HYDROLOGY and WATER QUALITY ASSESSMENT

April 2004
(Revised March 2005)

SONOMA-MARIN SMART AREA RAIL TRANSIT

Alternatives Analysis/
Draft Environmental Impact Statement/
Draft Environmental Impact Report

SMART

Alternatives Analysis (AA)/Draft Environmental Impact Statement (DEIS)/
Draft Environmental Impact Report (DEIR)

HYDROLOGY and WATER QUALITY ASSESSMENT

Prepared for:

Sonoma-Marin Area Rail Transit District

and

Federal Transit Administration

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1.0 SUMMARY

1.1 Regional Hydrology

This technical paper describes the region's hydrological and water quality of the SMART project. Included in the analysis is an assessment of water bodies that may be affected by the proposed SMART project, a floodplain analysis, and the legal/regulatory process that may be extended to the proposed project.

2.0 INTRODUCTION

The SMART project is located along a corridor that has many surface water bodies. The water resources within the project area exist in various forms, locations, and levels of quality, which run directly under the railroad right-of-way (ROW). Surface water bodies range from seasonal and perennial creeks, sloughs, wetlands, and rivers with tidal influence draining into major watersheds. The most significant watersheds included in the project corridor are the Russian River, Petaluma River, San Pablo Bay, and San Francisco Bay.

The majority of the SMART project is located within the Russian River watershed (USGS Cataloging Unit: 18010110). Comprising approximately 950,366 acres, the Russian River basin includes almost 1,823 miles of naturally occurring waterways, some of which cross the SMART project corridor. A smaller portion of the project lies within the San Francisco Bay Hydrological Region, which includes the San Pablo Bay Watershed (USGS Cataloging Unit: 18050002). The San Pablo Bay Basin includes 648,546 acres and almost 1,102 miles of naturally occurring waterways.

The SMART project is located along a corridor extending from Cloverdale south to Larkspur. The rail line follows the relatively flat plain that extends northward with elevations ranging from sea level in the south to a high point in Cloverdale of just over 300 feet. The rail line continues northward through low plains ranging in elevation from just above sea level to elevation 35 in Petaluma. From Petaluma, it begins a steady climb through Santa Rosa, Healdsburg and Cloverdale.

The changes in elevation can have some impact on the rainfall microclimate. However, the generally low plains along the route translate to lower rainfall than in the hills to the west and east of the route. The National Oceanic and Atmospheric Administration (NOAA) Atlas, Precipitation-Frequency Atlas of the Western United States, identifies peak rainfall events from a 2-year through a 100-year 24-hour event. The peak 100-year rainfall event ranges from a low of 6.5-inches to just over 10-inches in 24 hours along the rail route.

Land use within the project site includes open space, industrial, commercial, and residential. In developed locations, stormwater runoff that does not infiltrate into the subsurface is directed into constructed stormwater drainage systems consisting of crowned streets, curbside gutters, and drainage inlets. Surface water runoff within the project area drains into creeks, streams, and rivers, and eventually to the San Francisco Bay.

Various wetland communities are located within the SMART corridor. The area from Cloverdale to Larkspur includes 86.1 acres of wetlands. Non-wetland waters total 8.9 acres, which include perennial and seasonal drainages, as well as open water bodies. Riparian communities are also characteristic of the project area allowing for riparian scrub and woodland to total 11.4 acres. In the upland regions, which compose 598.7 acres of the total project area, there is a variety of vegetation.

The Clean Water Act, as amended in 1972, requires that the State formulate and adopt water quality control plans or basin plans for all areas in the region. For this analysis, the affected water bodies are described.

The Total Maximum Daily Load (TMDL) process leads to a "pollution budget" designed to restore the health of a polluted body of water. The TMDL process provides a quantitative assessment of water quality

problems, contributing sources of pollution, and the pollutant load reductions or control actions needed to restore and protect the beneficial uses of an individual waterbody impaired from loading of a particular pollutant. More specifically, a TMDL is defined as the sum of the individual waste load allocations for point sources, load allocations for non-point sources, and natural background such that the capacity of the water body to assimilate pollutant loading (the loading capacity) is not exceeded (40 CFR §130.2). In other words, a TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, which will insure the protection of beneficial uses. This calculation also includes a margin of safety and consideration of seasonal variations. In addition, the TMDL contains the reductions needed to meet water quality standards and allocates those reductions among the pollutant sources in the watershed. The Clean Water Act of 1972 gave the State Water Resources Control Board (SWRCB) and the US Environmental Protection Agency (EPA) the authority to establish TMDLs under Section 303(d).

This report describes the section 303(d) list of water bodies in the project vicinity that have pollutants which cannot be completely managed.

The SWRCB implements the National Pollution Discharge Elimination System (NPDES) program, which was established by the EPA to regulate stormwater runoff. There are three categories of NPDES permits: construction (over 0.4 hectare or 1.0 acre of disturbance), municipal, and industrial.

Process water generated by mass transit system maintenance and storage facilities can contain a number of pollutants that, through improper handling or treatment, can be released into stormwater systems. Process water such as steam cleaning, vehicle washing, and floor wash-downs sources of which typically contain concentrations of oil and grease, detergents, chemicals, metals, and solid materials that pass into the drainage system.

Stormwater runoff from the rail terminal and associated parking areas may contain harmful pollutants such as lead, zinc, and cadmium. These pollutants have the potential to enter the storm drainage systems of bus and commuter rail parking and maintenance facilities.

Also, a transit project could change the existing runoff pattern as this could contribute to local flooding. Examples of transit projects that may contribute to flooding include paving of an area where previously a permeable surface existed, modifying a drainage system, or channeling existing runoff.

This report looks at the potential impacts on flooding due to the proposed rail line improvements. Bridges, culverts and rail stations were identified and a determination was made as to whether the identified structures are within a designated floodplain by reviewing Flood Insurance Rate Maps (FIRMs).

3.0 WATER RESOURCES

The alternatives proposed for the Highway 101/SMART corridor were examined in respect to the potential impacts to hydrology, water quality and stormwater runoff.

In order to satisfy the requirements of both the National Environmental Policy Act of 1969 (NEPA) and the California Environmental Quality Act (CEQA), this section is intended to analyze the probable effects and to disclose the environmental consequences of building and operating the SMART project.

The Clean Water Act, passed in 1972, requires that the State formulate and adopt water quality control plans or basin plans for all areas in the region. This analysis describes the Section 303(d) list of water bodies in the project vicinity that have pollutants which cannot be completely managed.

This analysis also looks at the potential impacts on flooding due to the proposed rail line improvements. Bridges, culverts and rail stations were identified and a determination was made as to whether the identified structures are within a designated floodplain by reviewing Flood Insurance Rate Maps (FIRMs).

4.0 STUDY METHODOLOGY

4.1 Federal Clean Water Act

The Clean Water Act, passed in 1972, is regulated by the EPA. The Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and has given the EPA the authority to implement pollution control programs. The Clean Water Act also contains requirements that set water quality standards for all contaminates in surface waters. The Act makes it unlawful for any person to discharge any pollutant for a point source into navigable waters, unless a permit is obtained under the provision. Contemporary 303(d) listings of priority streams were examined and applied to this analysis.

4.2 National Pollution Discharge Elimination System

The National Pollution Discharge Elimination System (NPDES) Nonpoint Source Program (established through the Clean Water Act) regulates runoff water quality; the NPDES program objective is to control and reduce pollutants to water bodies from nonpoint discharges. The 1987 amendments to the Clean Water Act established a framework for regulating municipal, industrial, and construction stormwater discharges. The program and permit is administered by the Regional Water Quality Control Board (RWQCB), as determined by the EPA and the SWRCB. An NPDES permit is needed for any construction activity that will, or is part of a "common plan" of development that will, disturb one or more acres and has the potential to have a discharge of storm water to a water of the United States. Because development of the project site would result in the disturbance of one or more acres, a NPDES construction permit would be required.

4.3 State Water Resources Control Board/Regional Water Quality Control Board

The SWRCB and the nine RWQCBs regulate water quality in surface and groundwater bodies. The SWRCB regulates water quality through the Porter-Cologne Water Quality Act of 1969. Porter-Cologne contains a complete framework for the regulation of waste discharges to both surface and groundwaters of the state.

On the regional level, the SMART project falls under the jurisdiction of the North Coast Region RWQCB and the San Francisco Bay RWQCB, which are responsible for the implementation of state and federal water quality protection statutes, regulations, and guidelines near the project site. The State and Regional Water Quality Control Boards will play a major role in the permitting process of the SMART project.

