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SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

DRAFT

Stormwater Resource Plan for San Mateo County

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SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

A Program of the City/County Association of Governments of San Mateo County (C/CAG)

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EXECUTIVE SUMMARY

Stormwater resource planning is a relatively new and important component of the watershed management process in California. Extended drought conditions, climate change, and the ongoing need to manage water quality and flooding requires additional planning from municipalities to manage surface water runoff. Through Senate Bill 985, a Stormwater Resource Plan (SRP) is required for municipalities to receive funding for stormwater and dry weather runoff capture projects. Development of the San Mateo County SRP was led by the City/County Association of Governments (C/CAG) of San Mateo County and its Countywide Water Pollution Prevention Program (Countywide Program), representing twenty cities and the County of San Mateo, through a collaborative effort with stakeholders and the public. The purpose of the SRP is to provide detailed analysis of stormwater and dry weather capture projects for the County. These projects aim to reduce flooding and pollution associated with stormwater runoff, improve biological functioning of plants, soils, and other natural infrastructure, and provide community benefits through stakeholder engagement and education.

ES.1 Watershed-Based Approach

The San Mateo County SRP was not based on property boundaries, county lines, or other political boundaries, but was developed through a hydrologically defined watershed-based approach. Using the United States Geological Survey (USGS) Hydrologic Unit designations (HUC), watershed scales and boundaries were used to ultimately identify priority stormwater and dry-weather projects for San Mateo County (Figure ES-1). Two major watersheds were assessed in the SRP: San Francisco Bay Watershed and San Francisco Coastal South Watershed. Each watershed contains unique surface water and groundwater characteristics, and through the assessment process, priorities were identified on a watershed-basis. Parameters assessed were: watershed processes, surface and groundwater quality, water usage, land use characteristics, and natural habitats. For example, the San Francisco Bay Watershed has high levels of impervious cover along San Francisco Bay and contains most of the population for San Mateo County. San Francisco Coastal South Watershed

Figure ES-1 Major Watersheds Addressed by the SRP.

includes the Pacific coastline of San Mateo County and, in its southern reaches, includes large areas of open space and agriculture. The goal of this characterization is to provide an introduction to watershed processes in San Mateo County, give historical context of the watersheds through previous planning efforts, and aid in stormwater project prioritization.

The watershed-based approach also leveraged previous regional and watershed planning efforts. Various agencies and municipalities throughout the county have developed regional plans, local watershed plans, Total Maximum Daily Loads (TMDLs), and other research documents that provide depth to the SRP, allowing it to be tailored to the specific needs of each watershed while maintaining a regional perspective.

ES.2 Project Prioritization Process

The SRP includes an evaluation of project benefits addressing several key metrics: Water Quality, Water Supply, Flood Management, Environmental, and Community benefits. The first steps were to identify suitable public parcels and public rights-of-way. Hydrologic Response Units (HRUs), small spatial units containing unique attributes (i.e. land use cover), were then used to evaluate watershed processes within San Francisco Bay and San Francisco Coastal watersheds and their subwatersheds to prioritize stormwater and dry weather runoff capture projects. HRUs assessed were: land use, impervious cover, hydrologic soil groups, and slope. Based on these key metrics, watershed characteristics, and watershed processes through HRUs, several stormwater projects were identified and prioritized to address water quality impairments, reduce flooding, and provide more natural groundwater recharge throughout the County. A screening and prioritization method was developed to reasonably site stormwater capture projects through a ranking method, with emphasis on projects that offered the greatest opportunity for multiple benefits. Higher prioritization was given to projects that addressed flood-prone streams, those located in PCBs-risk areas, and ones that drain to TMDL waters. Three types of project opportunities for stormwater management were identified throughout the County:

Regional Stormwater Capture Projects

Regional stormwater capture projects consist of facilities that capture and treat stormwater from off-site. The primary objective of regional projects is often flood attenuation, but many also contain a water quality treatment or infiltration component.

Green Streets

Green streets consist of stormwater capture infrastructure that is implemented in public rights-of-way. Green streets are intended to capture only runoff that is generated from the street and adjacent land that drains to the street (Figure ES-2).

Figure ES-2 Example green street with stormwater planter box (SMCWPPP 2009)

Low Impact Development Retrofit

Low Impact Development (LID) is a form of on-site urban infrastructure design that uses a suite of technologies intended to imitate pre-urbanization (natural) hydrologic conditions. One of the most prominent effects of urbanization is the drastic increase in impervious surfaces, and thus, stormwater runoff. LID is meant to capture, remove (through infiltration), and slow runoff to reduce the impacts of the urban landscape.

Separate prioritization scoring processes were developed for each of the three project types. A project's priority score was determined by summing all of the points assigned from the evaluated physical characteristics, proximity to areas of interest, potential for co-locating projects, and the various multiple benefits. All public parcels and streets throughout the county were prioritized and the results were analyzed at the countywide scale, and city-scale. Figure ES-3 provides an example of green street prioritization of Menlo Park.

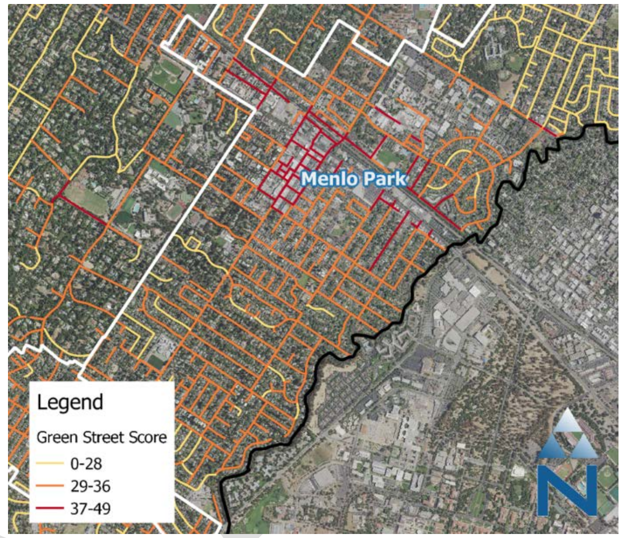

Figure ES-3 Example City Scale for Prioritization of Green Streets.

Twenty-two projects were selected from the prioritized project list for quantitative analysis of stormwater capture potential and preparation of conceptual designs. Modeling of average annual stormwater capture volume and pollutant load reductions provides further quantitative analysis for the highest opportunity projects and acts as a validation of the quantitative, metric-based prioritization process. The conceptual designs provide a platform to discuss project benefits with diverse audiences, including potential funding sources, project beneficiaries, stakeholders, and the community. The concepts provide project details and capital costs that will aid in the future design and implementation and seeking funding. Three projects were selected for regional planning projects, fifteen for green streets, and four for low-impact development. These projects were selected based on distribution across the county for multiple cities, proximity to impairments or flood prone streams, and opportunities for co-location of planned projects.

For example, Twin Pines Park, owned and maintained by the City of Belmont, was identified as a potential location for a regional stormwater capture project. Belmont Creek, which runs through Twin Pines Park, is the primary receiving water for the City and is identified as a flood-prone channel impacting downstream properties, including a pharmaceutical manufacturing facility. A nearby storm drain was identified as the most feasible opportunity for stormwater capture, and contains a drainage area of approximately 30 acres. The first page of the concept is shown in Figure ES-4 and is shown in more detail in Section 4.3.3.

Site Description:

This project concept consists of an offline subsurface infiltration chamber at Twin Pines Park. The park is owned and operated by the City of Belmont and is adjacent to City Hall. The park provides the opportunity to treat runoff from a 30-acre area that is primarily residential and drains directly to Belmont Creek. Due to the heavy tree cover that dominates most areas of the park, the parking lots represents some of the few opportunities for stormwater capture. The project would capture flows and associated pollutant loadings from a small portion of the upper Belmont Creek, entirely within the City of Belmont. The project would help to alleviate flooding issues in lower reaches of Belmont Creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (mercury and PCBs), augment water supply by recharging the Santa Clara Valley groundwater basin, and provide community enhancement through integration with the recreational facilities of the park.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

Drainage Characteristics	
Capture Area (acres)	30
Impervious Area (%)	27
Dominant Land Use	Residential
Jurisdictions	Belmont

Site Information	
Land Owner	City of Belmont
Street Address	30 Twin Pines Ln, Belmont, CA 94002
Latitude/Longitude	37° 31' 02.3" N / 122° 16' 40.4" W
Watershed	Belmont Creek


Twin Pines Park: west parking lot

Concept for a Multi-jurisdictional Regional Stormwater Capture Project
Site: Twin Pines Park (City of Belmont)

Figure ES-4 Example Concept of Twin Pines Park in the City of Belmont.

