **Program C-3.3A: Development Review.** Provide guidance to developers, contractors and builders on the use of rain gardens, bioswales and bio-retention facilities, permeable pavers, grass parking lots, and other measures to absorb stormwater and reduce runoff rates and volumes.
 - **Program C-3.3B: Non-Traditional Gardens.** Evaluate best practices in the use of roof gardens, vertical gardens/ green walls, pollinator gardens and other measures that increase the City's capacity to sequester carbon, plant trees, and enhance environmental quality. Encourage the incorporation of such features in new development.
- **Policy C-3.4: Green Streets.** Requires the City to design streets and infrastructure so they are more compatible with the natural environment, mitigate urban heat island effects, and have fewer negative impacts on air and water quality, flooding, climate, and natural habitat.

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- **Program C-3.4A: Green Streets Planning.** Develop a Green Streets Plan that includes policy guidance, tools, analytics, and funding mechanisms to create more sustainably designed street and storm drainage systems. Street and drainage system improvements should support City conservation and climate change goals.
- **Program C-3.4B: Funding.** Identify and apply for grants and federal, state, and regional funds to upgrade stormwater facilities, rehabilitate roads, and implement other Green Streets initiatives.
- **Policy C-3.5: Groundwater Protection.** Protect San Rafael’s groundwater from the adverse effects of urban uses. Encourage opportunities for groundwater recharge to reduce subsidence and water loss, and support water-dependent ecosystems.
 - **Program C-3.5A: Underground Tank Remediation.** Continue efforts to remediate underground storage tanks and related groundwater hazards. Avoid siting new tanks in areas where they pose hazards, including areas prone to sea level rise.

Goal S-2: Resilience to Geologic Hazards. Minimize potential risks associated with geologic hazards, including earthquake-induced ground shaking and liquefaction, landslides, erosion, sedimentation, and settlement.

- **Policy S-2.5: Erosion Control.** Requires appropriate control measures in areas susceptible to erosion, in conjunction with proposed development. Erosion control measures should incorporate best management practices (BMPs) and should be coordinated with requirements for on-site water retention, water quality improvements, and runoff control.
 - **Program S-2.5A: Erosion and Sediment Control Plans.** Require Erosion and Sediment Control Plans (ESCPs) for projects meeting the criteria defined by the Marin County Stormwater Pollution Prevention Program, including those requiring grading permits and those with the potential for significant erosion and sediment discharges. Projects that disturb more than one acre of soil must prepare a Stormwater Pollution Prevention Plan, pursuant to State law.
 - **Program S-2.5B: Grading During the Wet Season.** Avoid grading during the wet season due to soil instability and sedimentation risks. Require that development projects implement erosion and/or sediment control measures and runoff discharge measures based on their potential to impact storm drains, drainageways, and creeks.
- **Policy S-2.6: Septic Systems.** Discourage the use of septic systems within San Rafael’s Planning Area. If no other alternatives exist, then soil tests shall be required to determine if soils are suitable for a septic system or other innovative means of onsite wastewater disposal. . In hillside areas, an evaluation of the impact of additional water from a septic system on hillside stability shall be required. New or improved septic systems shall be designed by a registered civil engineer that specializes in septic design.

Goal CSI-4: Reliable, Efficiently Managed Infrastructure. Support reliable, cost-effective, well-maintained, safe and resilient infrastructure and utility services.

- **Policy CSI-4.4: Sustainable Design.** Plan, design, and operate infrastructure to minimize non-renewable energy and resource consumption, improve environmental quality, promote social equity, and reduce greenhouse gas emissions. An evaluation of costs and benefits must be a factor in all improvements. This includes the potential costs of inaction and potential for “avoided costs,” particularly with respect to climate change.

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- **Program CSI-4.4A: Public Space and Infrastructure.** Seek opportunities to improve environmental quality in the design of streets, infrastructure, and public spaces. For example, public space improvements provide an opportunity to retain and treat stormwater through groundwater infiltration and subsurface water storage.
- **Program CSI-4.4B: Reducing Impervious Surfaces.** Pursue porous pavement, rain catchment areas, and similar elements that reduce runoff.

Therefore, with the implementation of these policies in conjunction with State and local regulatory requirements, potential future development would not violate water quality standards or waste discharge requirements for both construction and operational phases, and impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

Downtown Precise Plan

Roughly half of the proposed development through horizon year 2040 is anticipated to occur in the Downtown Precise Plan Area, which is a highly developed and urbanized area of the city. Potential future development in this area would occur on a limited number of vacant parcels in the form of infill/intensification on sites already developed and/or underutilized or in close proximity to existing development. Much like potential future development in the remainder of the city, new development or redevelopment within the Downtown Precise Plan Area would be required to comply with the General Plan 2040 goals, policies, and programs as well as State and local regulatory requirements that would minimize impacts to water quality during both operation and construction phases.

Within the Downtown Gateway sub-area of the Downtown Precise Plan, future projects such as an urban wetland could be suitable on the southern edge near US-101, south of Second Street and east of Lincoln Avenue. An urban wetland would help alleviate local flooding during the rainy season and to combat sea-level rise in the future. An urban wetland project would require parcel acquisition along San Rafael Creek. An urban wetland could be designed to widen the connection of Irwin Creek and San Rafael Creek and create a natural downtown amenity.

Compliance with these regulatory requirements would ensure that development in the Downtown Precise Plan Area would not violate any water quality standards or waste discharge requirements for both construction and operational phases, and impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

HYD-2	Implementation of the proposed project could substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.
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General Plan 2040

Implementation of the proposed project would result in a significant environmental impact if it would substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that

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there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. New development under the proposed General Plan 2040 could result in an increase in impervious surfaces, thus reducing groundwater recharge. Also, new projects that involve construction dewatering could have a temporary impact on the shallow groundwater aquifer.

Groundwater Recharge

New projects developed pursuant to the proposed General Plan 2040 are required to implement BMPs and LID measures—which include on-site infiltration—where feasible. The E.12 Post-Construction Measures in the Phase II Small MS4 Permit require site design measures, source control measures, LID standards, and hydromodification measures to be included in an SCP that must be submitted to and approved by the City. These measures minimize the impact of impervious areas by including pervious pavements, drainage to landscaped areas and bioretention areas, and the collection of rooftop runoff in rain barrels or cisterns for new development projects. These measures also increase the potential for groundwater recharge. In addition, groundwater within the EIR Study Area is not used by municipal water agencies and is limited in capacity and quality.

Groundwater Use

The two groundwater basins within the EIR Study Area are categorized as low priority basins and there is no groundwater withdrawal for municipal use. Groundwater is limited to domestic and irrigation uses from private groundwater wells. The MMWD has determined that the potential for municipal groundwater use is very limited due to low production capabilities, water quality constraints, and potential water rights issues. Therefore, groundwater beneath the EIR Study Area is not currently used and is not planned to be used as a municipal water supply source by MMWD. Projects pursuant to the proposed project would receive their water supply from surface water sources and thus would not decrease groundwater supplies.