4.4 Section 401 Permit

In order for any work to be completed around the various surface water bodies, Section 401 of the Clean Water Act is applicable. Section 401 requires any applicant for a federal permit that conducts any activity that may result in a discharge of pollutants to first obtain a Water Quality Certification (WQC) from the state. Most applications for federal permits that trigger the need for WQC are the US Army Corp of Engineers (COE). The US Army Corp of Engineers issues these permits pursuant to Section 404 of the Clean Water Act.

4.5 Section 404 Permit

Section 404 establishes programs to regulate the discharge of dredged and fill material in waters of the U.S. including wetlands. The Army Corps of Engineers and EPA jointly administer this regulation and the permitting process. When the application for the Section 404 permit is made the applicant must show they have:

- Taken steps to avoid wetland impacts where practicable
- Minimized potential impacts to wetlands
- Provided compensation for any remaining, unavoidable impacts through activities to restore or create wetlands

An individual permit is usually required for potentially significant impacts. However, most discharges that will have only minimal adverse effects, the Army Corps of Engineers often grants general permits.

4.6 Section 10 Permit

In addition to the above permits, Section 10 of the Rivers and Harbors Act may be applicable if the water body is designated "Navigable." This determination is made by the Army Corps of Engineers. Section 10 requires authorization from the Army Corps of Engineers for the construction of any structure in or over navigable waters of the United States, the excavation/dredging or deposition of material in these waters or any obstruction or alteration in a "navigable water". "Navigable water" in the U.S. are those subject to the ebb and flow of the tide shoreward to the mean high water mark and/or presently used, or have been used in the past, or are susceptible for use to transport instate or foreign commerce.

4.7 Lake or Streambed Alteration Agreement

Since work for the SMART project would be completed along the banks of various surface water bodies, an application for a Lake or Streambed Alteration Agreement would be required. This permit is a result of Section 1602 of the California Department of Fish and Game code. Section 1602 requires any person who proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank or any river, stream, or lake or use materials from a streambed to notify the Department before beginning the project.

4.8 Executive Order 11988/Federal Emergency Management Agency

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Each federal agency is responsible for preparing implementing procedures for carrying out the provisions of the Order. Federal agencies consult with the Federal Emergency Management Agency (FEMA) concerning implementation of the Executive Order and base their decision on a set of guidelines to decide if a project will have any potential impacts to or within the floodplain.

FEMA conducted flood analysis studies throughout California that resulted in the development of FIRM's (Flood Insurance Rate Maps) identifying the estimated limits of the 100-year and 500-year flood event in various watersheds. The flood designations include:

- Zone A – Areas of 100-year flood; base flood elevations and flood hazard factors not determined
- Zone AO – Areas of 100-year shallow flooding where depths are between one and three feet; average depths of inundation are shown, but no base hazard factors are determined
- Zone AH - Areas of 100-year shallow flooding where depths are between one and three feet; base flood elevations are shown, but no base hazard factors are determined
- Zones A1-A30 – Areas of 100-year flood; base flood elevations and flood hazard factors determined
- Zone B – Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood
- Zone C – Areas of minimal flooding
- Zone D – Areas of undetermined, but possible, flood hazards
- Zone X – Areas determined to be outside 500-year floodplain

Much of the rail route was analyzed and is available on existing FIRM maps to aid in determining potential flooding along the route. There are close to 70 bridge and culvert crossings of the rail line along the project reach with over half of them within the FEMA floodplain designation.

The bridge and culvert crossings of the rail line along the project reach as well as the rail stations were identified from Working Paper # 5 Detailed Project Design Options (Parsons Brinckerhoff, 2003). Copies of

the FIRM's were obtained along the project reach. These included FIRM's for the cities and towns of Larkspur, San Rafael, Novato, Petaluma, Cotati, Rohnert Park, Santa Rosa, Healdsburg and Cloverdale as well as the Counties of Marin and Sonoma. The identified facilities were located as accurately as possible on the FIRM's in order to determine if any of the structures are within a designated floodplain.

Proposed improvements to structures that are within a designated floodplain could have adverse impacts to the floodwater surface. Any projects within a floodplain require a detailed analysis in the environmental document as specified in the US Department of Transportation Order 5650.2 "Floodplain Management and Protection," April 23, 1979. The analysis should discuss any risk to, or resulting from, the action, the impacts on natural and beneficial floodplain values, the degree to which the action provides direct or indirect support for development in the floodplain and measures to minimize harm or to restore or preserve the natural and beneficial floodplain values affected by the project.

This effort is beyond the scope of this current analysis. Generally, there is inadequate information available to perform any detailed analysis of impacts. Proposed improvements are currently not in enough detail to provide information necessary to model impacts.

4.9 Bay Conservation and Development Commission

A Bay Conservation and Development Commission (BCDC) permit may also be required if construction occurs within 100 feet of the mean high tide. The BCDC has a jurisdiction that includes the open water marshes and mudflats of the greater San Francisco Bay and portions of most creeks, rivers, and sloughs and other tributaries that flow into the San Francisco Bay. A BCDC permit must often receive authorization from the RWQCB and the COE. The BCDC would base their jurisdiction on the McAteer-Petris Act, which has long served as the key legal provision under California state laws to preserve San Francisco Bay from indiscriminate filling, and the San Francisco Bay Plan.

4.10 Dredging Permits

If dredging is to take place in surface water along the SMART right-of-way, a dredging permit must be obtained through the Dredged Material Management Office (DMMO). The DMMO has a regulatory policy that is enforced by the Army Corps of Engineers. The DMMO program is comprised of the BCDC, RWQCB, State Land Commission (SLC), the San Francisco District U.S. Army Corps of Engineers (COE), and the EPA. The California Department of Fish and Game, the National Marine Fisheries Service, and the Fish and Wildlife Service provide advice and expertise to the process. The purpose of the DMMO is to cooperatively review sediment quality sampling plans, analyze the results of sediment quality sampling, and make suitability determinations for the material proposed for disposal in the San Francisco Bay. Even if material is going to be disposed in an upland area, the DMMO would like to review the proposed activity and make their own determination to weather there could be significant impacts.

4.11 Joint Aquatic Resources Permit Application

The Joint Aquatic Resources Permit Application (JARPA) is a useful tool when applying for multiple permits. JARPA can be used by anyone who intends to perform work in or near "waters of the state". Waters of the state are defined broadly as any surface water or ground water within the boundaries of the State of California. Using JARPA enables an applicant to fill out one form, instead of three or more that may be require for the proposed work. Using JARPA allows each agency to receive the same information at the same time enabling better coordination among the involved agencies and the opportunity for a more streamline permit process.

4.12 Sonoma County Water Agency

The Sonoma County Water Agency provides service for Sonoma County. They are responsible for water supply, flood control, wastewater treatment, Fisheries, and Recreation.

4.13 Marin County Public Works Department

The Marin County Public Works Department staffs the Marin County Flood Control and Water Conservation District. The district was formed in 1955 by an Act of the State Legislature found in Chapter 68 of the State Water Code. The boundaries of the district are those of the County of Marin and eight "zones" established to address specific water quality problems.

5.0 EXISTING CONDITIONS (AFFECTED ENVIRONMENT)

Due to the large spatial area of the proposed SMART project, the analysis that follows is based on station segments. Specifically, an area from one rail station to another within the SMART right-of-way is analyzed to determine existing conditions. Waterbodies listed under Section 303(d) of the Clean Water Act are presented in tabular form including the type of priority pollutant and an analysis of potential flooding is also presented. Detailed hydraulic analysis of the SMART project is contained in Appendix A.

5.1 North of Cloverdale to the Healdsburg Station

This segment of the railway from Cloverdale to Healdsburg generally follows along the course of the Russian River from Cloverdale to Geyserville with separations ranging from 0.15 miles in Cloverdale to 0.5 miles at Geyserville. This segment of the right-of-way includes several rail crossings over stream courses that involve bridges or culverts and two train stations. When Caltrans relocated the railroad at Cloverdale during the construction of the Highway 101 Cloverdale bypass, they constructed a new station and installed monolithic welded rail capable of supporting high-speed trains. Parking facilities for approximately 100 cars were constructed at the Cloverdale Station. The SMART project would include the renovation of the existing rail station at Healdsburg and the development of approximately 76 parking spaces.

This segment of the project also includes approximately 13 miles of bicycle paths and barrier along the right-of-way from the Cloverdale Station to the intersection of Alexander Valley Road and Healdsburg Avenue. The waterbodies that could be affected by the proposed action are identified in Table 5.1-1.