ES.3 Implementation and Adaptive Management

For the SRP to be effective, an adaptive management and funding strategy is needed to transition from planning to implementation. TMDL pollutant reduction schedules and requirements of the Municipal Regional Stormwater Permit (MRP) will determine the pace for implementation of projects, timing, and project funding. To address the MRP, a TMDL Implementation Plan will be completed in the coming years for priority pollutants in the watersheds. The TMDL Implementation Plan will determine the amount of green infrastructure and other stormwater capture projects necessary to achieve pollutant reductions to meet interim and final TMDL wasteload allocations.

The SRP will act as a living document that will continue to be updated to incorporate multiple-benefit projects as they are identified. As projects are implemented and lessons are learned through wider scale integration of LID, green streets, and regional stormwater capture projects within traditional infrastructure, the SRP will be periodically revised to update the project implementation plan. This is expected to occur once every five years, coinciding with the five-year cycle for updates to the MRP. Throughout implementation of the SRP and TMDL Implementation Plan, C/CAG, via the Board of Directors, committees, and Countywide Program committees will continue to meet to discuss both planning efforts.

1 INTRODUCTION

The San Mateo County SRP is a comprehensive document that represents a significant transformation in watershed resource planning and stormwater runoff management. Development of the SRP was led by the City/County Association of Governments (C/CAG) of San Mateo County and its Countywide Water Pollution Prevention Program (Countywide Program), representing twenty cities and the County of San Mateo. The SRP was prepared through a collaborative effort with stakeholders and the public and was tailored to the specific stormwater and dry weather runoff issues in the region. The main goals of the SRP are to identify and prioritize stormwater and dry weather capture projects in San Mateo County through detailed analysis of watershed processes and surface and groundwater resources, input from stakeholders and the public, and analysis of multiple benefits that can be achieved. The collective objective of this plan is to address major challenges to and opportunities for managing stormwater and dry weather runoff within San Mateo County.

C/CAG is a joint powers agency whose members are the County and the 20 cities and towns in San Mateo County. Its primary role is a Congestion Management Agency, but it has administered the Countywide Program since its inception in the early 1990s, with a primary goal of assisting member agencies in meeting municipal stormwater regulatory mandates. The C/CAG Board of Directors includes one elected official from each of the 21 member agencies. The Board of Directors is advised by numerous committees, including a Stormwater Committee that includes all of the public works directors in the County, as well as a representative of the San Francisco Regional Water Quality Control Board (Regional Water Board). The Countywide Program also administers numerous subcommittees and workgroups that address various aspects of stormwater management under National Pollutant Discharge Elimination System Permit (NPDES) requirements of the San Francisco Bay Municipal Regional Stormwater Permit (MRP).

This SRP does not intend to reproduce existing or ongoing plans, and is a building block for efforts outlined in the current MRP. The SRP draws from past research, management plans, assessment plans, and water quality regulatory compliance plans, and identifies new projects needed to address regional stormwater management goals. This document provides projects for managing stormwater in San Mateo County, allowing jurisdictions to take actions to collaboratively address the major stormwater-related challenges and needs in the watersheds. This SRP meets the standards and requirements of Water Code section 10560 et seq., and will be updated and adapted as new goals, projects, and needs arise for the County.

1.1 Background and Purpose

Senate Bill 985 (SB-985) on stormwater resource planning (implemented through Water Code section 10563, subdivision (c)(1)[1]), went into effect January 1, 2015, and requires a city, county, or special district to develop a SRP as a condition of receiving voter-approved bond funds for stormwater and dry weather runoff capture projects. The Regional Water Board regulates federally listed waterbodies that are listed as impaired for water quality through water body/pollutant combinations outlined in Section 303(d) of the Clean Water Act. Section 303(d) requires each state

[1] More information on SB-985 and amendment to the Water Code can be found here: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB985

to submit to the U.S. Environmental Protection Agency (EPA) a list of waters with impaired beneficial uses (e.g., recreation, aquatic life) resulting from pollutants or other stressors (e.g., temperature). Once the impaired waterbodies are placed on the 303(d) list, the Clean Water Act requires that the state implement Total Maximum Daily Loads (TMDLs) that provide pollutant load allocations for the listed water body.

In the 1990s, local stormwater agencies and professional associations in California started to develop stormwater capture projects associated with specific rainfall frequencies. In the early 2000s, Regional Water Boards and other stakeholders recommended the establishment of a water quality design storm for water quality protection on a watershed scale. These recommendations and continued research and conversations led to the establishment of the Stormwater Resource Planning Act, implemented through Water Code section 10563, which focuses on stormwater management on a watershed-scale and development of SRPs.

Due to concerns with extended drought conditions, climate change, and the ongoing need to improve stormwater runoff quality and manage flows, watershed-based planning and incorporating green infrastructure into the urban landscape are now seen as requirements and necessities in order to restore stormwater and dry weather runoff infiltration capacity. Existing engineering technologies coupled with the use of natural and biological functions of soil and plants allow for capture and treatment of stormwater and dry weather runoff in a cost-effective way. In addition, these projects enable collaboration between local and regional governments, utilities, and other stakeholder groups to develop hydrologic, habitat, and community benefits. These green infrastructure changes provide substantial progress toward healthy watersheds, reduced hydromodification impacts, reduced pollutant loads to surface waters, restored native habitat, increased recreational areas and green space, opportunities to coordinate with and enhance multi-modal complete street projects, and positive community engagement opportunities.

The purpose of this SRP is to provide concrete, implementable solutions to water quality and flow issues related to stormwater runoff in San Mateo County, California. This document provides detailed analysis of San Mateo County watersheds, contributors to pollution, and specific, quantified stormwater and dry weather runoff capture projects for the County.

1.2 Goals and Elements of the SRP

Goals of the SRP are as follows:

- Characterize watershed processes, surface and groundwater quality, water usage, land use characteristics, and natural habitats of San Mateo County watersheds;
- Provide historical context and detailed analysis of San Mateo County watersheds through previous regional planning efforts, analysis of water quality impacts, and research on water quality compliance and existing TMDL implementation plans;
- Provide a quantitative and transferable methodology for the identification and prioritization of stormwater and dry weather runoff capture projects;
- Outline specific stormwater and dry weather runoff capture projects within the County;
- Leverage stakeholder expertise and knowledge through past planning documents, community engagement efforts, and continued communication and data sharing among stakeholder groups;
- Implement future stormwater resource planning through adaptive management.

Elements of the SRP are as follows:

- The remainder of Section 1 discusses previous planning efforts of regional watershed management plans, local watershed management plans, and TMDLs and watershed assessments;
- Section 2 identifies the two major watersheds within San Mateo County and discusses watershed and subwatershed boundaries, surface and groundwater resources, watershed processes, and native habitats of each watershed;
- Section 3 outlines organization, coordination and collaboration, and specifically discusses local agency contributions that have been made, public engagement efforts, and coordination with government agencies;
- Section 4 discusses the methods used to identify and prioritize stormwater and dry weather runoff capture projects in San Mateo County, and provides detailed descriptions of the integrated benefit metrics used as well as how the data will be manage. Section 4 also identifies and prioritizes multiple benefit projects, and outlines the multiple benefits and impacts of plan implementation;
- Section 5 outlines a projection of additional funding and tools needed for the program, implementation strategies, adaptive management, and a discussion on how performance will be measured going forward;
- Section 6 discusses community outreach and public participation that occurred throughout the organization and completion of this document;
- Section 7 provides references.

1. 3 Previous Planning

One of the goals of the SRP is to leverage previous regional and watershed planning efforts led by various agencies and municipalities throughout the County. By incorporating the results from the separate plans throughout the County, the result is a more robust and synergistic SRP that is tailored to the specific needs of individual watersheds while maintaining a regional perspective. The following subsections outline the previous planning efforts and the significant conclusions made that will be referred to throughout the SRP.