The proposed Conservation and Climate Change (C) and Community Services and Infrastructure (CSI) Elements contain goals, policies, and programs that require local planning and development decisions to consider impacts to groundwater. As previously listed under impact discussion HYD-1, proposed General Plan Policy C-3.5 requires the City to protect San Rafael's groundwater from the adverse effects of urban uses and encourages opportunities for groundwater recharge to reduce subsidence and water loss. Program C-3.5A requires the City to continue efforts to remediate underground storage tanks and related groundwater hazards. Program CSI-4.4A requires the City to seek opportunities to improve environmental quality in the design of streets, infrastructure, and public spaces, which could include public space improvements that provide opportunities to retain and treat stormwater through groundwater infiltration and subsurface water storage. Program CSI-4.4B requires the City to pursue porous pavement, rain catchment areas, and similar elements that reduce runoff, which would also support groundwater recharge.

Potential future development as a result of implementation of the General Plan 2040 would not use groundwater supplies or interfere with groundwater recharge, and General Plan 2040 includes goals, policies, and programs that would further protect groundwater; therefore, impacts would be *less than significant*.

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Significance without Mitigation: Less than significant.

Downtown Precise Plan

As shown on Figure 4.10-2, a small portion of the San Rafael Valley groundwater basin is within the southern edge of the Downtown Precise Plan Area. However, groundwater within this groundwater basin is not used by municipal water agencies and is limited in capacity and quality. Similar to the EIR Study Area requirements, adherence to E.12 provisions in the Phase II Small MS4 Permit require site design measures, source control measures, LID standards, and hydromodification measures to be implemented for new construction or reconstruction, which would increase the potential for groundwater recharge in the Downtown Precise Plan Area. Therefore, potential future development in the Downtown Precise Plan Area would not use groundwater supplies or interfere with groundwater recharge, and the goals, policies, and programs of the General Plan 2040 that protect groundwater would also apply to the Downtown Precise Plan Area; therefore, impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

HYD-3	Implementation of the proposed project could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: i) result in substantial erosion or siltation on- or off-site; ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site; iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or iv) impede or redirect flood flows.
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General Plan 2040

Erosion and Siltation

New development or redevelopment within the EIR Study Area and changes in land use could result in an increase in impervious surfaces. This, in turn, could result in an increase in stormwater runoff, higher peak discharges to drainage channels, and the potential to cause erosion or siltation in drainage swales and streams. Increases in tributary flows can exacerbate creek bank erosion or cause destabilizing channel incision.

All potential future development pursuant to the proposed General Plan 2040 would be required to implement construction-phase BMPs as well as post-construction site design, source control measures, and treatment controls in accordance with the requirements of the CGP, the SRMC, the Phase II MS4 Permit, and the BASMAA Post-Construction Manual. Typical construction BMPs include silt fences, fiber rolls, catch basin inlet protection, water trucks, street sweeping, and stabilization of truck entrance/exits. Each new development or redevelopment project that disturbs one or more acre of land would be

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required to prepare and submit a SWPPP to the SWRCB that describes the measures to control discharges from construction sites. In addition, the City requires preparation and submittal of an ESCP for review prior to the issuance of grading permits.

Once potential future development projects have been constructed, there are Provision E.12 requirements in the Phase II Small MS4 permit for new development or redevelopment projects that must be implemented and include site design measures, source control measures, LID, and treatment measures that address stormwater runoff and would reduce the potential for erosion and siltation. Site design measures include limits on clearing, grading, and soil compaction; minimizing impervious surfaces; conserving the natural areas of the site as much as possible; complying with stream setback ordinances; and protecting slopes and channels from erosion. LID measures include the use of permeable pavements, directing runoff to pervious areas, and the construction of bioretention areas. The SCP must also include operation and maintenance procedures and an agreement to maintain any stormwater treatment and control facilities for perpetuity. Adherence to the streambed alteration agreement process under Sections 1601 to 1606 of the California Fish and Game Code would further reduce erosion and siltation impacts that may occur due to streambed alterations. Compliance with these regional and local regulatory requirements will ensure that erosion and siltation impacts from new development and redevelopment projects would be *less than significant*.

Flooding On- or Off-Site

New development and/or redevelopment and changes in land uses could result in an increase in impervious surfaces, which in turn could result in an increase in stormwater runoff, higher peak discharges to drainage channels, and the potential to cause nuisance flooding in areas without adequate drainage facilities. However, all potential future development must comply with the requirements of the Phase II MS4 Permit and the BASMAA Post-Construction Manual. Regulated projects must implement BMPs, including LID BMPs and site design BMPs, which effectively minimize imperviousness, retain or detain stormwater on-site, decrease surface water flows, and slow runoff rates. Projects that create and/or replace one acre of impervious surface must also adhere to the hydromodification requirements of the BASMAA Post-Construction Manual to ensure that post-project runoff does not exceed pre-project runoff for the 2-year, 24-hour storm. SRMC Chapter 9.30 also mandates that projects maintain pre-development stormwater runoff rates to the extent possible. Adherence to these regulatory requirements would minimize the amount of stormwater runoff from new development and redevelopment within the study area. Therefore, projects pursuant to the proposed General Plan 2040 would not result in flooding on- or off-site, and impacts would be *less than significant*.

Stormwater Drainage System Capacity

As stated in the impact discussions above, an increase in impervious surfaces with new development or redevelopment within the EIR Study Area could result in increases in stormwater runoff, which in turn could exceed the capacity of existing or planned stormwater drainage systems. All potential future development and redevelopment projects would be required to comply with the Phase II Small MS4 permit requirements and follow the BASMAA Post-Construction Manual when designing on-site stormwater treatment facilities. The hydrology study and SCP for each project is subject to City review to verify that the on-site storm drain systems and treatment facilities can accommodate stormwater runoff

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from the site and would not exceed the capacity of downstream drainage systems at the point of connection. Also, implementation of the E.12 provisions for new development, which include LID design and bioretention areas, would minimize increases in peak flow rates or runoff volumes, thus reducing stormwater runoff to the storm drain system. In addition, the SRMC Chapter 9.30 states that pre-development stormwater runoff rates should be maintained whenever possible for new development projects. Finally, as part of the permitting process, new development projects would be required to pay public utility fees, as per SRMC Chapter 3.32, which finances improvements to the municipal storm drain system to accommodate increased flows.

Potential future development within the EIR Study Area would be infill projects or the intensification of existing land uses and would be in urban areas with existing storm drain systems. With the implementation of the E.12 provisions for new projects within the EIR Study Area, there would not be a significant increase in stormwater runoff to the City's storm drain system.