5.1.1 Groundwater Conditions

Depth to groundwater varies considerably within the project corridor due to differing soil types and geological features. Groundwater can be defined as the part of the subsurface water that is in the zone of saturation.

Well data was obtained and provided by the California Department of Water Resources (DWR). Depth to groundwater data is broken down by city along the SMART corridor.

5.1.1.1 Cloverdale

Groundwater was discovered at finish grade, 0 feet, in one location, but on the average groundwater depths range from 4.86 feet to 9.37 feet below ground surface (bgs).

5.1.1.2 Asti

There is not extensive information for this city along the project corridor. Groundwater ranges from 15.85 feet to 20.25 feet bgs.

TABLE 5.1-1
NORTH OF CLOVERDALE TO HEALDSBURG STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Russian River	Cloverdale	Located downstream from rail easterly through this segment of SMART.	Sedimentation/ Siltation/ Temperature	
Porterfield Creek	Cloverdale Rancheria	Culvert Crossing		Russian River
Icaria Creek	Cloverdale	Culvert crossing		Russian River
Barrelli Creek	Asti	Bridge Crossing		Russian River
Unnamed	N. Chianti	Bridge Crossing		Russian River
Unnamed	S. Chianti	Culvert Crossing		Russian River
Wood Creek	Geyserville	Culvert Crossing		Russian River
Peterson Creek	Nervo	Bridge Crossing		Russian River
Lytton Creek	Lytton	Bridge Crossing		Russian River
Norton Slough	Simi	Located adjacent to rail		
Foss Creek	Healdsburg	Bridge Crossing	303(d)	Russian River

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.1.1.3 Geyserville

Depth to groundwater information is limited in this region along the project corridor. Depths range from 4.45 feet to 8.34 feet bgs.

5.1.1.4 Healdsburg

The well data is more extensive in this region than the surrounding areas. Groundwater ranges from 5.41 feet to 10.09 feet bgs.

5.1.2 100- and 500-Year Floodplain

The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.1-2. The flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 100-year flood hazard zone may be inundated during the 100-year (or greater magnitude) storm event. The 100-year storm is expected to occur, on average, once every 100 years. Areas shown within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than one foot.

5.2 Healdsburg North Boundary to Windsor Station

This segment of SMART includes a major bridge crossing over the Russian River on the southern boundary of Healdsburg. Several bridge and culvert crossings are included in this segment. The streams shown in Table 5.2-1 would be affected by the proposed action.

TABLE 5.1-2
CLOVERDALE STATION TO HEALDSBURG STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Cloverdale Rail Station	**Existing Station 315'**		**Sonoma County panel 060375-0120**	**In Zone X (area determined to be outside 500-year floodplain)**	**Station should have no impacts to flooding**
Healdsburg Rail Station	**106'**	**Station**	**City of Healdsburg panel 060378-0005**	**In Zone C (Area of minimal flooding - no shading)**	**Station should have no impacts to flooding**

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.2-1
HEALDSBURG STATION TO WINDSOR STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Russian River	Healdsburg	Major Bridge Crossing	Sedimentation/ Siltation/ Temperature	
Unnamed Stream	S. Healdsburg	Culvert crossing		Russian River
Unnamed Stream	Sotoyome	Culvert crossing		Russian River
Unnamed Stream	S. Sotoyome	Bridge Crossing		Russian River
Windsor Creek	Windsor	Bridge Crossing	303(d)	Russian River

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.2.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.2.1.1 Windsor

Minimum groundwater depths in Windsor range from 1.85 feet to 29.83 feet; maximum depths range from 19.7 feet to 36.66 feet bgs.

5.2.2 100- and 500-Year Floodplain

Portions of this segment would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.2-2. The Flood Insurance Rate Maps indicates that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 100-year flood hazard zone may be inundated during the 100-year (or greater magnitude) storm event. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than 1 foot.

5.3 Windsor to Jennings and Santa Rosa Stations

This segment of the SMART corridor includes several bridge and culvert crossings. Maintenance features for SMART such as railcar washing structures and storage facilities are proposed. The conceptual plans for the Jennings Station include 630 parking spaces in a surface lot or parking structure. Minor renovation of the Santa Rosa Station is proposed. The streams shown in Table 5.3-1 would be affected by the proposed action.

TABLE 5.2-2
FLOOD PLAIN IMPACTS – HEALDSBURG STATION TO WINDSOR STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Windsor Rail Station	117’	Station	Sonoma County panel 060375-0540	In Zone X (area determined to be outside 500-year floodplain)	Station should have no impacts to flooding

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.3-1
WINDSOR STATION TO SANTA ROSA STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Pool Creek	Shiloh	Bridge Crossing	303(d)	Russian
Mark West Creek	Mark West	Bridge Crossing	303(d)	Russian
Piner Creek	Fulton	Bridge Crossing	303(d)	Santa Rosa Creek
Paulen Creek	Santa Rosa	Bridge Crossing	303(d)	Santa Rosa Creek

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.3.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.3.1.1 Santa Rosa

Depth to groundwater in Santa Rosa ranges from 6.0 feet to 9.28 feet bgs but is not consistent throughout the area. One location surveyed shows the maximum depth to reach 22.81 feet bgs.

5.3.2 100- and 500-Year Floodplain

No stations within the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A.

5.4 Santa Rosa Station to Rohnert Park Station

This segment includes development of the Rohnert Park Station including 17 new parking stalls for a total of 197 park-and-ride spaces. Two bridge and one flood control crossing are included in this segment. The streams shown in Table 5.4-1 would be affected by the proposed action.

5.4.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.4.1.1 Rohnert Park

Depth to groundwater ranges from 4.12 feet to 11.43 feet bgs.

5.4.2 100- and 500-Year Floodplain

No stations within the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A.

5.5 Rohnert Park Station to Cotati Station

This segment includes development of the Cotati Station including approximately 90 new parking stalls for a total of 177 park-and-ride spaces. Two bridge and one flood control crossing are included in this segment. The streams shown in Table 5.5-1 would be affected by the proposed action.

TABLE 5.4-1
SANTA ROSA STATION TO ROHNERT PARK STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Santa Rosa Creek	Santa Rosa	Bridge Crossing	303(d)	Russian River
Colgan Creek	Santa Rosa	Flood Control Channel	303(d)	Russian River
Laguna de Santa Rosa	S. Cotati	Bridge Crossing		Russian River

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.5-1
ROHNERT PARK STATION TO COTATI STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Hinebaugh Creek	Rohnert Park	Bridge Crossing	303(d)	Laguna de Santa Rosa
Copeland Creek	Rohnert Park	Bridge Crossing	303(d)	Laguna de Santa Rosa
Bellview/Wilfred Channel	S. Cotati	Flood Control Channel		Laguna de Santa Rosa

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.5.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.5.1.1 Cotati

Depth to groundwater ranges from 6.67 feet to 28.00 feet bgs.

5.5.2 100- and 500-Year Floodplain

No stations within the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A.

5.6 Cotati Station to Corona Road Station

This segment includes development of the Corona Road Station including approximately 350 new parking stalls. One bridge and two culvert crossings are included in this segment. The streams shown in Table 5.6-1 would be affected by the proposed action.

5.6.1 100- and 500-Year Floodplain

Portions of this segment would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.6-2. The flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 100-year flood hazard zone may be inundated during the 100-year (or greater magnitude) storm event. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than 1 foot.

5.7 Corona Road Station to Petaluma Station

This segment includes possible renovation of the Petaluma Station. One bridge crossing would be included in this segment. The streams shown in Table 5.7-1 would be affected by the proposed action.

TABLE 5.6-1
COTATI STATION TO CORONA ROAD STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Lichau Creek	Penngrove	Bridge Crossing		Petaluma River
Willow Creek	Denman Flat	Culvert crossing	303(d)	Petaluma River
Unnamed Stream	Crown	Culvert crossing		Petaluma River

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.6-2
FLOODPLAIN IMPACTS – COTATI STATION TO CORONA ROAD STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Corona Road Rail Station	36’	Station	Sonoma County panel 060375-0870	In Zone AH, 100-year flood elevation of 32 (area of 100-year flooding where depths are between one (1) foot and three (3) feet; base flood elevations are shown but no flood hazard factors are determined)	Station improvements will likely need a more detailed study to determine impacts to the 100-year flood elevation
N. Petaluma River	29.3’	Bridge Crossing	City of Petaluma panel 060379-0002	In a detailed 100-year floodplain of Petaluma River of Zone AE with a 100-year flood elevation of 18'	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.7-1
CORONA STATION TO PETALUMA STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Petaluma River	N. Petaluma	Bridge Crossing	Sedimentation/ Siltation/ Nutrients/ Pathogens/Metals	

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.7.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.7.1.1 Petaluma

On average, depth to groundwater ranges from 4.96 feet to 9.13 feet bsg.