1.3.1 Regional Plans

San Francisco Bay Area Integrated Regional Watershed Management Plan (IRWMP)

The San Francisco Bay IRWMP (Kennedy/Jenks Consultants 2013) is a nine county, multi-stakeholder regional effort to address major challenges and opportunities related to water and natural resource management in the Bay Area. The IRWMP provides a collaborative and integrative framework to take action and

San Francisquito Creek Flood Protection and Ecosystem Restoration Capital Improvement Project East Bayshore Road to San Francisco Bay

Abstract:
The goal of San Francisquito Creek Flood Protection and Ecosystem Restoration Capital Improvement Project, East Bayshore Road to San Francisco Bay is to provide protection against a 1% fluvial event coincident with a 1% tide, with accommodation for 26 inches of projected sea level rise and FEMA freeboard requirements on San Fransciquito Creek between East Bayshore Road and the San Francisco Bay. If awarded, this grant will fund the removal of abandoned Pacific Gas and Electric pipelines, which is a recently added project component, along with creation of additional marsh habitat.

Deadline:

Project URL	link
Sponsoring Agency	San Francisquito Creek Joint Powers Authority
Subregions	('South Bay', 'West Bay')
Counties	Santa Clara County, San Mateo County
Watershed Tributary	
Public or private land?	()
Location (lat/lon)	37.453139, -122.127270
Start Date	08/01/2015
End Date	12/31/2017
Location Description	San Francisquito Creek - San Francisco Bay to Highway 101.

address the major water-related challenges in the Region through goals, objectives, selected resource management strategies, and prioritized projects. Projects are submitted to the Bay Area IRWMP for project screening, review, and inclusion in the IRWRP. Projects are made available on the Bay Area IRWMP website (Figure 1-1) for the public to review and assess. Extensive details of each project are outlined on the website. Some of the projects currently listed are the Bayfront Canal Flood Management and Habitat Restoration Project, the 2020 Turf Replacement Project in Marin County, San Francisquito Creek Flood Protection and Ecosystem Restoration Capital Improvement Project in Santa Clara and San Mateo Counties, and Napa River Arundo Removal, among others.

Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin

The San Francisco Bay Basin Plan (SFRWQCB 2011) is the water quality control planning document for the San Francisco Bay Region prepared by the San Francisco Regional Water Board. The Basin Plan includes identification and descriptions of beneficial uses in the Region and identifies beneficial uses for select waterbodies. In addition, it outlines water quality objectives and implementation plans for water quality control in the Region through watershed management and discharge prohibitions. It identifies other plans and policies that work in tandem with the Basin Plan, and stresses the importance of surveillance and monitoring on a regional scale. In its final chapter, the Basin Plan classifies water quality attainment strategies, including specific TMDLs and enhancement plans that help to maintain water quality standards.

Watershed Management Initiative (WMI)

The Watershed Management Initiative (SFRWQCB 2004a) was completed in 2004 by the Regional Water Board to 1) use water quality to prioritize water resource problems in specific watersheds through stakeholder involvement, 2) better coordinate point and nonpoint source regulation by incorporating staff from different programs, and 3) to better coordinate local, state, and federal activities and programs to assist local watershed groups. Within San Francisco Bay Region, there are ten identified watershed management areas (San Mateo is number seven). Within each watershed management area, watershed descriptions and issues are identified and watershed groups and management efforts are compiled. Water quality issues were recognized and a proposed Regional Board staff work plan was developed.

1.3.2 Local Watershed Plans

Belmont Creek Watershed Monitoring Report

The Belmont Creek Watershed Monitoring Report (SMCWPPP 2006) was conducted to assess flooding in the lower sections of Belmont Creek. One business, which was flooded twice in five years, dredged the creek and hired technical consultants to evaluate feasible flood control alternatives. Five conceptual alternatives were selected by stakeholders for further analysis using hydraulic models to analyze the effectiveness of each concept. The study identified a collaborative alternative which involved enlarging a by-pass culvert on Harbor Boulevard and restoring the floodplain at Twin Pines Park, which would reduce sedimentation, allow larger flows to pass through lower Belmont Creek, improve habitat surrounding the Creek, and ultimately reduce flooding.

Belmont City-Wide Storm Drainage Study

The Belmont City-Wide Storm Drainage Study (City of Belmont 2009) was conducted for the City of Belmont to evaluate the storm drain network that drains to Belmont Creek and identify drainage deficiencies to prioritize improvements. The Belmont Creek watershed is known to have frequent flooding issues stemming from areas not served by drainage facilities, undersized storm drain lines, and failing corrugated metal pipes. Areas not served by the storm drain system convey runoff on the street and curbs, causing more opportunities for roadway damages during flood events. The Study recommends improvements through replacement of aging or undersized pipes as the primary solution. However, the Study also prioritizes areas that are the most impacted and can be used to identify areas where green infrastructure implementation may reduce the need and costs for storm drain replacement.

Bayfront Canal / Atherton Channel Flood Improvement Project

Redwood City partnered with the Coastal Conservancy to implement the Bayfront Canal / Atherton Channel Flood Management Improvement Project, which aims to direct stormwater to salt ponds, enhance habitat, and serve as stormwater detention for the Bayfront Canal and Atherton Channel drainage areas (IRWMP 2013). This project would route flows from the Bayfront Canal and Atherton Channel into managed ponds within the Ravenswood Pond Complex and the South Bay Salt Ponds, ultimately resulting in a seasonal wetlands habitat that helps to mitigate flooding in the area. This project is included in the San Francisco Bay IRWMP.

San Bruno Creek/Colma Creek Resiliency Study

The San Bruno Creek/Colma Creek Resiliency Study (San Francisco International Airport 2015) was conducted to evaluate the vulnerability of assets within the lower reaches of both San Bruno Creek and Colma Creek to the effects of sea level rise and storm events. The Study identified flooding issues in both creeks to be a result of a combination of both high discharge and rising water levels of San Francisco Bay. Among other solutions, the Study suggests both detention and low impact development (LID) to alleviate fluvial flooding. To manage tidal surges from the Bay, improvements to floodwalls and construction of a tidal gate and pump stations are recommended.

San Gregorio Creek Watershed Management Plan

The San Gregorio Creek Watershed Management Plan (Natural Heritage Institute 2010) was implemented to improve ecological conditions in the San Gregorio Creek watershed and provide multiple benefits including enhancement of native fish and wildlife populations, increased ecosystem functioning, and maintenance of rural quality of life in the watershed. The creek is listed as high priority based on existing water quality conditions, value and sensitivity of coastal resources, threats to beneficial uses, and local support for watershed-based planning. The watershed management plan named many management, restoration, and research priorities including continued water quality monitoring, analysis of coho salmon spawning conditions, limiting factors for focal species in the watershed, stream flow measurement, construction of off-stream water storage, control of non-native species, and continued support of watershed groups, among others.

Peninsula Watershed Management Plan

The Peninsula Watershed Management Plan (San Francisco Planning Department 2001b) was developed by the San Francisco Public Utilities Commission (SFPUC) to provide collaborative production, collection, and storage of highest quality water for SFPUC's customers, implement and monitor a resource management program, and protect water and natural resources while balancing costs and benefits. Peninsula watershed management actions include assessment of on-site stormwater collection and drainage systems for sizing and erosion, field verify stormwater runoff, develop hazardous chemical management procedures, identify and prioritize removal of dump sites, inspect sanitation and treatment systems, evaluate landscaping and irrigation practices for water efficiency, and regularly inspect and maintain facilities used by the public, among other actions. The

Environmental Impact Report of the Peninsula Watershed Management Plan provides an overview of the environmental impacts of these plans as well as watershed management alternatives.

San Pedro Creek Watershed Assessment and Enhancement Plan

The San Pedro Creek Watershed Assessment and Enhancement Plan (San Pedro Creek Watershed Coalition 2002) was implemented to improve San Pedro Creek and its surrounding watershed by addressing erosion, flooding, pollution, and fish population changes. Goals of the enhancement plan included implementation of monitoring and adaptive management, restoration of geomorphic function and water quality, attention to critical watershed issues through education and community involvement, and collaboration between private and public sectors. Major steps being taken as part of the enhancement plan are field reconnaissance meetings, field work, data analysis, and design development and planning.