Further, new development and redevelopment within the EIR Study Area would not create substantial additional sources of polluted runoff. During the construction phase, projects would be required to prepare SWPPPs and ESCPs, thus limiting the discharge of pollutants from the site. During operation, projects must implement BMPs and LID measures that minimize the amount of stormwater runoff and associated pollutants.

With implementation of these control measures and regulatory provisions to limit runoff from new development sites, the proposed General Plan 2040 would not result in significant increases in runoff that would exceed the capacity of existing or planned storm drain facilities, and the impact is *less than significant*.

Redirecting Flood Flows

The discussion above regarding on- and off-side flooding is also applicable to the analysis of impeding or redirecting flood flows. Since new development projects are required to comply with E.12 provisions of the Phase II Small MS4 Permit and retain stormwater on-site via the use of bioretention facilities, any flood flows would also be retained for a period of time on-site, which would minimize the potential for flooding impacts. The following section, HYD-4, discusses the potential for impeding or redirecting flood flows with development in areas within the 100-year floodplain. Based on these discussions, impacts related to impeding or redirecting flood flows would be *less than significant*.

The proposed Community Design and Preservation (CDP), Conservation and Climate Change (C), Safety and Resilience (S), and the Community Services and Infrastructure (CSI) Elements contain goals, policies, and programs that require local planning and development decisions to consider impacts to hydrology. The following General Plan 2040 goals, policies, and programs would serve to minimize potential adverse impacts on drainage patterns:

Goal CDP-4: Quality Construction and Design. Encourage quality construction and design that enhances San Rafael's character and creates places of lasting value.

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- **Policy CDP-4.10, Landscape Design:** Encourages privately owned and maintained landscaping that contributes to neighborhood quality, complements building forms and materials, improves stormwater management and drainage, and enhances the streetscape.
 - **Program CDP-4.10A: Zoning Regulations.** Periodically evaluate the landscape provisions in the Zoning Ordinance to respond to climate change, hazards, water availability, shading needs, and other issues. Zoning should support the City’s goal of having a strongly landscaped character.
 - **Program CDP-4.10B: Industrial Landscape Design.** Ensure that landscape guidelines for new industrial and general commercial development provide effective buffering, while also supporting water conservation, water quality, and fire hazard reduction goals.
 - **Program CDP-4.10C: Parking Lot Landscaping Requirements.** Review City standards for parking lot landscaping to ensure that they adequately address visual screening, water conservation, environmental quality, and climate-related issues. Standards should allow for solar shade structures within parking areas.

Goal C-1: Supporting Our Natural Communities. Protect, restore, and enhance San Rafael’s environment and natural communities.

- **Policy C-1.9, Enhancement of Creeks and Drainageways:** Conserve or improve the habitat value and hydrologic function of creeks and drainageways so they may serve as wildlife corridors and green infrastructure to improve stormwater management, reduce flooding, and sequester carbon. Require creek enhancement and associated riparian habitat restoration/ creation for projects adjacent to creeks to reduce erosion, maintain storm flows, improve water quality, and improve habitat value where feasible.
 - **Program C-1.9A: Watercourse Protection Regulations.** Maintain watercourse protection regulations in the San Rafael Municipal Code. These regulations should be periodically revisited to ensure that they adequately protect creeks and drainageways. Consider specific measures or guidelines to mitigate the destruction or damage of riparian habitat from roads, development, and other encroachments.
 - **Program C-1.9B: Creek Restoration.** Encourage and support efforts by neighborhood associations, environmental organizations, and other interested groups to fund creek enhancement, restoration, and daylighting projects, as well as creek clean-ups and ongoing maintenance programs.
 - **Program C-1.9C: Upper Gallinas Watershed Restoration.** Support implementation of creek restoration projects in the Upper Gallinas Creek Watershed, consistent with the Restoration Opportunities Report prepared in December 2016. It remains a priority of the City to restore the creek by removing the concrete channel, creating a walkway/ bikeway alongside, and planting native trees to provide shade and filter runoff. Pursue grants and other funds, including capital improvement projects and general operating funds, to restore natural creek conditions and native vegetation.
 - **Program C-1.9D: Restoration of San Rafael, Mahon, and Irwin Creeks.** Pursue opportunities for creek restoration and beautification along San Rafael, Mahon, and Irwin Creeks, building on past efforts supporting biological and ecological restoration, education, and water quality improvements along these waterways.

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Goal C-3: Clean Water. Improve water quality by reducing pollution from urban runoff and other sources, restoring creeks and natural hydrologic features, and conserving water resources.

- **Policy C-3.3: Low Impact Development:** Encourages construction and design methods that retain stormwater on-site and reduce runoff to storm drains and creeks.
 - **Program C-3.3A: Development Review.** Provide guidance to developers, contractors and builders on the use of rain gardens, bioswales and bio-retention facilities, permeable pavers, grass parking lots, and other measures to absorb stormwater and reduce runoff rates and volumes.
 - **Program C-3.3B: Non-Traditional Gardens.** Evaluate best practices in the use of roof gardens, vertical gardens/ green walls, pollinator gardens and other measures that increase the City's capacity to sequester carbon, plant trees, and enhance environmental quality. Encourage the incorporation of such features in new development.
- **Policy C-3.4, Green Streets:** Requires the City design streets and infrastructure so they are more compatible with the natural environment, mitigate urban heat island effects, and have fewer negative impacts on air and water quality, flooding, climate, and natural habitat.
 - **Program C-3.4A: Green Streets Planning.** Develop a Green Streets Plan that includes policy guidance, tools, analytics, and funding mechanisms to create more sustainably designed street and storm drainage systems. Street and drainage system improvements should support City conservation and climate change goals.
 - **Program C-3.4B: Funding.** Identify and apply for grants and federal, state, and regional funds to upgrade stormwater facilities, rehabilitate roads, and implement other Green Streets initiatives.

Goal S-2: Resilience to Geologic Hazards. Minimize potential risks associated with geologic hazards, including earthquake-induced ground shaking and liquefaction, landslides, erosion, sedimentation, and settlement.

- **Policy S-2.5: Erosion Control.** Requires appropriate control measures in areas susceptible to erosion, in conjunction with proposed development. Erosion control measures should incorporate best management practices (BMPs) and should be coordinated with requirements for on-site water retention, water quality improvements, and runoff control.
 - **Program S-2.5A: Erosion and Sediment Control Plans.** Require Erosion and Sediment Control Plans (ESCPs) for projects meeting the criteria defined by the Marin County Stormwater Pollution Prevention Program, including those requiring grading permits and those with the potential for significant erosion and sediment discharges. Projects that disturb more than one acre of soil must prepare a Stormwater Pollution Prevention Plan, pursuant to State law.
 - **Program S-2.5B: Grading During the Wet Season.** Avoid grading during the wet season due to soil instability and sedimentation risks. Require that development projects implement erosion and/or sediment control measures and runoff discharge measures based on their potential to impact storm drains, drainageways, and creeks.