5.7.2 100- and 500-Year Floodplain

No stations within the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A.

5.8 Petaluma Station to North Novato Station

This segment includes construction of the North Novato Station and includes approximately 66 parking stalls. Two major bridge crossings would be included in this segment. In addition, the proposed SMART right-of-way runs parallel to jurisdictional wetland including the Petaluma Marsh Wildlife Area. The streams shown in Table 5.8-1 would be affected by the proposed action.

5.8.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.8.1.1 Novato

On average, depth to groundwater ranges from 4.43 feet to 7.73 feet bgs.

TABLE 5.8-1
PETALUMA STATION TO NORTH NOVATO STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Petaluma River	McNear	Major Bridge Crossing	Sedimentation/ Siltation/ Nutrients/ Pathogens/Metals	
Schultz Slough	Neils Island	Bridge Crossing	303(d)	Petaluma River
San Antonio Creek	Burdell	Creek runs adjacent to tracks.	303(d)	Petaluma River
Mud Slough	Burdell	Slough adjacent to tracks		Petaluma River
Basalt Creek	N. Novato	Creek runs adjacent to tracks		Petaluma River
Petaluma Marsh	Novato	Jurisdictional Wetlands		Petaluma River

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.8.2 100- and 500-Year Floodplain

Portions of this segment would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.8-2. The flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 100-year flood hazard zone may be inundated

during the 100-year (or greater magnitude) storm event. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than one foot.

5.9 North Novato Station to South Novato Station

This segment would include construction of the South Novato Station and include approximately 102 parking stalls. Three bridge (one major) crossings are included in this segment. In addition, the proposed SMART right-of-way runs parallel to jurisdictional wetland including the Petaluma Marsh. The proposed SMART right-of-way runs parallel to Rush Creek. The streams shown in Table 5.9-1 would be affected by the proposed action.

5.9.1 100- and 500-Year Floodplain

No stations within the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A.

TABLE 5.8-2
FLOOD PLAIN IMPACTS – PETALUMA STATION TO NORTH NOVATO STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
North Novato Rail Station	10’	Station	City of Novato panel 060178-0002	In a detailed 100-year flood plain Zone AE with a 100-year flood elevation of 7	Station improvements will likely need a more detailed study to determine impacts to the 100-year flood elevation

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.9-1
NORTH NOVATO STATION TO SOUTH NOVATO STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Novato Creek	Novato	Major Bridge Crossing	303 (d)	San Pablo Bay
Petaluma Marsh	Novato	Bridge Crossing		San Pablo Bay
Arroyo de San Jose	Ignacio	Bridge Crossing		San Pablo Bay

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.10 South Novato Station to Civic Center Station

This segment would include construction of the Civic Center Station and include 133 parking stalls. Two bridge crossings and one culvert crossing are included in this segment. In addition, the proposed SMART right-of-way runs parallel to the South Fork of Gallinas Creek. The streams shown in Table 5.10-1 would be affected by the proposed action.

5.10.1 100- and 500-Year Floodplain

Portions of the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.10-2. The Flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than one foot.

5.11 Civic Center Station to San Rafael Station

This segment would include the possible renovation of the San Rafael Station. One culvert crossing is included in this segment. The stream shown in Table 5.11-1 would be affected by the proposed action.

TABLE 5.10-1
SOUTH NOVATO STATION TO CIVIC CENTER STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Pacheco Creek	Marin Keys	Culvert crossing		San Francisco Bay
Miller Creek	St. Vincent	Bridge Crossing	303(d)	San Francisco Bay
Gallinas Creek	Las Galinas	Bridge Crossing	303(d)	San Francisco Bay
S.F. Galinas Creek	Las Galinas	Creek runs adjacent to tracks		San Francisco Bay
Rush Creek	Novato	Creek runs adjacent to tracks		Petaluma River

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.10-2
FLOOD PLAIN IMPACTS – SOUTH NOVATO STATION TO CIVIC CENTER STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Civic Center Rail Station	12’	Station	City of San Rafael panel 065058-0005	Edge of Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)	Grading of area should place structures one foot above existing grade to limit potential flood damage

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.11-1
CIVIC CENTER STATION TO SAN RAFAEL STATION

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Mahon Creek	San Rafael	Culvert crossing		San Francisco Bay

Source: Winzler & Kelly Consulting Engineers, April 2004.

5.11.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.11.1.1 San Rafael

On average, depth to groundwater ranges from 3.34 feet to 6.16 feet bgs.

5.11.2 100- and 500-Year Floodplain

Portions of this segment would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.11-2. The flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 100-year flood hazard zone may be inundated during the 100-year (or greater magnitude) storm event. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than one foot.

5.12 San Rafael Station to Larkspur Station

This segment would include a new Larkspur Station. The stream shown in Table 5.12-1 would be affected by the proposed action.

TABLE 5.11-2
FLOOD PLAIN IMPACTS – CIVIC CENTER STATION TO SAN RAFAEL STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Downtown San Rafael Rail Station	12’	Station	City of San Rafael panel 065058-0015	In Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)	Grading of area should place structures one foot above existing grade to limit potential flood damage

Source: Winzler & Kelly Consulting Engineers, April 2004.

TABLE 5.12-1
SAN RAFAEL TO LARKSPUR STATIONS

Water Body Name	Nearest Community	Rail Impact	Priority Pollutant 303 (d) List	Tributary
Corte Madera Creek	San Rafael	Culvert crossing	Urban Runoff/Storm Sewers	San Francisco Bay

5.12.1 Groundwater Conditions

Groundwater conditions would be the same as defined in 5.1.1.

5.12.1.1 Greenbrae

On average, depth to groundwater ranges from 1.59 feet to 4.73 feet bgs.

5.12.2 100- and 500-Year Floodplain

Portions of the project site would be subject to regional flooding hazards, as mapped by FEMA. The detailed analysis of the flood impacts on SMART structures is contained in Appendix A. Station impacts are listed in Table 5.13-2. The flood Insurance Rate Maps indicate that portions of the site are within the 100-year and 500-year flood hazard areas. Areas mapped as within the 500-year flood hazard zone are areas between the 100-year and the 500-year floodplains, or certain areas subject to the 100-year flood with average depths of inundation less than one foot.

TABLE 5.13-2
FLOOD PLAIN IMPACTS – SAN RAFAEL STATION TO LARKSPUR STATION

SMART Structure Name	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Panel Map	Flood Zone	Comments
Larkspur Rail Station	32’	Station	City of Larkspur panel 065040-0001	In Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)	Grading of area should place structures one foot above existing grade to limit potential flood damage

Source: Winzler & Kelly Consulting Engineers, April 2004.

6.0 IMPACTS AND MITIGATIONS

Because the project is expected to disturb an area exceeding one acre in size, the project would be subject to NPDES permit requirements. NPDES permit conformance requires that the project applicant file a Notice of Intent (NOI) and submit a Storm Water Pollution Prevention Plan (SWPPP) to the Regional Water Quality Control Board (RWQCB). The SWPPP contains a listing and implementation plan for the

stormwater Best Management Practices (BMPs) that will be implemented during construction of the project to minimize erosion and sedimentation, as well as permanent post-construction BMPs. Following the NPDES permit conformance requirements would reduce any impacts associated with discharge or run-off to a less-than-significant level.

The project would not result in the extraction of groundwater, and would therefore not impact groundwater supplies or production rates of wells in the vicinity. The project would not impact any recharge facilities, or natural areas that would facilitate groundwater recharge. The project would not result in any impacts to ground water supplies or groundwater recharge.
In addition, following the various regulatory requirements, permit requirements and mitigation outlined in this section would reduce any impacts to hydrology and water quality to a less-than-significant level.

6.1 Hydrology

Short-term Impacts:

Impact: Temporary increase in surface erosion due to the use of earthmoving equipment during construction.