Fitzgerald Marine Reserve Master Plan and Area of Special Biological Significance (ASBS) Pollution Reduction Program

The Fitzgerald Marine Reserve Master Plan (San Mateo County Parks Department 2002) was implemented to preserve and protect the resources within the reserve. Policies and activities within the master plan include visitor management policies, reef monitoring, restoration of marshes, overall water quality improvements, implementation of special status for wildlife and plant species, vegetation management, maintenance of historic character of plants and historic sites, acquisition of land, and enforcement of recreational hunting, gathering, and fishing as well as possession of domestic and feral animals within the reserve.

The James V. Fitzgerald ASBS Pollution Reduction Program (San Mateo County 2016) was led by the County of San Mateo Department of Public Works which implemented stormwater Best Management Practices (BMPs), water quality studies, and BMP effectiveness monitoring and education. The overall goal of this project was to improve water quality and maintain beneficial uses of the Reserve while also assisting in the County's compliance with stormwater regulations.

Master Plans for other parks have been developed throughout San Mateo County and are addressed in more detail at the County of San Mateo Parks Department website: http://parks.smcgov.org/park-planning.

Characterization of Imperviousness and Creek Channel Modifications for Seventeen Watersheds in San Mateo County

This watershed study conducted by the Countywide Program (SMCWPPP 2002) characterized watershed imperviousness and creek channel modifications for seventeen watersheds that included major urbanized creek watersheds discharging to San Francisco Bay, and watersheds discharging to the Pacific Ocean that have experienced development pressure. The objective of this study was to help municipalities minimize the impacts of development on creeks in urban areas. The study found that high-density residential land use made the largest contribution to watershed imperviousness, and most of the coastal watersheds contained lower impervious cover. Impervious data from this study has been used to characterize runoff flows and land use, and channel modification data has been used to establish areas exempt from requirements through reduced runoff volumes. This study is available in full in Appendix A.

Building upon the above study in 2002, the Countywide Program followed with numerous additional investigations in these and other watersheds throughout the County to better understand watershed processes, water quality, and other impacts to creeks and San Francisco Bay. These include:

- Assessment of Sediment Management Practices in Six High Priority Watersheds in San Mateo County (SMCWPPP 2004)
- Bioassessment and Water Quality Monitoring in the San Pedro Creek Watershed (SMCWPPP 2005)
- Water Quality Screening in the Cordilleras Creek Watershed (SMCWPPP 2007a)
- Unified Stream Assessment in Seven Watersheds in San Mateo County (SMCWPPP 2008)

Other studies have been conducted on pollutants of concern, trash, unified stream assessments, and watershed restoration (SMCWPPP 2015). These and other past investigations are made publicly available by the Countywide Program at http://flowstobay.org/studiesresearch.

1.3.3 TMDLs and Watershed Assessments

TMDLs have been developed by the Regional Water Board for watersheds throughout the San Francisco Bay Area. Completed TMDLs include selenium for North San Francisco Bay, mercury and PCBs for San Francisco Bay, bacteria for San Francisco Bay beaches, San Pedro Creek, and Pacifica State Beach, and pesticide toxicity for various urban creeks throughout the Region. TMDLs in development in the Bay Area include sediment for Pescadero, Butano, and San Francisquito Creeks as well as bacteria for San Vicente Creek and Fitzgerald Marine Reserve. Multiple local watershed assessments have also been developed to investigate water quality on a local level and address specific stakeholder interests and involvement. The previous section summarized multiple watershed assessments performed since 2002 by the Countywide Program (SMCWPPP 2002, 2004, 2005, 2007a, 2008, and 2015). Additional watershed assessments in the Region include the Pescadero-Butano Watershed Assessment (Monterey Bay National Marine Sanctuary Foundation 2004), and the Non-point source Watershed Assessment: James Fitzgerald Marine Reserve Critical Coastline Area (California Coastal Commission 2008).

2 DESCRIPTION OF SAN MATEO COUNTY WATERSHEDS ADDRESSED BY THE SRP

San Mateo County is located on a peninsula south of the City of San Francisco bordered by San Francisco Bay to the east and the Pacific Ocean to the west. The County contains 20 cities, spans 450 square miles, and has a population of 758,581, according to the 2014 census. About 50% of the western portion of the County is parks and open space, while the rest is agricultural and urban. About 26% of San Mateo County is considered urbanized, with the majority of urban area located on the eastern portion of the County adjacent to San Francisco Bay (SFRWQCB 2004b).

Four watersheds (defined on a broad scale using USGS HUC 8 digit boundaries) lie within or border San Mateo County: San Francisco Bay watershed, San Francisco Coastal South watershed, Coyote watershed, and San Lorenzo-Soquel watershed (Figure 2-1). Coyote watershed borders south eastern San Mateo County and only a small area of San Lorenzo-Soquel watershed lies within the County. These two watersheds are therefore not discussed at length in this document. Within San Francisco Bay watershed and San Francisco Coastal South watershed are twenty impaired water bodies on EPA's 2012 303 (d) list of impaired waters including San Francisco Bay (central, lower, and south), Marina Lagoon, Pescadero Creek, and Pillar Point Beach along the Pacific Ocean. Many of these water bodies support the endangered and threatened wildlife.

The following sections discuss the two major watersheds within San Mateo County that are addressed by the SRP: San Francisco Bay watershed and San Francisco Coastal South watershed. The discussion outlines watershed and subwatershed boundaries of each watershed, surface and groundwater resources, watershed processes, and native habitats.

Figure 2-1. Watersheds and 303(d) listed waterbodies within San Mateo County.

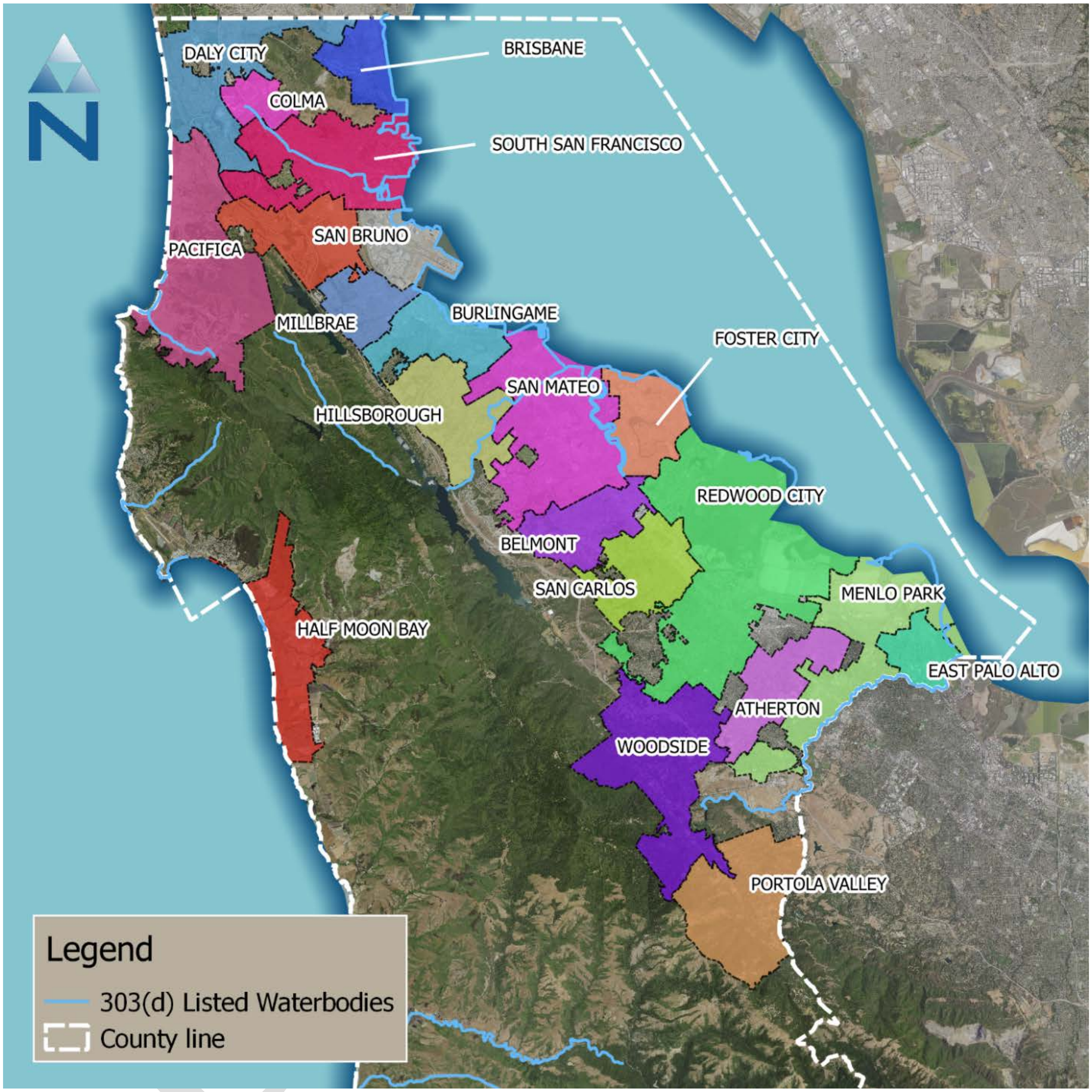

Figure 2-2. Cities within San Mateo County.