Goal S-3: Resilience to Flooding and Sea Level Rise. Recognize, plan for, and successfully adapt to the anticipated effects of increased flooding and sea level rise.

- **Policy S-3.8, Storm Drainage Improvements:** Requires new development to mitigate potential increases in runoff through a combination of measures, including improvement of local storm

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drainage facilities. Other measures, such as the use of porous pavement, bioswales, and “green infrastructure” should be encouraged.

- **Program S-3.8A: Storm Drainage Improvements.** Consistent with Countywide and regional stormwater management programs, require new development with the potential to impact storm drainage facilities to complete hydrologic studies that evaluate storm drainage capacity, identify improvements needed to handle a 100-year storm, and determine the funding needed to complete those improvements.
- **Program S-3.8B: Green Infrastructure Guidelines.** Evaluate potential measures to more sustainably manage stormwater, erosion, and improve water quality associated with urban runoff. *This includes improvements such as rain gardens and permeable pavement, which attenuate flooding downstream and provide ecological benefits.*

Goal CSI-4: Reliable, Efficiently Managed Infrastructure. Support reliable, cost-effective, well-maintained, safe and resilient infrastructure and utility services.

- **Policy CSI-4.10, Storm Drainage Facilities:** Require the continued monitoring and improving of the storm drainage system, including programs to reduce flooding, improve water quality, remove trash, and respond to climate-related changes. **Evaluate the potential for restoration of the natural hydrologic function of creeks and drainageways where possible.**
 - **Program CSI-4.10A: Replacement of Aging Facilities.** Pursue the replacement of older or failing drainage facilities such as metal pipes and stormwater pumping stations with more durable and resilient materials, or with new structures and pumps.
 - **Program CSI-4.10B: Silt Removal.** Continue to remove accumulated silt from City maintained drainageways, ponds, and creeks subject to tidal siltation such as Mahon and Irwin Creeks. **Sediment from stream flow and deposition should be considered a potential resource.**
 - **Program CSI-4.10C: Sustainable Stormwater Management.** Seek funding for projects that restore the natural characteristics and functions of stormwater systems, such as bioswales and conversion of concrete ditches to natural creeks. Such projects should mitigate the effects of urban runoff, reduce flood hazards, and improve water quality and habitat value.

With the implementation of regulatory requirements and the proposed General Plan 2040 policies listed above, these hydrology impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

Downtown Precise Plan

Like elsewhere in the city, the potential future development or redevelopment within the Downtown Precise Plan Area would be required to prepare SWPPPs and erosion and sediment control plans during project construction. During operation, projects in the Downtown Precise Plan Area must implement BMPs and LID measures. Additionally, projects that create and/or replace 1 acre of impervious surface must also adhere to the hydromodification requirements of the BASMAA Post-Construction Manual, and SRMC Chapter 9.30 further mandates that projects maintain pre-development stormwater runoff rates to the extent possible. Compliance with these regional and local regulatory requirements would ensure that erosion and siltation impacts, flooding on- or off-site, and impacts to the stormwater drainage system

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capacity, would be *less than significant* from new development and redevelopment projects in the Downtown Precise Plan Area.

Depending on the final design, future projects such as an urban wetland could alter the course of the existing San Rafael Creek, which could result in redirecting flood flows. However, the intent of an urban wetland is to alleviate local flooding and combat sea level rise. As shown on Figure 4.10-3, the property south of Second Street and east of Lincoln Avenue, where a potential urban wetland could be located, is within the FEMA 100-year flood zone. Also, as shown on Figure 4.10-13, this area is within the area of sea level rise plus storm surge by 2050. Additionally, portions of the Downtown Precise Plan Area would be impacted by sea level rise by 2100.

Implementation of an urban wetland project would require consultation with the USACE, which issues permits to dredge waters of the United States under Section 404 of the CWA and for activities involving the construction of any structures in or over navigable waters of the United States under the River and Harbors Act of 1899. An urban wetland project would also require consultation with CDFW because it would result in streambed alteration under Sections 1601 to 1606 of the California Fish and Game Code. Compliance with federal and regional regulatory requirements would ensure impacts related to impeding or redirecting flood flows, from an urban wetland or similar flood control project, would be *less than significant* for the Downtown Precise Plan.

Potential future development and redevelopment within the Downtown Precise Plan Area is also required to comply with E.12 provisions of the Phase II Small MS4 Permit and retain stormwater on-site via the use of bioretention facilities. Therefore, any flood flows would be retained temporarily on-site, which would minimize the potential for flooding impacts. Developments in the Downtown Precise Plan Areas that are within the 100-year floodplain would be subject to FEMA and City floodplain building regulations, as discussed in the following section, HYD-4. Based on these discussions, impacts related to impeding or redirecting flood flows would be *less than significant* in the Downtown Precise Plan Area.

With the compliance with the regulatory requirements and the proposed General Plan 2040 goals, policies, and programs listed above, impacts to existing drainage patterns and the course of a stream or river would be *less than significant*.

Significance without Mitigation: Less than significant.

HYD-4	Implementation of the proposed project could risk release of pollutants due to project inundation if in a flood hazard, tsunami, or seiche zones.
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General Plan 2040

Flood Hazard Zones

Buildout pursuant to the proposed General Plan 2040 could involve development of some projects in FEMA 100-year flood zones. As shown on Figure 4.10-3, most of the land along Miller Creek, the outlets of Gallinas Creek and San Rafael Creek, and land adjacent to San Pablo Bay are within the 100-year floodplain.

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The proposed General Plan 2040 land use map designates residential and airport/recreational land uses within the 100-year flood zone at the outlet of Gallinas Creek. Residential land use designations are also located within the 100-year flood zone adjacent to the San Pablo Bay in the northeast area of the city. At the San Rafael Creek outlet, light and general industrial, mixed use, and residential land uses are designated within the 100-year flood zone. Residential land use designations are also assigned within the 100-year flood zone adjacent to Miller Creek.

As discussed in Section 4.10.1, Environmental Setting, there are levees along the creek outlets and many of the bayfront areas. In the northern portion of the city, levees extend from Miller Creek outlet to Gallinas Creek outlet, including levees along the north side of McInnis Park. In the southern portion, levees extend from Pickleweed Park to US-580 along the shoreline.