> Mitigation Measure: Because the project proposes to disturb an area exceeding one acre in size, the project is subject to NPDES permit requirements. NPDES permit conformance requires that the project applicant file a Notice of Intent and submit a Storm Water Pollution Prevention Plan (SWPPP) to the Regional Water Quality Control Board (RWQCB). The SWPPP contains a listing and implementation plan for the stormwater Best Management Practices (BMPs) that will be implemented during construction of the project to minimize erosion and sedimentation.
>
> Mitigation Measure: In order for any work to be completed around the various surface water bodies, Section 401 and 404 of the Clean Water Act would be applicable. Section 401 requires any applicant for a federal permit that conducts any activity that may result in a discharge of pollutants to first obtain a Water Quality Certification (WQC) from the state. Most applications for federal permits that trigger the need for WQC are the US Army Corp of Engineers (ACOE). The US Army Corp of Engineers also issues these permits pursuant to Section 404 of the Clean Water Act. In addition to the above permits, Section 10 of the Rivers and Harbors Act may be applicable if the water body is designated “Navigable.” Section 10 requires authorization from the Army Corps of Engineers for the construction of any structure in or over navigable waters of the United States, the excavation/dredging or deposition of material in these waters or any obstruction or alteration in a “navigable water”. “Navigable water” in the U.S. are those subject to the ebb and flow of the tide shoreward to the mean high water mark and/or presently used, or have been used in the past, or are susceptible for use to transport instate or foreign commerce.
>
> Mitigation Measure: Since work for the project would be completed along the banks of various surface water bodies, an application for a Lake or Streambed Alteration Agreement would be required. This permit is described in Section 1602 of the California Department of Fish and Game code. Section 1602 requires any person who proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank or any river, stream, or lake or use materials from a streambed to notify the Department before beginning the project.
>
> Mitigation Measure: Any industrial wastewater generated during construction activities would be treated to water quality standards before being discharged to the land surface for dust suppression. The potential for fuel and other spills to reach regulated waterbodies would be minimized through implementation of the spill prevention and emergency response plan created for this project.

Impact: Potential impacts to groundwater during construction of the proposed project. No mitigation would be necessary as impacts to groundwater are not expected from the project because local aquifers occur at depths significantly below ground surface.

Impact: Potential adverse impacts to surface water such as siltation or hydrocarbon pollution during construction of the proposed project.

> Mitigation Measure: Adverse impacts to surface water resulting from the construction of the proposed project would be minor if adequate design and engineering controls are implemented. Additionally, there would be no unavoidable significant adverse impacts on water resources with implementation of the above mitigation measures. Impacts to surface water would not result in an impairment of water resources or violation of requirements under the Clean Water Act if mitigation measures outlined above are implemented.

Long-term Impacts

Impact: The project would have the potential to positively benefit water quality and re-establish hydrologic connections along the SMART right-of-way through cross-culvert resizing, reconstruction, or clearing of obstructions, and bridge replacement. Over the years many of the cross-culverts have become clogged with debris causing potential erosion of surface and side slopes.

> Mitigation Measure: Cross-culverts will be cleared, resized, or reconstructed, as required, to re-establish hydrologic connections and minimize sediment delivery to the impaired waterbodies described in Section 3.2.2.1. These measures also reduce the risk of flooding that can occur when surface water ponds behind clogged culverts.

6.2 Stormwater Runoff

Short-term Impacts:

Impact: Water runoff would likely increase during the operation of the passenger rail service. A greater area covered with hardened parking lots, sidewalks, and alternatives for the Anderson Drive crossing and buildings would likely lead to an increase in surface water flow from storms. Process water generated by the two mass transit system maintenance and storage facilities can contain a number of pollutants that, through improper handling or treatment, can be released into stormwater systems. Process water such as steam cleaning, vehicle washing, and floor wash-downs sources of which typically contain concentrations of oil and grease, detergents, chemicals, metals, and solid materials that could pass into the drainage system.

> Mitigation Measure: Surface runoff from the rail improvements, depot construction, the maintenance facilities at Cloverdale and Windsor and park-and-ride facilities should be intercepted with bio-filtration swales. Surface water runoff from these areas should be dispersed in accordance with the mitigation measures required by under a Storm Water Pollution Prevention Plan (SWPPP) from the Regional Water Quality Control Board (RWQCB) and should not reach any waterbodies. Additional private vehicles and buses could lead to more small fuel spills affecting surface water runoff, but it is unlikely that any spills would affect drinking water sources.

Long-term Impacts

Impact: The project would have the potential to positively benefit stormwater management by re-establish hydrologic connections along the SMART right-of-way through cross-culvert resizing, reconstruction, or clearing of obstructions, and bridge replacement.

> Mitigation Measure: None required as the long-term impacts are considered beneficial.

6.3 Floodplains

Short-term Impacts:

Impact: Proposed improvements to structures that are within a designated floodplain could have adverse impacts to the floodwater surface. Any projects within a floodplain require a detailed analysis in the environmental document as specified in the US Department of Transportation Order 5650.2 "Floodplain Management and Protection," April 23, 1979. The analysis should discuss any risk to, or resulting from, the action, the impacts on natural and beneficial floodplain values, the degree to which the action provides direct or indirect support for development in the floodplain and measures to minimize harm or to restore or preserve the natural and beneficial floodplain values affected by the project.

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

> Mitigation Measure: Perform additional hydrological studies as outlined in the US Department of Transportation Order 5650.2 and implement adequate design and engineering controls. Adverse floodplain impacts from the SMART project would be minor if adequate design and engineering controls are implemented. In addition, there would be no unavoidable significant adverse impacts within flood prone areas with implementation of the above mitigation measures. Floodplain impacts would not result in an impairment of surface waters or violation of requirements Executive Order 11988 if mitigation measures outlined above are implemented.

Impact: Impacts to the 100-year floodplain directly through changes to the volumetric capacity of the floodplain (e.g., filling, bridge piers).

> Mitigation Measure: Perform additional hydrological studies as outlined in the US Department of Transportation Order 5650.2 and implement adequate design and engineering controls. Adverse floodplain impacts from the SMART project would be minor if adequate design and engineering controls are implemented. In addition, there would be no unavoidable significant adverse impacts within flood prone areas with implementation of the above mitigation measures. Floodplain impacts would not result in an impairment of surface waters or violation of requirements Executive Order 11988 if mitigation measures outlined above are implemented.

Impact: Impacts to the 100-year floodplain indirectly through an increase in the total volume of water arriving at and being conveyed by the floodplain.

> Mitigation Measure: Perform additional hydrological studies as outlined in the US Department of Transportation Order 5650.2 and implement adequate design and engineering controls. Adverse floodplain impacts from the SMART project would be minor if adequate design and engineering controls are implemented. In addition, there would be no unavoidable significant adverse impacts within flood prone areas with implementation of the above mitigation measures. Floodplain impacts would not result in an impairment of surface waters or violation of requirements Executive Order 11988 if mitigation measures outlined above are implemented.

Long-term Impacts

Impact: Fill needed to accommodate additional laneage could potentially impact 100-year flood surface elevations downgradient from the project area. However, this type of impact is expected to be minimal because the amount of fill added to 100-year floodplains is not substantial relative to the total volume each 100-year floodplain embodies. Moreover, at each crossing, adequate freeboard between the bottom of a crossing structure (e.g., bridge) and the predicted 100-year flood surface elevation is maintained to ensure a minimal risk of flooding new areas. Drainage designs for 50- and 100-year precipitation events minimize long-term on-site impacts to the natural and beneficial values of these floodplains.

> Mitigation Measure: Perform additional hydrological studies as outlined in the US Department of Transportation Order 5650.2 and implement adequate design and engineering controls. Adverse floodplain impacts from the SMART project would be minor if adequate design and engineering

controls are implemented. In addition, there would be no unavoidable significant adverse impacts within flood prone areas with implementation of the above mitigation measures. Floodplain impacts would not result in an impairment of surface waters or violation of requirements Executive Order 11988 if mitigation measures outlined above are implemented.

7.0 CEQA SIGNIFICANCE

This section has been prepared in accordance with the California Environmental Quality Act of 1970 (CEQA), as amended (Public Resources Code, Section 21000, et. seq.), and the California Environmental Quality Act Guidelines (California Administrative Code Section 15000, et. seq.). The CEQA Guidelines section 15382 defines "significant effect on the environment" as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including water resources.

Appendix G of the State CEQA Guidelines provides guidance for determining the significance of impacts to hydrology and water quality. These guidelines require that physical changes in the environment be evaluated based on factual evidence, reasonable assumptions supported by facts, and expert opinion based on facts. Project-related effects to hydrology and water quality were considered significant when these impacts would result in the following conditions:

- Would the project violate any water quality standards or waste discharge requirements?
- Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
- Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off site?
- Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?
- Would the project 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?