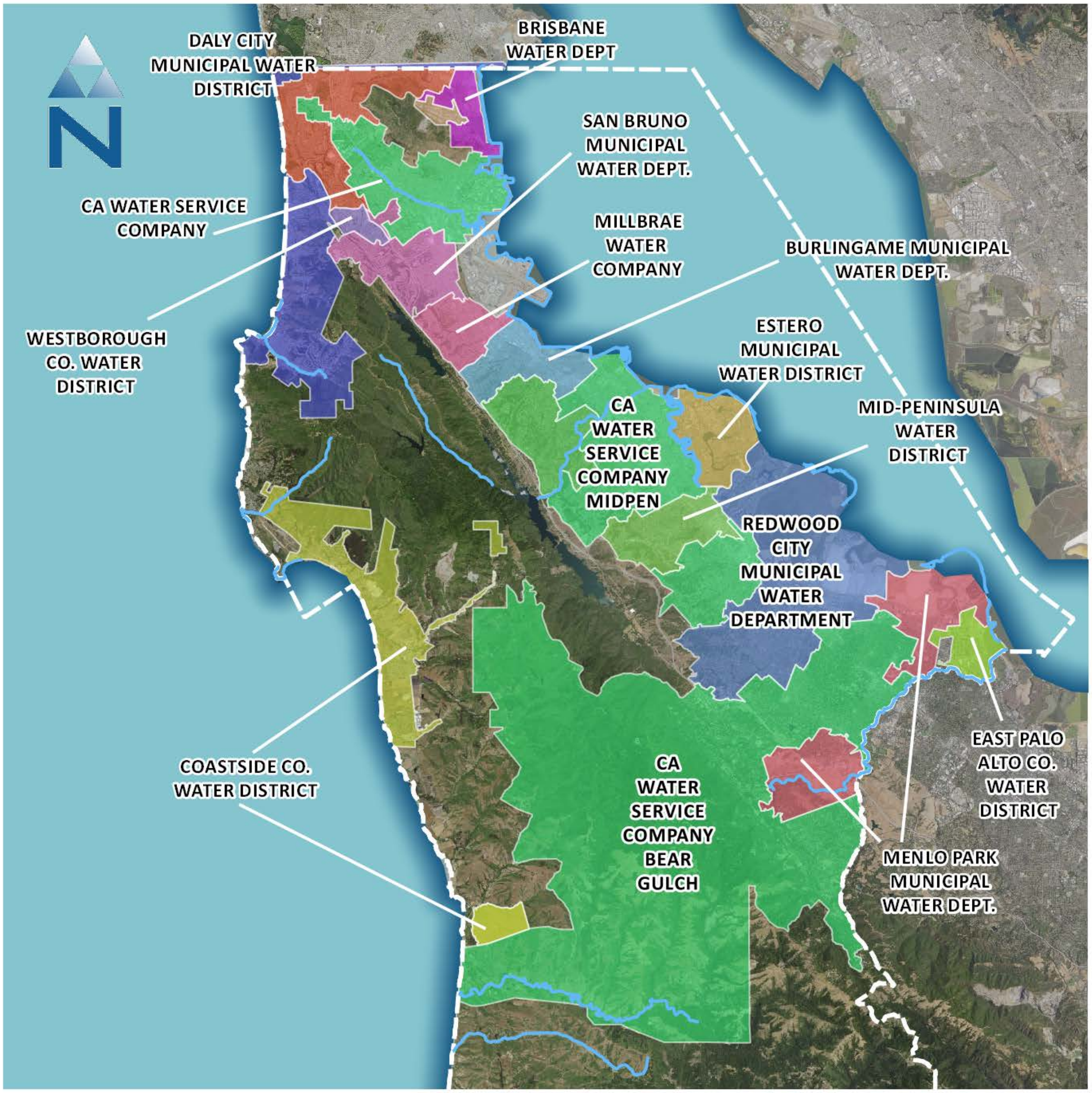

Figure 2-3. Water Districts within San Mateo County.

Twenty cities lie within San Mateo County, plus unincorporated areas, as shown in Figure 2-2. There are twenty water districts that serve the County (Figure 2-3), seventeen sewer, sanitation, sanitary, an solid waste districts (Figure 2-4), and nine groundwater basins (Figure 2-10).

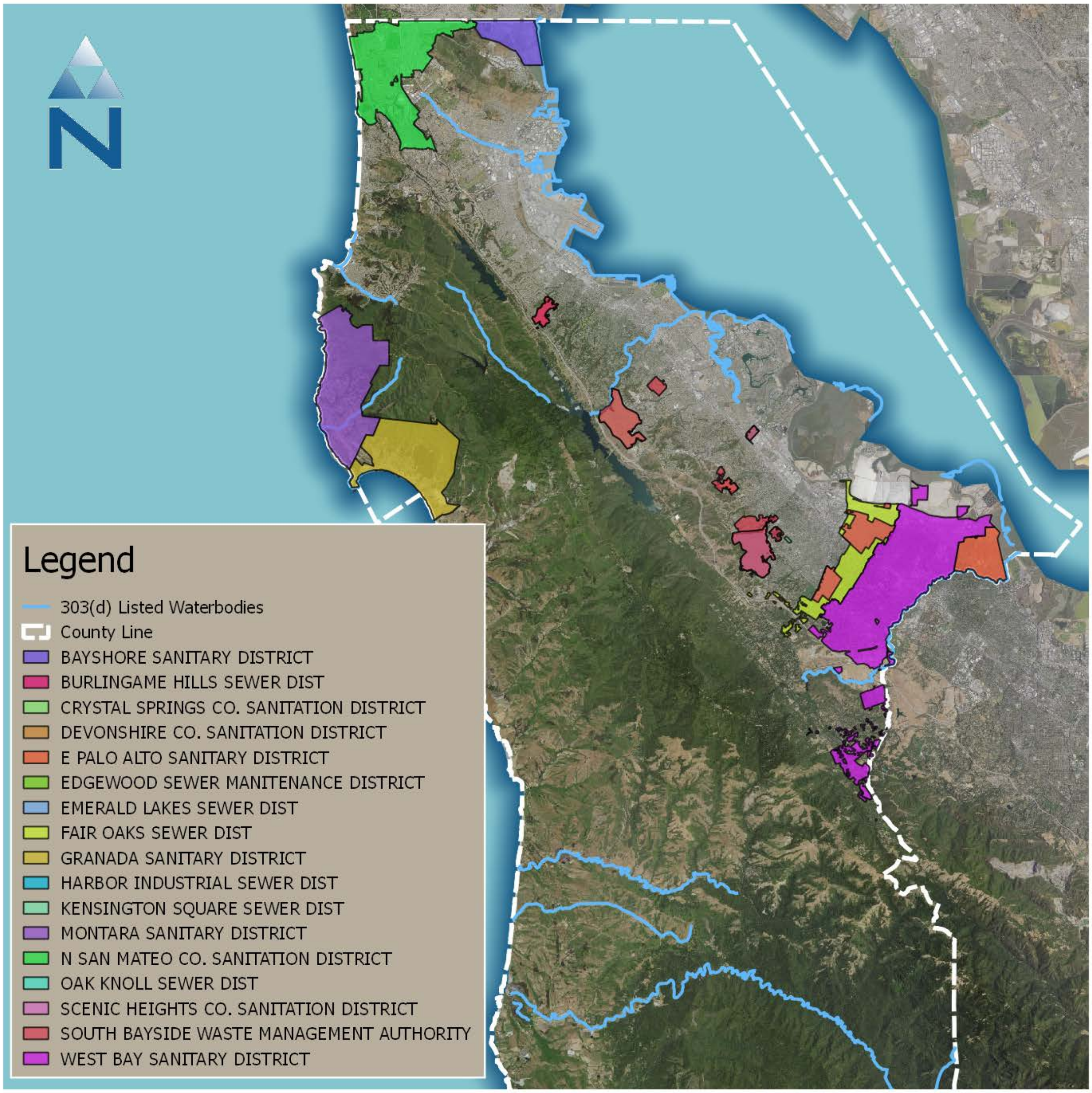

Figure 2-4. Sewer, sanitary, and sanitation districts in San Mateo County.