Potential future development in 100-year flood zones would be subject to floodplain requirements listed in SRMC Title 18. Prior to the start of construction or development within a Flood Hazard Area (i.e., 100-year floodplain), the City of San Rafael requires project applicants to obtain a development permit from the City's Floodplain Administrator and construct new development in accordance with the standards in SRMC Section 18.50.010, Standards of Construction. The standards of construction vary depending on whether the proposed structure is in Zone A or Zone VE and include provisions for flood risk reduction, including anchoring and flood-resistant materials and construction methods, with the lowest floors elevated above the base flood elevation. Prior to occupancy of any building, proof that a Letter of Map Revision and an elevation certificate has been obtained from FEMA must be provided to the City. Compliance with FEMA's National Flood Insurance Program requirements and SRMC requirements would reduce potential flood hazards and ensure that pollutants are not released during flood inundation.

Additionally, the San Rafael LHMP includes hazard mitigation actions to help reduce the risk of damage or injury from floods. These actions include improvements to drainage systems, levee assessments, development of a City Flood Alert System, and San Rafael Canal dredging.⁵⁷

Tsunami

Given the history of tsunamis in the San Francisco Bay Area, the risk of flooding due to a tsunami event is considered to be unlikely for the city of San Rafael.⁵⁸ Tsunami hazards in the San Pablo and San Francisco Bays are much smaller than along the Pacific Coast because the bays are enclosed body of waters. However, as shown on Figure 4.10-8, the land surrounding the outlets of Gallinas Creek, San Rafael Creek, McInnis Park, and the coastal areas of the Canal, Loch Lomond, Glenwood, and Peacock Gap neighborhoods are within the mapped tsunami inundation zones.

The tsunami zone surrounding the Gallinas Creek outlet and the Peacock Gap neighborhood is designated open space in the General Plan 2040 Land Use Map. The zone surrounding the San Rafael Creek outlet is

⁵⁷ City of San Rafael, July 2017, *Local Hazard Mitigation Plan*, <https://storage.googleapis.com/proudcity/sanrafaelca/uploads/2018/01/City-of-San-Rafael-LHMP-Complete.pdf>, accessed May 12, 2020.

⁵⁸ City of San Rafael, 2017. *San Rafael Local Hazard Mitigation Plan*. Dated June 2017.

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designated mixed use and residential land use. Loch Lomond includes mixed-use designations within the tsunami zone, and the Glenwood area and Canal include residential land use.

Due to the infrequent nature of tsunamis and relatively low predicted tsunami wave height in the area, the City is reasonably safe from tsunami hazards. Furthermore, SRMC Title 18 includes requirements for development within coastal high-hazard areas, which includes tsunami zones.

In addition, there are various precautions and warning systems that would be implemented by the City in the event of a tsunami. The City uses an automated telephone and text message system that can notify affected portions of the community when emergency alerts or notifications are needed. Also, the National Oceanic and Atmospheric Administration operates the National Tsunami Warning Center and the Pacific Tsunami Warning Center that alert local authorities to order the evacuation of low-lying areas, if necessary.

Marin County and the City are part of the tsunami warning system. The Marin Operational Area Emergency Operations Plan provides information and guidance for tsunami warnings, advisories, watches, and information statement bulletins, and specifies the roles and responsibilities of local response agencies in alert and warning dissemination. Additionally, the Marin Emergency Recovery Plan provides a concept of operations for long term recovery and restoration after extensive damage due to tsunami.⁵⁹ Both the Marin Operational Area Emergency Operations Plan and the Marin Emergency Recovery Plan are discussed further in Chapter 4.9, Hazards and Hazardous Materials, of this Draft EIR.

A bayfront levee currently protects portions of the city from high tides and waves. Although the lower elevation portions of the levees could be overtopped by a tsunami, the potential for significant damage is low given the distance of structures from the levee and the short duration of a tsunami, the impact would be less than significant.⁶⁰

Sea Level Rise

As discussed in the Flood Hazard discussion above, potential development under the proposed General Plan 2040 could involve development in areas that will be inundated by sea level rise and associated coastal flooding. As shown on Figures 4.10-4 to Figure 4.10-7, most of the land along the outlets of the Miller Creek, Gallinas Creek, and San Rafael Creek will be in sea level rise inundation areas by 2050 and 2100, with additional land being inundated during a 100-year storm surge. Other areas that will be inundated by sea level rise and storm surge in 2100 include southern San Rafael east of I-580, Peacock Gap golf course and surrounding neighborhood, and marshlands near Santa Venetia Marsh Preserve. Other marshland areas adjacent to San Pablo Bay and San Francisco Bay are also at risk of inundation from sea level rise and coastal flooding.

⁵⁹ Marin County Sheriff's Office of Emergency Services. 2015. *Tsunami Annex*. <https://www.marinsheriff.org/assets/downloads/01.30.2015-Tsunami-AnnexUH.pdf>

⁶⁰ City of San Rafael, July 2017, *Local Hazard Mitigation Plan*, <https://storage.googleapis.com/proudcity/sanrafaelca/uploads/2018/01/City-of-San-Rafael-LHMP-Complete.pdf>, accessed May 12, 2020.

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As shown on Figure 3-7 in Chapter 3, Project Description, of this Draft EIR, nearly every land use designated on the General Plan 2040 land use map, with the exception of Hillside Resource Residential and Hillside Residential, would have some land within the projected sea level rise inundation area for 2050 with a 100-year storm surge. Many of the inundation areas would include parks and open space, residential, commercial, or mineral resource uses along Miller Creek, Gallinas Creek, and San Rafael Creek and areas adjacent to the San Pablo and San Francisco Bays.

As discussed above, there are levee systems in both northern and southern areas of the EIR Study Area that protect development from inundation from sea level rise and storm surge. These levees extend from the Miller Creek outlet to the Gallinas Creek outlet and along McInnis Park in the north, and from Pickleweed Park to US-580 along the shoreline in the south.

Additionally, the City has developed the *San Rafael Sea-Level Rise Adaptation Study*, which identifies potential adaptation measures to reduce the risk of inundation from sea level rise and coastal flooding. Potential citywide measures include flood barriers and hydraulic pump stations; creating guidance on structure elevation, shoreline setbacks, and disclosure requirements; and developing and applying protocols for assessing pump station inflows, discharge capacity, and resilience with climate change.⁶¹ Potential adaptation measures in the six specific areas, identified in the Section 4.10.1.2, Existing Conditions, above, consist of raising shoreline levees and floodwalls, long-term restoration of canals and diked marshes, raising roadways to maintain evacuation routes, and upgrading the culverts and pumping stations that help with stormwater control.⁶²

Furthermore, potential future development under the proposed General Plan 2040 within 100 feet of the San Pablo or San Francisco Bay shoreline would be subject to review and approval by the BCDC. Potential future development and large shoreline projects, including shoreline protection projects, would be required to conduct a sea level rise risk assessment and be designed to be resilient to a midcentury sea level rise projection. BCDC also requires that if it is likely that the project will remain in place longer than midcentury, an adaptive management plan should be developed to address the long-term impacts that will arise, based on the risk assessment. Potential new development under the proposed General Plan 2040 more than 100 feet inland from San Pablo or San Francisco Bay shoreline would not be subject to BCDC review. However, potential future development under the proposed General Plan 2040 would be required to comply with SRMC Title 18, Protection of Flood Hazards, which restricts development in floodable areas and requires protections for new development within inundation areas.