8.0 CUMULATIVE IMPACTS

The cumulative impact of changing land uses, from rural to suburban, and accompanying increases in population has potentially modified the quantity, timing, and quality of surface water runoff. Urban and suburban runoff typically contains higher concentrations of nutrients (e.g., nitrogen and phosphorus), oxygen consuming wastes, pathogens, pesticides, heavy metals, and oil, compared with runoff from rural areas.

Many major residential developments are planned for the Highway 101 corridor that generally follows the course of the SMART right-of-way. These planned developments and the DEIR alternatives contribute to the cumulative degradation of water quality and in the Russian River basin and the San Francisco Bay Hydrological Region.

The original construction of Highway 101 and subsequent land use changes (e.g., agriculture to residential) and population increases along the transportation corridor may have adversely impacted basin water quality. For example, access roads and driveways in large lot subdivisions along Highway 101 comprise one-half to three-quarters of the impervious surface area surrounding this transportation corridor.

Recognizing the importance of water quality and quantity, it is expected that Federal/State regulations and guidelines, including BMPs on stormwater management and runoff will minimize the cumulative impacts of water resources in the SMART project area to a less than significant level.

9.0 REFERENCES

California Department of Water Resources, 1975 Bulletin Number 118-4.

Cardwell, G.T. 1958. Geology and Ground Water in the Santa Rosa and Petaluma Areas, Sonoma County, California. USGS Water-Supply Paper 1427. Government Printing Office, Washington, D.C.

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Office of Planning and Research, 2003 CEQA: California Environmental Quality Act, Statutes and Guidelines, Governor's Office of Planning and Research, Sacramento.

Southern Sonoma County Resource Conservation District, Assessment of Biological Health of Riparian Wetlands, Sonoma Creek Watershed CD- 98984501-0, March 2004

APPENDIX A

SMART Structure Flood Analysis

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Cloverdale Rail Station					Sonoma County panel 060375-0120	In Zone X (area determined to be outside 500-year floodplain)		Station should have no impacts to flooding
BR 83.48	Sta. 4323+00	Oat Valley Creek near confluence with the Russian River	15' Open Deck Trestle (296.1')	52' long, 3 Span Slab Girder Bridge with a grade raise	Sonoma Co. FIRM Panel 060375-0120	Located in the Zone A (approx. 100-year) / Zone X (500-year) transition area. No specific detailed flood elevation.	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 81.47	Sta. 4217+00	1800' SE of Barelli Creek	59' Open Deck Trestle (269')	53' long 24" Corrugated Steel Pipe	Sonoma Co. FIRM Panel 060375-0140	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 267'.	The proposed bike path is shown in the details crossing over the proposed 24" pipe.	It is proposed to replace an open deck trestle with a 53', 24" pipe. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.
BR 80.21	Sta. 4150+00	8500' SE of Barelli Creek	15' Open Deck Trestle (261.3')	Single span x 15' Prestressed Concrete Slab and raising approaches on existing abutments	Sonoma Co. FIRM Panel 060375-0140	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 254'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.
BR 79.29	Sta. 4102+00	13,300' SE of Barelli Creek	40' steel beam open deck (261.5' - 261.7')	2 span, 40' Prestressed Concrete Slab, raising approaches and extending wingwalls.	Sonoma Co. FIRM Panel 060375-0330	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 244.5'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 78.73	Sta. 4072+00	Appx. 2 miles NW of Geyserville	15' Prestressed Concrete Slab (251')	No changes to structure except the addition of a guard rail.	Sonoma Co. FIRM Panel 060375-0330	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 241'	The bike trail apparently will be routed along corresponding city and county right of way.	The replacement of the guard rail should not change the existing flood elevation.
BR 78.16	Sta. 4042+00	Appx. 2 miles from Cloverdale	45' single span Open Deck Trestle (242')	Twin 24" 61' Corrugated Steel Pipe	Sonoma Co. FIRM Panel 060375-0335	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 234'	The proposed bike path is shown in the details crossing over the proposed twin 24" pipes.	It is proposed to replace an open deck trestle with 53' twin 24" pipes. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.
BR 74.79	Sta. 3863+80	Peterson Creek	13' single span Open Deck Trestle (197.7')	Single span 13' Prestressed Concrete Slab with raised approaches	Sonoma Co. FIRM Panel 060375-0335	Located in the Zone X (500-year) approximate floodplain. Just outside AE floodplain, elevation 202	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 74.47	Sta. 3847+50	1,700' downstream of Peterson Creek	33' 2 span open deck concrete slab (209')	Placing Prestressed Concrete Slab on the existing abutments and extending the wingwalls	Sonoma Co. FIRM Panel 060375-0345	Located in the Zone X (500-year) approximate floodplain.	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 73.43	Sta. 3792+30	7,300' downstream of Peterson Creek	27' 2 span Open Deck Trestle with Foot Walk and Hand Rail (206.5')	Prestressed Concrete Slab girder bridge and northeast wingwall to be replaced if possible	Sonoma Co. FIRM Panel 060375-0345	Located in the Zone X (500-year) approximate floodplain.	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure which is outside a designated floodplain