2. 1 Watershed and Subwatershed Boundaries

2.1.1 San Francisco Bay Watershed and Subwatershed Boundaries

The San Francisco Bay watershed includes a little less than half of San Mateo County on its inland side (Figure 2-1). The watershed was delineated from the 8 Digit Hydrologic Unit Code (HUC) Watershed Boundary Dataset from the United States Geological Survey (USGS), with modification to provide more-detailed delineation based on known hydrologic boundaries and topographic information. The watershed encompasses seven California counties, including San Mateo, San

Francisco, and Santa Clara. There are eighteen cities that fall within the overall watershed (Brisbane, Hillsborough, Redwood City, Foster City, Woodside, East Palo Alto, Belmont, San Mateo, Colma, Millbrae, Burlingame, Daly City, Atherton, Menlo Park, San Bruno, South San Francisco, San Carlos, Portola Valley, and unincorporated areas) (Figure 2-2).

This watershed is a priority for stormwater management because it contains eight 303(d) listed waterbodies, three of which are sections of San Francisco Bay and subject to TMDLs that address impairments associated with PCBs, mercury, selenium and other pollutants (SFRWQCB 2015b, 2015c, and 2016a). TMDLs or other strategies to address water quality impairments are needed for the other waterbodies, listed in Table 2-1, associated with trash, selenium, sediment toxicity, sedimentation, and bacteria, among other pollutants. The San Francisco Bay watershed contains 36 subwatersheds that provide the basis for detailed characterization of hydrology and pollutant sources, which allow project identification and prioritization for the SRP (Figure 2-5).

2.1.2 San Francisco Coastal South Watershed and Subwatershed Boundaries

San Francisco Coastal South watershed is defined by the Pacific Ocean coastline, and spans the entire coast of San Mateo County. The watershed was delineated from the 8 Digit HUC Watershed Boundary Dataset from USGS, with modification to provide more-detailed delineation based on known hydrologic boundaries and topographic information. The watershed intersects three counties, but most the watershed lies within San Mateo County, and is a little over half of the entire County area. Three cities are found within the watershed in the County: including Daly City, Pacifica, Half Moon Bay, and unincorporated areas.

This watershed is considered a priority for stormwater management because it contains twelve 303(d) listed waterbodies, three of which are subject to TMDLs that address impairments associated with bacteria and sediment (SFRWQCB 2013c). TMDLs or other approaches to address water quality impairments also are needed for the other listed waterbodies associated with mercury, sediment, and bacteria. These waterbodies (listed in Table 2-2) require a comprehensive, multi-benefit plan to reduce pollutant loads and support attainment of water quality objectives and TMDL wasteload allocations. This watershed contains 44 subwatersheds that will provide the basis for detailed numeric modeling, project conceptualization, and proposed projects for the SRP (Figure 2-6).

2. 2 Surface Water Resources

Aquatic ecosystems provide many benefits to San Mateo County. These beneficial uses are protected by the Regional Water Board which regulates pollution and water quality objectives to maintain beneficial uses for each waterbody.The following provides a summary of beneficial uses of surface water resources within each watershed addressed by the SRP, and impairments to those uses that form the basis of strategic planning efforts of the SRP.

2.2.1 Surface Waters of the San Francisco Bay Watershed

Waterbodies in the San Francisco Bay watershed support beneficial uses such as freshwater, marine and estuarine habitat, groundwater recharge, municipal and domestic water supply, estuarine habitat, industrial service supply, contact and noncontact recreation, wildlife habitat, and preservation of rare and endangered species (SFRWQCB 2009b and 2015a). Impairments of these beneficial uses exist in eight San Mateo County waterbodies from pollutants listed in Table 2-1. Water quality priorities for this watershed include PCBs, mercury, trash, sediment toxicity, and coliform bacteria, among others, and are based on TMDLs and water body pollutant combinations listed on the Clean Water Act Section 303(d) List.

Table 2-1. 303(d) listed waterbodies and their pollutants within San Francisco Bay Watershed.

Waterbody	303(d) Listing
Colma Creek	Trash
Marina Lagoon	Coliforms / pathogens, fecal indicator bacteria
San Francisco Bay, Central	PCBs, mercury, selenium, chlordane, trash, DDT, invasive exotic species, dioxin, furan compounds, dieldrin
San Francisco Bay, Lower	PCBs, mercury, selenium, chlordane, DDT, invasive exotic species, dioxin, furan compounds, dieldrin
San Francisco Bay, South	PCBs, mercury, chlordane, trash, DDT, invasive exotic species, dioxin, furan compounds, dieldrin
San Francisquito Creek	Sedimentation/siltation, trash, diazinon
San Mateo Creek	Trash, diazinon
San Mateo Creek, lower	Sediment toxicity

The impaired waterbodies listed in Table 2-1 are found within thirty-two different subwatersheds within the San Francisco Bay watershed. These subwatersheds are highlighted in Figure 2-5.

Figure 2-5. Subwatersheds within San Francisco Bay Watershed[2]

TMDLs have been developed for San Francisco Bay (central, lower, and south) for mercury, PCBs, and selenium, and San Francisco beaches (including Marina Lagoon) for bacteria. A TMDL is in development for San Francisquito Creek for sediment.

[2] All subwatersheds technically drain to impaired waters as San Francisco Bay is included on the EPA 303(d) List, therefore all subwatersheds are highlighted in yellow.

Current TMDLs in the watershed point to storm water runoff as a major contributor to impairment, which has occurred through pesticide runoff, municipal and industrial wastewater discharges, construction practices, combined sewer overflows, rural road erosion, and historical discharges (SFRWQCB 2006, SFRWQCB 2008, SFRWQCB 2009, SFRWQCB 2013b, SFRWQCB 2015a). These sources contribute to elevated levels of PCBs, heavy metals (e.g. mercury), trash, sedimentation, sediment toxicity, and indicator bacteria. For example, a few stormwater runoff studies in San Francisco Bay determined that elevated levels of PCBs are conveyed by stormwater runoff drainage systems, especially in old industrial areas (SFRWQCB 2008). According to TMDLs, stormwater flowing into San Francisco Bay contributes to elevated levels of heavy metals, specifically mercury, through historic mine runoff, wastewater discharges, urban runoff, and resuspension of historically contaminated sediments. Impacts from stormwater pollution in the watershed have also been observed in beach closures from sewage overflows, where indicator bacteria and presumably pathogens are heightened from discharges during large rain events. The entire six-mile reach of Marina Lagoon is listed as impaired for coliforms/pathogens and fecal bacteria due to sanitary sewer leaks and sewer overflows associated with stormwater, as well as urban runoff containing pet waste and litter (SFRWQCB 2013c).

Stormwater may also cause impairment from sedimentation/siltation, where erosion related to human activities leads to negative impacts on aquatic life and habitat. San Francisquito Creek, for example, experiences high sedimentation and, therefore, degradation to salmonid habitat. The creek currently supports steelhead trout, a federally-listed threatened species in California, and is therefore deemed a high-priority stream by California Department of Fish and Wildlife (SFRWQCB 2004b). As a result of these impacts, the San Francisco Bay watershed and its subwatersheds within San Mateo County require stormwater management.