The proposed Land Use (LU), Conservation and Climate Change (C), Safety and Resilience (S), and Community Services and Infrastructure (CSI) Elements contain goals, policies, and programs that require local planning and development decisions to consider impacts to hydrology. The following General Plan 2040 goals, policies, and programs would minimize potential adverse impacts due to flooding:

⁶¹ Environmental Science Associates, 2020, San Rafael Sea-Level Rise Adaptation Study, <https://storage.googleapis.com/proudcity/sanrafaelca/uploads/2020/10/San-Rafeal-SLR-Vulnerability-Study-2020Jun19.pdf>.

⁶² Environmental Science Associates, 2020, San Rafael Sea-Level Rise Adaptation Study, <https://storage.googleapis.com/proudcity/sanrafaelca/uploads/2020/10/San-Rafeal-SLR-Vulnerability-Study-2020Jun19.pdf>.

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Goal LU-1: Well-Managed Growth. Grow and change in a way that serves community needs, improves fiscal security, and enhances the quality of life.

- **Policy LU-1.2: Development Timing.** Allow new development only when adequate infrastructure is available, consistent with the following findings [relevant to hydrology and water quality]:
 - Sewer, water, and other infrastructure improvements needed to serve the proposed development will be in place and available to serve the development by the time it is constructed.
 - The project has incorporated design and construction measures to mitigate exposure to hazards, including flooding, sea level rise, and wildfire.
 - **Program LU-1.2A: Development Review.** Implement Policy LU-2 through the development review and environmental review processes. The City may modify the requirements associated with this policy if it determines that its application as stated would preclude all economically viable use of a subject property.
- **Policy LU-1.12: Transfer of Development Rights.** Allow transfer of development rights (TDR) or density/FAR from one property to another in cases where:
 - Special circumstances (e.g., historic preservation, wetlands protection, sea level rise) are found to exist, potentially causing significant environmental impacts if the transfer was not allowed; or
 - A significant public benefit would be provided as a result of the transfer.
 - **Program LU-1.12A: Transfer of Development Rights (TDR) Program.** Evaluate opportunities for TDR as a response to issues such as sea level rise and wildfire hazards. This evaluation also should address how TDRs are sold and recorded.
- **Policy LU-1.17: Building Heights.** Use General Plan Figure 3-3 as the basis for determining “baseline” maximum building heights in San Rafael. Maximum heights should continue to be codified through zoning and the Downtown Precise Plan. In addition, the following specific provisions related to building heights shall apply:
 - Height of buildings existing or approved as of January 1, 1987, shall be considered as conforming to zoning standards.
 - Hotels outside of the Downtown Precise Plan boundary have a 54-foot height limit. Within Downtown, the height provisions of the Downtown Precise Plan apply.
 - As provided for by Policy LU-18, “baseline” building heights are subject to height bonuses of up to 24 feet where specific community benefits are provided, where a Variance or zoning exception is granted, or where a Transfer of Development Rights (TDR) is being implemented.
 - Heights may be increased by up to six (6) feet above the baseline allowable building heights is necessary to mitigate the exposure of properties to sea level rise and other flooding hazards (e.g., raising the first floor of habitable floor space above anticipated tidal flood elevations).

Goal C-1: Habitat Protection. Protect, restore, and enhance San Rafael’s environment and natural habitat.

- **Policy C-1.9: Enhancement of Creeks and Drainageways.** Requires that the City conserve or improve the habitat value of creeks and drainageways so they may serve as wildlife corridors and green infrastructure to improve stormwater management, reduce flooding, and sequester carbon.
 - **Program C-1.9A: Watercourse Protection Regulations.** Maintain watercourse protection regulations in the San Rafael Municipal Code. These regulations should be periodically revisited to ensure that they adequately protect creeks and drainageways. Consider adding specific measures

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or guidelines to mitigate the destruction or damage of riparian habitat from roads, development, and other encroachments.

- **Program C-1.9B: Creek Restoration.** Encourage and support efforts by neighborhood associations, environmental organizations, and other interested groups to fund creek enhancement, restoration, and daylighting projects, as well as creek clean-ups and ongoing maintenance programs.
- **Program C-1.9C: Upper Gallinas Watershed Restoration.** Support implementation of creek restoration projects in the Upper Gallinas Creek Watershed, consistent with the Restoration Opportunities Report prepared in December 2016. It remains a top priority of the City to restore the creek by removing the concrete channel, creating a walkway/ bikeway alongside, and planting native trees to provide shade and filter runoff. Grants and other funds should be pursued to restore natural creek conditions and native vegetation.
- **Program C-1.9D: Restoration of San Rafael, Mahon, and Irwin Creeks.** Pursue opportunities for creek restoration and beautification along San Rafael, Mahon, and Irwin Creeks, building on past efforts supporting biological and ecological restoration, education, and water quality improvements along these waterways.

Goal C-3: Clean Water. Improve water quality by reducing pollution from urban runoff and other sources, restoring creeks and natural hydrologic features, and conserving water resources.

- **Policy C-3.2: Reduce Pollution from Urban Runoff.** Require Best Management Practices (BMPs) to reduce pollutants discharged to storm drains and waterways. Typical BMPs include reducing impervious surface coverage, requiring site plans that minimize grading and disturbance of creeks and natural drainage patterns, and using vegetation and bioswales to absorb and filter runoff.
 - **Program C-3.2D: System Improvements.** Improve storm drainage performance through regular maintenance and clean-out of catch basins, installation of trash capture devices, a City street sweeping program, and improvements to the existing system. When existing lines are replaced, design changes should be made as needed to increase capacity to handle intensifying storms and expected sea level rise impacts.

Goal S-1: A Safer, More Resilient City: Minimize San Rafael's vulnerability to the impacts of environmental and public health emergencies.

- **Policy S-1.2: Location of Future Development.** Permit development only in those areas where potential danger to the health, safety, and welfare of the community can be adequately mitigated. Land uses and densities should take environmental hazards such as earthquakes, flooding, and fires into consideration.
 - **Program S-1.2A: Entitlement Process.** Use the entitlement process to evaluate the potential for hazards and to require appropriate mitigation measures and approval conditions.
- **Policy S-1.3: Location of Public Improvements.** Avoid locating public improvements and utilities in areas with high hazard levels. When there are no feasible alternatives, require effective mitigation measures to reduce the potential for damage.
 - **Program S-1.3B: Use of Hazard Maps in Development Review.** Review slope stability, seismic, flood hazard, sea level rise, wildfire, and other environmental hazard maps when development is

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proposed. Require appropriate studies and actions to ensure that hazards are identified and mitigated.