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 72.79	Sta. 3758+50	Lytton Creek	12' Open Deck Trestle (178.6' - 179')	12' single span bridge with the approaches raised 7"	Sonoma Co. FIRM Panel 060375-0365	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 183' - 184'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.
BR 72.48	Sta. 3742+00	Flooding effects from Russian River	12' Prestressed Concrete Slab (171')	Extending wingwalls and fixing hand rail	Sonoma County panel 060375-0365	In a detailed 100-year floodplain (in the backwater of the Russian River floodplain) Zone AE with a 100-year flood elevation of 181' - 182'	City of Healdsburg to construct bike path.	The extension of the wingwalls and fixing the hand rails should have no significant impact to the flooding.
BR 70.34	Sta. 3629+00	Foss Creek	45' Ballast Deck Trestle with foot walk and hand rail (166.8' - 167'	Replace with 60' 3 span Prestressed Concrete Slab girder bridge	City of Healdsburg panel 060378-0005	Zone C (area of minimal flooding - no shading)	City of Healdsburg to construct bike path.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 69.23	Sta. 3570+60	Within Healdsburg corporate limits	26' Open Deck Trestle with Foot Walk and Hand Rail (119' - 119.4')	36' 3-span Prestressed Concrete Slab Ballast Deck girder bridge	City of Healdsburg panel 060378-0005	Zone A (area of approximate 100-year flood zone with no set base flood elevation or flood hazard determined)	City of Healdsburg to construct bike path.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 69.05	Sta. 3561+50	Within Healdsburg corporate limits	75' Open Deck Trestle with Hand Rail and Foot Walk (111.2' - 111.9')	90' 6-span Prestressed Concrete Slab girder bridge	City of Healdsburg panel 060378-0005	Zone A (area of approximate 100-year flood zone with no set base flood elevation or flood hazard determined)	City of Healdsburg to construct bike path.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 68.65	Sta. 3540+50	Within Healdsburg corporate limits at Foss Creek & Norton Slough	72' Open Deck Trestle with Hand Rail and Foot Walk (103' - 103.5')	84' 6-span Prestressed Concrete Slab	City of Healdsburg panel 060378-0005	Zone A (area of approximate 100-year flood zone with no set base flood elevation or flood hazard determined)	City of Healdsburg to construct bike path.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Healdsburg Rail Station					City of Healdsburg panel 060378-0005	In Zone C (Area of minimal flooding - no shading)		station should have no impacts to flooding
BR 67.62	Sta. 3487+20	Within Healdsburg corporate limits over the Russian River	132' Open Deck Trestle, 2-97.5' Through Truss Open Deck spans, 1-198' through pinned truss Open Deck span and 31' open Deck Trestle (109.4')	Replace approaches with Prestressed Concrete Box Girder spans with high abutment, North approach to use 97.5' spans as is. Replace pinned truss span with new throng truss open deck due to extremely low rating.	City of Healdsburg panel 060378-0005	In the detailed 100-year floodplain of the Russian River of Zone A-13 with a 100-year flood elevation of 96'	City of Healdsburg to construct bike path.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.
BR 66.29	Sta. 3415+20	Outside corporate limits of Healdsburg 600' north of Limenick Lane	23' beam open deck with foot walk and hand rail (109')	32' 2-span prestressed concrete slab with a sheet pile retaining wall on Northeast side	Sonoma County panel 060375-0530	In Zone X (within or outside the 500-year floodplain)	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 64.68	Sta. 3330+50	2,000' south of Eastside Road	17' steel beam open deck with foot walk (111.8')	17' prestressed concrete slab, repair east abutment and repair foot walk	Sonoma County panel 060375-0530	In Zone X (within or outside the 500-year floodplain)	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Windsor Rail Station					Sonoma County panel 060375-0540	In Zone X (area determined to be outside 500-year floodplain)		station should have no impacts to flooding
BR 62.41	Sta. 3210+00	Windsor Creek (north section of split flow)	45' open deck trestle with hand rail and foot walk (103.6')	55' prestressed concrete box girder with a potential grade raise of 12"	Sonoma County panel 060375-0545	In a detailed 100-year floodplain of Windsor Creek of Zone AE with a 100-year flood elevation of 100'	Bike lane out of right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and should not change the elevation of the floodplain.
BR 62.32	Sta. 3205+50	Windsor Creek (south section of split flow)	55' open deck trestle with foot walk and hand rail (101.4')	Prestressed concrete slab of equivalent length, using the existing abutments, 1' piers, extending wingwalls with a 7" grade raise required.	Sonoma County panel 060375-0545	In a detailed 100-year floodplain of Windsor Creek of Zone AE with a 100-year flood elevation of 98'	Bike lane out of right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and should not change the elevation of the floodplain.
BR 61.58	Sta. 3166+70	Unnamed	15' ODT (103')	54.5' 8'x3' RCB	Sonoma County panel 060375-0545	In Zone X	Bike path separated by barrier 15' from center line of track	No anticipated flooding issue
BR 61.30	Sta. 3151+50	Pool Creek	60' open deck trestle with foot walk and hand rail (102.8')	3-span 75' prestressed concrete box girder with a potential 13" grade raise	Sonoma County panel 060375-0545	In a detailed 100-year floodplain of Pool Creek of Zone AE with a 100-year flood elevation of 101'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and should not change the elevation of the floodplain.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 60.40	Sta. 3109+00	4,500' south of Pool Creek	29' open deck trestle with hand rail and foot walk (112.1')	Replace with a single cell cast in place 8'x3.5' concrete box and fill in the creek	Sonoma County panel 060375-0545	In Zone X (within or outside the 500-year floodplain)	No separate bridge required	It is proposed to replace an open deck trestle with a single cell cast in place 8'x3.5' concrete box and fill in the creek. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 59.50	Sta. 3056+50	Mark West Creek	30' ballast deck trestle, 63' through plate girder open deck, 29' ballast deck trestle (130.2')	5-span 140' prestressed concrete box girder	Sonoma County panel 060375-0545	In a detailed 100-year floodplain of Mark West Creek of Zone AE with a 100-year flood elevation of 129' - 131'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and should not change the elevation of the floodplain.
BR 58.82	Sta. 3020+50	Fulton Creek	15' prestressed precast concrete (131.2')	Replace with 2, 36" x 55" corrugated metal pipes	Sonoma County panel 060375-0685	In a detailed 100-year floodplain of Fulton Creek of Zone AE with a 100-year flood elevation of 129' - 131'	Bike path shown in plan details.	It is proposed to replace a bridge with 2, 36" x 55" corrugated metal pipes. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 56.11	Sta. 2877+50	Piner Creek	30' prestressed precast concrete (126')	Minor repairs	City of Santa Rosa, panel not printed.	Zone C (areas of minimal flooding). No set base flood elevation.	The bike trail apparently will be routed along corresponding city and county right of way.	The minor repairs appear to not have any effect on flooding. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 55.85	Sta. 2863+50	Paulin Creek	30' prestressed precast concrete (127.5')	Minor repairs	City of Santa Rosa, panel not printed.	Zone C (areas of minimal flooding). No set base flood elevation.	The bike trail apparently will be routed along corresponding city and county right of way.	The minor repairs appear to not have any effect on flooding. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
Jennings Rail Station								No flooding impacts
Downtown Santa Rosa Rail Station								No flooding impacts
BR 49.12	Sta. 2507+00	North branch Laguna De Santa Rosa	60' open deck trestle with foot walk and hand rail (96.9')	Prestressed concrete box girder same length, high abutments for a potential 23" grade raise.	County of Sonoma panel 060375-0855	In Zone X (within or outside the 500-year floodplain)	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Rohnert Park Rail Station								No flooding impacts
BR 47.54	Sta. 2423+50	Hinebaugh Creek	90' prestressed precast concrete box girder (108')	Minor repairs	City of Rohnert Park panel 060380-0001	Zone C (areas of minimal flooding). No set base flood elevation.	The bike trail apparently will be routed along corresponding city and county right of way.	The minor repairs appear to not have any effect on flooding. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
BR 46.97	Sta. 2393+50	Copeland Creek	30' ballast deck trestle (110')	1-span 30' prestressed concrete box girder	City of Rohnert Park panel 060380-0001	Zone C (areas of minimal flooding). No set base flood elevation.	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and would not change the elevation of the floodplain. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Cotati Rail Station								No flooding impacts
BR 44.37	Sta. 2256+00	Lichau Creek	45' ballast deck trestle with no hand rail (99.8')	60' prestressed concrete box girder	County of Sonoma panel 060375-0870	In a detailed 100-year floodplain of Lichau Creek of Zone AE with a 100-year flood elevation of 94'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible from the information given that this proposed structure will not restrict flow more than the existing structure and should not change the elevation of the floodplain.
BR 43.73	Sta. 2222+50	Approximately 600' southeast of the junction of Pengrove Ave. and Lichau Creek	15' ballast deck trestle with cattle pass and no hand rail (79.8')	Replace with a 24" steel pipe culvert and fill in the creek	County of Sonoma panel 060375-0870	is possible to be in Zone X (within or outside the 500-year floodplain) about 30' away from Zone AE elevation 75'	No bridge required	It is proposed to replace a bridge with a 24" steel pipe culvert and fill in the creek. It is possible that this could reduce the capacity of this creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction. It is also noted the close proximity to the flood Zone AE and it is recommended to assure that this proposed structure is truly out of the Zone AE and in Zone X. The Zone X would not have any FEMA related restrictions regarding construction.
BR 42.42	Sta. 2153+50	Willow Brook Creek	46' ballast deck trestle (53')	80' prestressed concrete slab girder	County of Sonoma panel 060375-0870	In a detailed 100-year floodplain of Willow Creek of Zone AE with a 100-year flood elevation of 48' - 49'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Corona Rail Station					Sonoma County panel 060375-0870	In Zone AH, 100-year flood elevation of 32 (area of 100-year flooding where depths are between one (1) foot and three (3) feet; base flood elevations are shown but no flood hazard factors are determined)		Station improvements will likely need a more detailed study to determine impacts to the 100-year flood elevation
BR 39.74	Sta. 2012+50	Petaluma River	196' ballast deck trestle with hand rail and foot walk (29.3')	196', 7-span prestressed concrete box girder with approaches raised 12"	City of Petaluma panel 060379-0002	In a detailed 100-year floodplain of Petaluma River of Zone AE with a 100-year flood elevation of 18'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.