2.2.2 Surface Waters of the San Francisco South Coastal Watershed

Waterbodies in the San Francisco Coastal South watershed support surface water, marine, and coastal beneficial uses such as water contact recreation, noncontact water recreation, marine habitat, shellfish harvesting, commercial and sport fishing, fish migration, preservation of rare and endangered species, domestic water supply, agricultural water supply, and groundwater recharge (SFRWQCB 2009b). Impairments of these beneficial uses exist in twelve San Mateo County waterbodies from pollutants listed in Table 2-2. Water quality priorities for this watershed include pollutants from mercury, coliform bacteria, and sedimentation/siltation, and are based on TMDLs and water body pollutant combinations listed on the Clean Water Act Section 303(d) 2012 List.

Table 2-2. 303(d) listed waterbodies and their pollutants within San Francisco Coastal South Watershed and San Mateo County.

Waterbody	303(d) Listing
Butano Creek	Sedimentation/Siltation
Fitzgerald Marine Reserve[1]	Coliform Bacteria
Pacifica State/Linda Mar Beach	Coliform Bacteria
Pescadero Creek	Sedimentation/Siltation
Pillar Point	Mercury
Pillar Point Beach	Coliform Bacteria
Pomponio Creek	Coliform Bacteria
Rockaway Beach	Coliform Bacteria
San Gregorio Creek	Coliform Bacteria, sedimentation/siltation
San Pedro Creek	Coliform Bacteria
San Vicente Creek	Coliform Bacteria, sedimentation/siltation
Venice Beach	Coliform Bacteria

[1] Fitzgerald Marine Reserve is in the process of being removed (delisted) from the Clean Water Act 303(d) list as further research indicated that it was no longer impaired.

The impaired waterbodies listed in Table 2-2 are found within twenty-three different subwatersheds within the San Francisco Coastal South watershed. These subwatersheds are highlighted in Figure 2-6 in yellow. All other subwatersheds within San Francisco Coastal South watershed are outlined in white.

Figure 2-6. Subwatersheds within San Francisco Coastal South Watershed.

Figure 2-7. Northwestern Portion of the San Francisco Coastal South Watershed.[3]

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[3] Fitzgerald Marine Reserve is in the process of being removed (delisted) from the Clean Water Act 303(d) List

Existing TMDLs, watershed management plans, and other research conducted by federal, state, and local authorities point to stormwater runoff from urbanization, erosion, and human land use practices as major factors impacting the watershed (SFRWQCB 2009a, 2013a, 2013c, and 2015b; Monterey Bay National Marine Sanctuary Foundation 2004). The majority of the County that lies within the watershed is agricultural, ranching, timber harvest, and open space to the south, but the impaired streams and beaches to the north are located in more heavily developed areas (Figure 2-11, Figure 2-6, Figure 2-7). TMDL or related plans have been developed for San Pedro Creek, Pacifica State Beach, and San Vincente Creek in the northern portion of the watershed, and for Pescadero Creek and Butano Creek in the southern reaches of the watershed (SFRWQCB 2013a). An evaluation of water quality conditions was completed in the Fitzgerald Marine Reserve and, because conditions are no longer impaired, it is in the process of being delisted from the Clean Water Act 303(d) list. As a result of the factors above, San Francisco Coastal South watershed and its subwatersheds within San Mateo County are appropriate for stormwater management.

Most of the 303(d) listed waterbodies in the northern portion of San Francisco Coastal watershed are impaired from indicator bacteria (total coliform, fecal coliform, enterococcus, and E. coli), with one waterbody impaired by mercury. In the south, sedimentation/siltation is the major cause of impairment in addition to indicator bacteria. The major sources of indicator bacteria along beaches and waterbodies in the north are from

- horse waste (and commercial horse facilities);
- dog waste;
- onsite wastewater treatment systems (OWTS);
- wildlife waste;
- and stormwater runoff;

which carries bacteria to waterbodies from these sources (SFRWQCB 2013c). In the San Vincente Creek, for example, commercial horse facilities, pet dogs, and OWTS were prioritized based on feasibility of implementation actions, and stormwater runoff was identified as the principal carrier of the bacteria (SFRWQCB 2016b). In San Pedro Creek and along Pacifica Beach, sources of bacteria include sanitary sewer leaks and overflows, horse facilities, and urban runoff containing pet waste (SFRWCB 2012).

Sedimentation in the southern portion of San Francisco Coastal watershed appears to be primarily attributed to erosion, natural geologic processes, and human land use practices (SFRWQCB 2013a and 2013b). Pescadero Creek and Butano Creek exist in areas of the watershed where excessive logging and agricultural practices occurred in the late 1800s through the 20th century resulting in road construction and clear cutting. Agricultural land is still cultivated in these areas. A TMDL is being developed for these waterbodies as well as a Habitat Enhancement Plan for their subwatershed (SFRWQCB 2013b). Sedimentation has degraded aquatic habitat in these creeks and lead to declining rare and endangered species population

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as further research indicated that it was no longer impaired.

including the steelhead trout (Figure 2-8), coho salmon, and others. The steelhead is a federally-listed threatened species in California, and the coho salmon is a State-listed endangered species (south of the Golden Gate Bridge) and a federally-listed endangered species. San Mateo Creek and San Francisquito Creek support 3.3 and 18.1 miles of Steelhead Trout habitat respectively (CEMAR 2007). San Gregorio Creek and Pescadero Creek are listed as top priority streams by National Marine Fisheries Service (NMFS) Coho recovery plan, and the risk of extinction of these fish is high in this area (NMFS 2016).

2. 3 Groundwater Resources

Groundwater resources are an important component of the hydrologic system in San Mateo County, and are represented by nine groundwater basins within the San Francisco Bay Watershed and San Francisco Coastal South Watershed. Identifying and describing groundwater resources within each watershed helps to understand overarching watershed processes and provides context for the stormwater project prioritization process. The following summarizes groundwater resources in each of the watersheds addressed by the SRP.

2.3.1 Groundwater in the San Francisco Bay Watershed

In the San Francisco Bay watershed includes four groundwater basins: Islais Valley, Visitacion Valley, Westside, and San Mateo Plain (Figure 2-10). Islais Valley is the most northern groundwater basin within the County, and only a small portion is within County lines. Groundwater levels in the basin have remained mostly stable, and most dissolved constituents meet EPA drinking water standards except for elevated nitrate and chloride concentrations (CA DWR 2004b). Visitacion Valley and Westside basins are located directly south of Islais Valley. Groundwater levels in Visitacion Valley basin have remained mostly stable, while dissolved constituents meet EPA guidelines except for high nitrate and chloride concentrations (CA DWR 2004e).

The Westside groundwater basin, , contains two main water bearing formations: the Merced Formation and the Colma Formation in the southern part of the basin. Aquifer storage coefficients are less than 100 feet in unconfined conditions, and over 100 feet in confined conditions. The basin experienced declining water levels since 1987 due to concurrent drought issues in California (Phillip et al. 2003, CA DWR 2006), though levels are currently generally stable. The shallow aquifer within the northern portion of the Westside basin is in direct contact with the ocean near the coastline and has experienced some temporary seawater intrusion due to pumping. Once dewatering ceased, the gradient reversed, and natural outward flow of freshwater to the ocean resumed. The deep aquifer in the basin extends miles offshore, and any short-duration pumping for dry year or emergency water supply would not be expected to permanently change the westward flow of the Westside basin. There is no other historical seawater intrusion despite historical data of groundwater levels below sea level near both the Pacific Ocean and San Francisco Bay. Therefore, natural hydrogeologic conditions likely act as partial barriers to inhibit flow of seawater into the basin (SFPUC 2005 and 2012). Most dissolved constituents in Westside basin meet EPA guidelines except nitrate-nitrogen concentrations, which exceed the primary maximum contaminant of 10 milligrams per liter (CA DWR 2006).