Goal S-3: Resilience to Flooding and Sea Level Rise. Recognize, plan for, and successfully adapt to the anticipated effects of increased flooding and sea level rise.

- **Policy S-3.1: Sea Level Rise Projection Map.** Utilize Figure S-2 (Sea Level Rise Projection Map) to address flooding and sea level rise hazards. The figure should be used to:
 - maximize public awareness and disclosure to property owners and the public.
 - assess and address impacts to future development.
 - establish a zoning “overlay zone” and building code requirements for future planning and adaptation.
 - plan opportunity areas for adaptation.
 - inform funding and financing decisions about short-term and long-term adaptation projects.
- **Program S-3.1A: Incorporate into City GIS.** Incorporate the Sea Level Rise Projection Map into the City’s Geographic Information System (GIS) map and utilize GIS as a publicly accessible tool for tracking flooding and sea level rise hazards.
- **Program S-3.1B: Periodic Update of Sea Level Rise Projection Map.** Review sea level rise data at least once every five (5) years to determine the need for Map updates.
- **Program S-3.1C: Sea Level Rise Overlay Zone.** Adopt an “overlay zone” on the City Zoning Map incorporating the Sea Level Rise Projection Map. The “overlay zone” shall include land use regulations for site planning and a minimum construction elevation that reflects flooding and sea level rise data.
- **Policy S-3.3: Awareness and Disclosure.** Maximize awareness and disclosure by providing information to property owners and the public on areas subject to increased flooding and sea level rise vulnerability.
 - **Program S-3.3A: Residential Building Resale (RBR) Reports.** Revise the RBR Report template to include a disclosure of potential property risk to increased flooding and sea level rise. Utilize the Sea Level Rise Prediction Map for confirming property vulnerability.
- **Policy S-3.4: Mitigating Flood and Sea Level Rise Impacts.** Consider and address increased flooding and sea level rise impacts in vulnerable areas (see Figure S-2) in development and capital projects, including resiliency planning for transportation and infrastructure systems.
 - **Program S-3.4A: Development Projects.** Where appropriate, require new development, redevelopment projects, and substantial additions to existing development to consider and address increased flooding and sea level rise impact, and to integrate resilience and adaptation measures into project design.
 - **Program S-3.4B: Capital Projects.** Prepare a guidance document for addressing increased flooding, sea level rise impacts, and adaptation measures into the City’s capital projects and planning process. This should include strategies for identifying and evaluating the costs, benefits and potential revenue sources for elevating or redesigning low-lying roadways and critical infrastructure. If the life of a public improvement in a vulnerable area extends beyond 2050, adaptation measures should be incorporated.
 - **Program S-3.4C: Coordination with Utilities and Services.** Coordinate with the utilities and services that have infrastructure and facilities in vulnerable areas (for example: wastewater treatment

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plants) to ensure that sea level rise information and goals are consistent with the City's goals, and that infrastructure/utilities projects address and plan for increased flooding and sea level rise.

- **Policy S-3.5: Minimum Elevations.** For properties in vulnerable areas, ensure that new development, redevelopment, and substantial additions to existing development meets a minimum required construction elevation. Minimum elevations should provide protection from the potential impacts of a 100-year flood (a flood with a one percent chance of occurring in any given year), the potential for increased flooding due to sea level rise, and the ultimate settlement of the site due to consolidation of bay mud from existing and new loads and other causes.
 - **Program S-3.5B: Ground Elevation Survey.** Perform periodic ground elevation surveys in the Sea Level Rise vulnerability zone. The result of the surveys should be considered when developing projects to reduce coastal flooding potential.
- **Policy S-3.6: Resilience to Tidal Flooding.** Improve San Rafael's resilience to coastal flooding and sea level rise through a combination of structural measures and adaptation strategies.
 - **Program S-3.6A: Sea Level Rise Adaptation Plan.** Prepare and adopt an adaptation plan addressing increased flooding and sea level rise.
- **Policy S-3.7: Shoreline Levees.** Improve and expand San Rafael's shoreline levee system. When private properties are developed or redeveloped, require levee upgrading as appropriate, based on anticipated high tide and flood conditions.
 - **Program S-3.7A: Levee Improvement Plans.** Assess existing levees, berms, and flood control systems to identify reaches with the greatest vulnerability. Develop improvement plans based on existing conditions and projected needs, as documented in adaptation plans. This should include improvement studies for the Spinnaker Point levee, as recommended by the LHMP, and the Canalways levee along San Pablo Bay.
 - **Program S-3.7B: Financing Levee Improvements.** Coordinate with property owners; residents and businesses; federal, state, and regional agencies; utilities; and other stakeholders to evaluate potential methods of improving levees and funding ongoing levee maintenance, including assessment or maintenance districts. The cost and fiscal impacts of levee improvements should be evaluated against potential benefits, as well as the potential costs and consequences of inaction.
- **Policy S-3.9: Flood Control Improvements.** Pursue financing and funding opportunities to fund short-term and long-term flood control and adaptation projects. Funding tools and opportunities would include, among others tax or bond measures, assessment districts, geologic hazard abatement districts and grants. The City will also support legislation that provides regional, state, and federal funding for these projects, and will pursue such funding as it becomes available.
 - **Program S-3.9A: Incremental Flood Control Improvements.** Where needed and possible, new development/ redevelopment projects shall include measures to improve area flood protection. Such measures would be identified and required through the development review process.
 - **Program S-3.9B: Flood Hazard Mitigation Projects.** Undertake flood hazard mitigation projects as outlined in the Local Hazard Mitigation Plan, including sewer relocation and replacement, pump station rehabilitation, corrugated metal pipe replacement, and improvements to flood-prone streets such as Beach Drive.

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- **Program S-3.9C: Restoration and Dredging Projects.** Implement restoration and dredging projects that will increase stormwater drainage capacity and reduce flood hazards. As noted in the LHMP, this could include restoration of the Freitas Parkway flood channel and dredging of Gallinas Creek and the San Rafael Canal.

Goal CSI-4: Reliable, Efficiently Managed Infrastructure. Support reliable, cost-effective, well-maintained, safe and resilient infrastructure and utility services.