BR 38.88	Sta. 1967+00	Petaluma River	177' 3-span cast in place concrete (15.8')	The 177' 3-span cast in place concrete bridge is new and the previously existing open deck trestle has been removed. The new bridge has not been inspected	City of Petaluma panel 060379-0005	In a detailed 100-year floodplain of Petaluma River of Zone AE with a 100-year flood elevation of 13' - 14'	No comment on bike path.	It is unknown what study was done on this newly constructed bridge. It is located in Zone AE and would be subject to FEMA construction guidelines in the floodplain.
Downtown Petaluma Rail Station					City of Petaluma panel 060379-0005	In Zone X (area determined to be outside 500-year floodplain)		station should have no impacts to flooding
BR 37.19	Sta. 1876+50	Petaluma River	56' open deck trestle / 185' swing span / 30' open deck trestle (14.8' - 15')	5-span x 80' prestressed concrete slab / 100' through plate girder Steel Lift Span / 8-span x 125' prestressed concrete slab	City of Petaluma panel 060379-0003	In a detailed 100-year floodplain of Petaluma River of Zone AE with a 100-year flood elevation of 7'	The bike trail apparently will be routed along corresponding city and county right of way.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.
BR 35.54	Sta. 1790+50	8,600' south of Petaluma river	15' open deck trestle with foot path and hand rail (9')	2, 25' 5' x 5' reinforced concrete box culverts	County of Sonoma panel 060375-980	In a detailed 100-year floodplain of tidal and Petaluma River of Zone AE with a 100-year flood elevation of 7'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	It is proposed to replace an open deck trestle with 2, 25' 5' x 5' reinforced concrete box culverts. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 34.21	Sta. 1720+50	Shultz Slough	150' prestressed concrete box girder with hand rail and foot walk (9')	Minor repairs to concrete	County of Sonoma panel 060375-980	In a detailed 100-year floodplain of tidal and Petaluma River of Zone AE with a 100-year flood elevation of 7'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	The minor repairs should not raise the existing base flood elevation at this location.
BR 33.49	Sta. 1682+50	San Antonio Creek	75' Open Deck Trestle with Hand Rail and Foot Walk (2')	5-span 100' prestressed concrete slab girder	County of Sonoma panel 060375-990	In a detailed 100-year floodplain of tidal and Petaluma River of Zone AE with a 100-year flood elevation of 7'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.
Culvert	Sta. 1633+57	4,900' south of San Antonio Creek	42" corrugated metal pipe (4.1')	48" reinforced concrete pipe	County of Marin panel 060173-0140	is possible to be in Zone C (areas of minimal flooding) with no set base flood elevation. Also is possible to be very close to Zone A1 with a base flood elevation of 6'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	The upgrade of the culvert from 42" to 48 inch should improve the passage of flow. It is also noted the close proximity to the flood Zone A1 and it is recommended to assure that this proposed structure is truly out of the Zone A1 and in Zone C. The Zone C would not have any FEMA related restrictions regarding construction.
BR 31.74	Sta. 1589+50	9,300' south of San Antonio Creek	45' open deck trestle (5.5')	2 52' 36" diameter corrugated steel pipe	County of Marin panel 060173-0140	In a detailed 100-year floodplain of tidal and Petaluma River of Zone A1 with a 100-year flood elevation of 6'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	It is proposed to replace an open deck trestle with 2 56' long 36" corrugated steel pipes. It is possible that this could reduce the capacity of the flood source and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 29.31	Sta. 1461+00	500' south of Hwy 101 undercrossing near Novato	15' open deck trestle (8')	2 25' 48" corrugated steel pipe culvert	City of Novato panel 060178-0002	Located in unshaded Zone X, which is out of any flood zone.	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	It is proposed to replace an open deck trestle with twin 25' long 48" corrugated steel pipes. It is possible that this could reduce the capacity of the flood source and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction. It is also noted that the proposed structure is not in a detailed 100-year floodplain and so would have no FEMA related construction restrictions based on this flood zone.
North Novato Rail Station					City of Novato panel 060178-0002	In a detailed 100-year flood plain Zone AE with a 100-year flood elevation of 7		Station improvements will likely need a more detailed study to determine impacts to the 100-year flood elevation
BR 28.77	Sta. 1432+50	2,100' north of Hwy 101 undercrossing near Novato	15' open deck trestle (8')	2- 5' x 5' x 25' reinforced concrete boxes	City of Novato panel 060178-0002	In a detailed 100-year floodplain Zone AE from tidal effects with a 100-year flood elevation of 7'	Caltrans plans to route a bike path adjacent to Hwy. 101 along frontage roads.	It is proposed to replace an open deck trestle with twin 25' long 5' x 5' reinforced concrete boxes. It is possible that this could reduce the capacity of the flood source and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.
BR 26.93	Sta. 1336+00	Novato Creek	230' open deck trestle (15.5' - 16')	20-span 298' prestressed concrete slab with approaches raised 7"	City of Novato panel 060178-0002	In a detailed 100-year floodplain Zone AE from tidal effects and Novato Creek with a 100-year flood elevation of 8'	Some locations may require property acquisition. No description of bike path crossing the river.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 26.04	Sta. 1288+70	4,730' south of Novato Creek	30' open deck trestle (11.2' - 11.5')	3-span 42' prestressed concrete slab	City of Novato panel 060178-0005	In a detailed 100-year floodplain Zone AE from tidal effects with a 100-year flood elevation of 7'	One of two options describes a bike path bridge over slough, however it is not shown in the details.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.
BR 24.81	Sta. 1224+00	Arroyo De San Jose	46' open deck trestle with hand rail and foot walk (21.5')	2-span 56' prestressed concrete box girder with approaches raised 11"	City of Novato panel 060178-0005	In a detailed 100-year floodplain Zone AE from Arroyo De San Jose with a 100-year flood elevation of 20'	Bike path not shown on details and is possible to follow an existing bike path over the Arroyo.	It is possible that the proposed structure will have greater hydraulic capacity than the existing structure and therefore, should not change the base flood elevation at this location.
South Novato Rail Station					City of Novato panel 060178-0005	outside flooding limits		station should have no impacts to flooding
BR 23.98	Sta. 1178+70	Pacheco Creek	30' open deck trestle with foot walk and hand rail (25' - 25.4')	6-48" corrugated steel pipes	City of Novato panel 060178-0005	Right on the border between a detailed 100-year floodplain Zone AE with a 100-year flood elevation of 22' and unshaded Zone X, which is out of any flood zone.	No bridge required here.	It is proposed to replace an open deck trestle with six 48" corrugated steel pipes. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction. It is also recommended to determine if this structure is in the floodplain as it is possible that it is located right on the transition of zones.
BR 22.32	Sta. 1091+50	1,200' north of Miller Creek	45' ballast deck trestle (8.8')	36" corrugated steel pipe	County of Marin panel 060173-0267	In a detailed 100-year floodplain Zone A1 with a 100-year flood elevation of 6'	Bike path crossing included in plans	It is proposed to replace a ballast deck trestle with a 36" corrugated steel pipe. It is possible that this could reduce the capacity of the flood source and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
BR 22.09	Sta. 1079+50	Miller Creek	46' open deck trestle with hand rail and foot walk (11.3' - 11.5')	Prestressed concrete slab girder of approximately same length with a 7" grade raise	County of Marin panel 060173-0267	In a detailed 100-year floodplain Zone A1 with a 100-year flood elevation of 12'	Unknown how the bike path will cross here.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.
BR 21.72	Sta. 1059+75	1,975' south of Miller Creek	15' open deck trestle (11.8')	24" corrugated steel pipe	County of Marin panel 060173-0269	is possible to be in detailed 100-year floodplain Zone A1 with a 100-year flood elevation of 6' or 10' however the railroad here is possible to offer some flood protection and includes a thin strip of Zone X unshaded, which would be out of the floodplain.	Bike path not shown in plans and it's unknown how it crosses here.	It is proposed to replace an open deck trestle with a 24" corrugated steel pipe. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction. It is also recommended to determine if this structure is in the floodplain as it is possible that it is located right on the transition of zones.
BR 20.91	Sta. 1015+00	Galinas Creek	163' open deck trestle, 40' steel through plate girder open deck, bascule 76' open deck trestle (11.1' - 12')	12-span 171' prestressed concrete box girder / 1-span 30' prestressed concrete box girder / 6-span 84' prestressed concrete slab and raising approaches 6"	City of San Rafeal panel 065058-0005	In a detailed 100-year floodplain Zone A1 with a 100-year flood elevation of 6'	It is noted that a new bike path over Galinas Creek would be required but it is not shown in the plans.	It is possible that the proposed replacement structure will not change the existing hydraulic capacity and should not raise the existing base flood elevation.
Civic Center Rail Station					City of San Rafael panel 065058-0005	Edge of Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)		Grading of area should place structures one foot above existing grade to limit potential flood damage

SMART Structure Name	SMART Station	Water Body	Existing Structure (track elevation)	Proposed Structure	FEMA FIRM Location	Flood Zone	Bike Trail	Comments
Downtown San Rafael Rail Station					City of San Rafael panel 065058-0015	In Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)		Grading of area should place structures one foot above existing grade to limit potential flood damage
BR 16.30	Sta. 772+80	3,020' south of Mahon Creek/San Rafael Creek	15' open deck trestle, footwalk and handrail, center and right (4.6')	Replace with reinforced concrete box culvert same size as existing downstream culvert.	City of San Rafael panel 065058-0015	In a detailed 100-year floodplain Zone A1 with a 100-year flood elevation of 6'	Bike lane out of right of way.	It is proposed to replace an open deck trestle with a box concrete box culvert. It is possible that this could reduce the capacity of the creek and it is recommended that greater detailed study would need to be done to determine the flooding effects of this potential restriction.
Larkspur Rail Station					City of Larkspur panel 065040-0001	In Zone B (areas between limits of 100-yearflood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot)		Grading of area should place structures one foot above existing grade to limit potential flood damage