- **Policy CSI-4.6: Climate Change Impacts.** Incorporate sea level rise and increased storm intensity forecasts in the planning and design of local infrastructure projects.
 - **Program CSI-4.6A: Guidance Document.** Prepare a guidance document for incorporating sea level rise into the City's capital planning process.
 - **Program CSI-4.6B: Coordination with Service Providers.** Coordinate with water, sewer, energy, solid waste, and telecommunication service providers to prepare a plan for retrofitting critical infrastructure for rising sea levels, more intense storms, and other climate-related impacts.
- **Policy CSI-4.9: Wastewater Facilities.** Ensure that wastewater collection, treatment and disposal infrastructure is regularly maintained and meets projected needs. Improvements should be programmed to meet state and federal standards, respond to sea level rise and seismic hazards, repair and replace aging or leaking pipes, and protect environmental quality.
 - **Program CSI-4.9A: Coordination of Services.** Support efforts by the Las Gallinas Sanitary District, Central Marin Sanitation Agency and San Rafael Sanitation District to maintain high-quality wastewater collection and treatment facilities.
- **Policy CSI-4.10: Storm Drainage Facilities.** Requires the continued monitoring and improving of the storm drainage system, including programs to reduce flooding, improve water quality, remove trash, and respond to climate-related changes.
 - **Program CSI-4.10A: Replacement of Aging Facilities.** Pursue the replacement of older or failing drainage facilities such as metal pipes and stormwater pumping stations with more durable and resilient materials, or with new structures and pumps.
 - **Program CSI-4.10B: Silt Removal.** Continue to remove accumulated silt from City maintained drainageways, ponds, and creeks subject to tidal siltation such as Mahon and Irwin Creeks
 - **Program CSI-4.10C: Sustainable Stormwater Management.** Seek funding for projects that restore the natural characteristics and functions of stormwater systems, such as bioswales and conversion of concrete ditches to natural creeks. Such projects should mitigate the effects of urban runoff, reduce flood hazards, and improve water quality and habitat value.

With the implementation of regulatory requirements and the listed General Plan goals, policies, and programs, impacts from implementation of the General Plan 2040 would be *less than significant*.

Significance without Mitigation: Less than significant.

Downtown Precise Plan

As discussed in Section 4.10.1.2, Existing Conditions, portions of the Downtown Precise Plan Area are within the FEMA 100-year flood zone (Figure 4.10-9), the tsunami inundation zone (Figure 4.10-14), and

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sea level rise inundation areas by 2100 (Figures 4.10-10 through 4.10-13). The southeastern portion of the Downtown Area is also within the 100-year floodplain and is subject to both overflow from San Rafael Creek and sea level rise in 2050 and 2100. Specific areas that will be subject to projected sea level rise include Albert Park, the Downtown San Rafael SMART station, and San Rafael High School. Therefore, potential future development in portions of the Downtown Precise Plan Area could risk the release of pollutants due to project inundation.

Projects in the 100-year flood zones within the Downtown Precise Plan Area would be subject to FEMA requirements and floodplain requirements listed in SRMC Title 18, Protection of Flood Hazards. SRMC Title 18 restricts development in floodable areas, including tsunami zones, and requires protections for new development within inundation areas. Furthermore, as stated previously, the General Plan 2040 includes several goals, policies, and programs that would ensure existing and future development would be protected from damage from sea level rise inundation. With the compliance with the regulatory requirements and the proposed General Plan 2040 goals, policies, and programs listed above, impacts resulting from implementation of the proposed Downtown Precise Plan would be *less than significant*.

Significance without Mitigation: Less than significant.

HYD-5 Implementation of the proposed project could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

General Plan 2040

Adherence to the CGP, the SRMC, the Phase II MS4 Permit, and the BASMAA Post-Construction Manual would ensure that surface and groundwater quality are not adversely impacted during construction and operation of development pursuant to the proposed General Plan 2040. As a result, site development will not obstruct or conflict with the implementation of the San Francisco Bay Basin Water Quality Control Plan. Furthermore, potential future development will be within the MMWD service area, which relies solely on surface water supply. Groundwater is not currently used or planned to be used as a municipal water supply source by the MMWD, and future projects would not conflict with the sustainable management of the groundwater basins. Therefore, the proposed General Plan 2040 would not obstruct or conflict with the RWQCB's Basin Plan or groundwater management plans, and impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

Downtown Precise Plan

Similar to the requirements for development elsewhere in the city, potential future development in the Downtown Precise Plan Area would be required to adhere to the CGP, SRMC, the Phase II MS4 Permit, and the BASMAA Post-Construction Manual would ensure that surface and groundwater quality are not adversely impacted during construction and operation of development pursuant to potential future development within the Downtown Precise Plan Area. Additionally, groundwater is not currently used or

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planned to be used as a municipal water supply source by the MMWD and future projects would not conflict with the sustainable management of the groundwater basins. Because the San Rafael Valley Groundwater Basin is considered by DWR to be a very low priority basin, there are no current plans or requirements to prepare a sustainable groundwater management plan for this basin. Therefore, potential future development in the Downtown Precise Plan Area would not obstruct or conflict with the RWQCB's Basin Plan or groundwater management plans, and impacts would be *less than significant*.

Significance without Mitigation: Less than significant.

HYD-6 Implementation of the proposed project could result in a cumulatively considerable impact to hydrology and water quality.

The geographic context used for the cumulative assessment to hydrology, drainage, flooding, and water quality encompasses the watersheds within the EIR Study Area: Gallinas Creek watershed, San Rafael Creek watershed, and Miller Creek watershed. (see Figure 4.10-1). New development in these watersheds could increase impervious areas, thus increasing runoff and flows into the storm drainage systems. Potential future development would be required to comply with the Phase II MS4 Permit, implement BMPs that direct drainage to landscaped areas, and integrate bioretention facilities into the site design. Implementation of these BMPs on a regional basis would reduce cumulative impacts to hydrology and drainage to *less than significant*.

All projects would be required to comply with various SRMC provisions and policies and County ordinances as well as numerous water quality regulations that control construction-related and operational discharge of pollutants into stormwater. The water quality regulations implemented by the San Francisco Bay RWQCB take a basinwide approach and consider water quality impairment in a regional context. For example, the NPDES Construction Permit ties receiving water limitations and basin plan objectives to terms and conditions of the permit, and the Phase II Small MS4 Permit encompasses all of the surrounding municipalities to manage stormwater systems and be collectively protective of water quality. Projects in these watersheds would implement structural and nonstructural source-control BMPs that reduce the potential for pollutants to enter runoff, and treatment control BMPs that remove pollutants from stormwater. Therefore, cumulative water quality impacts would be less than significant after compliance with these permit requirements, and impacts would not be cumulatively considerable.

Projects in the watersheds may be constructed within 100-year flood zones, areas of sea level rise, or tsunami inundation zones. Such projects would be mandated to comply with National Flood Insurance Program requirements. In addition, other jurisdictions within these watersheds regulate development within flood zones in a similar manner as San Rafael's Municipal Code Title 18 and in compliance with FEMA standards to limit cumulative flood hazard impacts. Therefore, cumulative impacts to hydrology, drainage, and flooding would be *less than significant*, and impacts of the proposed project would not be cumulatively considerable.

Significance without Mitigation: Less than significant.