The San Mateo Plain subbasin, within the Santa Clara Valley basin located along the west side of San Francisco Bay, is the largest basin in San Mateo County. Precipitation in the basin ranges from less than 16 inches in the southeast to more than 24 inches in the southwest. Natural recharge occurs in the basin by percolation of precipitation and by infiltration of water from streams entering the valley from upland areas. Historically, groundwater resources were used for irrigation. Especially in Atherton, groundwater has been heavily pumped since the beginning of the 20th century (CA DWR 2004d). Overall, water levels have declined since the 1900s from groundwater pumpage but have generally increased since 1965 as a result of greater recharge and decreased pumpage. After 1965, surface water deliveries to the County were used to reduce demand for groundwater, and restored levels to pre-1960 conditions (Fio and Leighton 1995). Hardness averaged 471 mg/L as $CaCO_3$, well above the 180 mg/L minimum value for water to be classified as very hard (Metzger and Fio 1997). Some wells in the study contained high levels of sodium after water was used for irrigation. Nitrate-nitrogen concentrations in one well exceeded the primary maximum contaminant level set by CA Department of Health Services and the EPA (Metzger and Fio 1997, DWR 1995). Public water systems are required to test for nitrate and must report their results, therefore, water from active and standby wells is typically treated to prevent exposure to high levels of nitrate when used for drinking.

2.3.2 Groundwater in the San Francisco Coastal South Watershed

Five groundwater basins are located entirely within the San Francisco Coastal South watershed. Northern basins, Westside, and Islais Valley jointly lie within the San Francisco Bay watershed and were discussed previously. Pescadero Valley is located in southern San Mateo County along the Pacific Ocean. Pescadero Creek and Butano Creek, originating in the Santa Cruz Mountains, flow west through the basin to the Pacific. Annual precipitation in the basin ranges from 20-25 inches, and groundwater is recharged from this precipitation and from surface runoff. Wells in the basin show stable conditions of groundwater level, although depths of groundwater fluctuate, and are generally greatest in the summer and shallowest in the winter. 60% of the wells in this basin are impacted by fecal coliform, and the basin is also high in nitrates. Total suspended solids concentrations average 901 mg/L. This basin is served by the Pescadero Community Water System water agency (CA DWR 2014b).

The San Gregorio Valley groundwater basin also lies in southern San Mateo County, slightly further north than the Pescadero Valley basin. San Gregorio Creek originates in the Santa Cruz Mountains and flows west through the basin to the Pacific. The average annual precipitation ranges from 24-28 inches. Most groundwater is recharged by precipitation in the higher elevation areas. Several northwest trending faults intersect the basin and may either act as conduits or barriers to groundwater flow depending on their location and direction. Overall groundwater level trends in the basin have been stable between 1989 and 2013. The Mio-Pilocene Purisima Formation is composed of different sedimentary units and sandstone. This formation is not considered water bearing, but in some areas it may produce groundwater for domestic usage (CA DWR 2004c).

Half Moon Bay Terrace groundwater basin is located on the northern San Mateo coast. Many creeks flow through the basin to the Pacific Ocean, including San Vincente (Figure 2-9) Purisima, and Lobitos Creeks. Most precipitation occurs as rain during the winter and spring. Summer is generally dry, but regional fog helps cool the atmosphere, reduces evapotranspiration, and provides

Figure 2-9 San Vicente Creek, which flows through Half Moon Bay Terrace groundwater basin (San Mateo County)

moisture to plants. For areas of higher elevation, direct precipitation is largely responsible for groundwater recharge. For lower elevations, most recharge occurs from local streams. Overall groundwater level has been stable since 1989 when the study first began, although groundwater depths fluctuate and are greatest during the summer. This groundwater is used for the Half Moon Bay Airport and Pillar Point Marsh area, estimated at about 1,300 acre feet per year (AFY). Groundwater pumping in the Airport subbasin was estimated at 513 AFY, and average inflow was estimated at approximately 2,780 AFY which equaled average outflow. The basin is in long term hydrologic balance. Groundwater in the northern part of the Basin is high in iron and manganese, and total suspended solids values average 283 mg/l. There is no indication within the basin that sea water intrusion has developed. Water agencies present in Half Moon Bay Terrace include the Coastside County Water District and the Montara Water and Sanitary District (DWR 2014b). Half Moon Bay provides water to residences and businesses in two major areas of San Francisco Coastal watershed, and contributes about 1,300 acre feet of potable water.

The San Pedro Valley groundwater basin is also located in northern San Mateo along the Pacific Ocean. San Pedro Creek, the Middle Fork, and South Fork are the main streams that flow through the basin and into the ocean. The mean annual precipitation ranges from 24 inches in the northwest to greater than 32 inches in the southeast. The groundwater basin has wet, mild winters and cool, dry summers. There are no published data for groundwater level trends or storage, and therefore no groundwater budget. Historical data from one well in the basin show an average of 140 mg/L of total dissolved solids. The water agency for this basin is the North Coast County Water District. Westside and Islais Valley groundwater basins lie at the northern most part of the watershed within San Mateo County and cross the watershed boundary only slightly (CA DWR 2004c).

Ano Nuevo Area groundwater basin is located in the southwestern-most part of the County. The basin lies on the Pacific Ocean in a low, rocky, and windswept area. Three creeks, Ano Nuevo, Green Oaks, and Cascade flow through the basin, originating in the Santa Cruz Mountains and flowing west through the basin to the Pacific Ocean. Average annual precipitation in the subbasin is about 20 – 32 inches, increasing from west to east. There is no published research on groundwater level trends or groundwater storage data, therefore no groundwater budget information. There are no water quality data for the basin (CA DWR 2004a).

Figure 2-10. Groundwater Basins within San Mateo County Watersheds.

2. 4 Water Supply

To fully characterize watershed processes in San Mateo County and provide context for stormwater project prioritization, it is necessary to discuss water supply from groundwater and surface water in the County. Severe drought has affected the region over the last 15 years, and the variability and uncertainty of California's climate and hydrology make issues of water supply extremely important.

Historic over pumping has shifted the source of water use in San Mateo County. In 2000, about 90% of the water demand in San Mateo County was met by imported surface water (BAWUA 2001). Potable water is also supplied from private wells, local streams and rivers, and water districts. In the northern part of the San Francisco Bay watershed and the San Francisco Coastal South watershed, 23,000 acres of watershed lands are managed by the San Francisco Public Utilities Commission (SFPUC), as part of the Hetch Hetchy Regional Water System (SFPUC 2016). The Hetch Hetchy pipelines run west from Fremont north of Redwood City, northwest of San Jose, eventually meeting and travelling north along the center of San Mateo County into San Francisco County. The SFPUC serves the entire San Francisco Bay watershed, the northern part of San Francisco Coastal watershed, and along the Half Moon Bay terrace (SFPUC 2001). The water is stored in three drinking water reservoirs: Pilarcitos Reservoir (which collects runoff from the Montara Mountain watershed and San Mateo Creek runoff and is managed by Coastside County Water Districtand SFPUC), Crystal Springs, and San Andreas reservoirs (which store water from the Hetch Hetchy Regional Water System and San Mateo Creek system). These reservoirs serve over 1 million people in northern San Mateo County and lower San Francisco County (SFPUC 2016).

Water districts in San Mateo County located in the San Francisco Bay watershed include San Bruno Municipal Water Department, Redwood City Municipal Water Department, Coastside County Water District, and California Water Service Company, among others. As of 2010, 52,780 people in San Mateo County were served by public supply groundwater and 649,270 people were served by surface water as shown in Table 2-3 (USGS 2010). Nine water districts are in the San Francisco Coastal South Watershed including Coastside County Water District, East Palo Alto County Water District, Daly City Municipal Water District, and CA Water Service Company.

Table 2-3 Water use in San Mateo County as of 2010 (USGS 2010).

	Groundwater	Surface Water
People served	52,780	649,270
Public supply self-supplied (millions of gallons/ day)	5.8	77.6
Agriculture (millions of gallons/day)	4.83	3.22[1]

[1]Agricultural usage from groundwater and surface water totals 6,260 acres.

2. 5 Land Use

San Francisco Bay watershed consists of industrial and residential land uses, especially along the Bay (Figure 2-11). San Francisco Coastal South watershed contains a mix of land uses, with a few areas of developed land (residential and commercial) to the north and along the northern coastline, as well as large areas agricultural (both crop & recreational use) and open space to the south (Figure 2-11). Figure 2-11 depicts land use by parcel using a parcel dataset from the San Mateo County Recorder's Office.

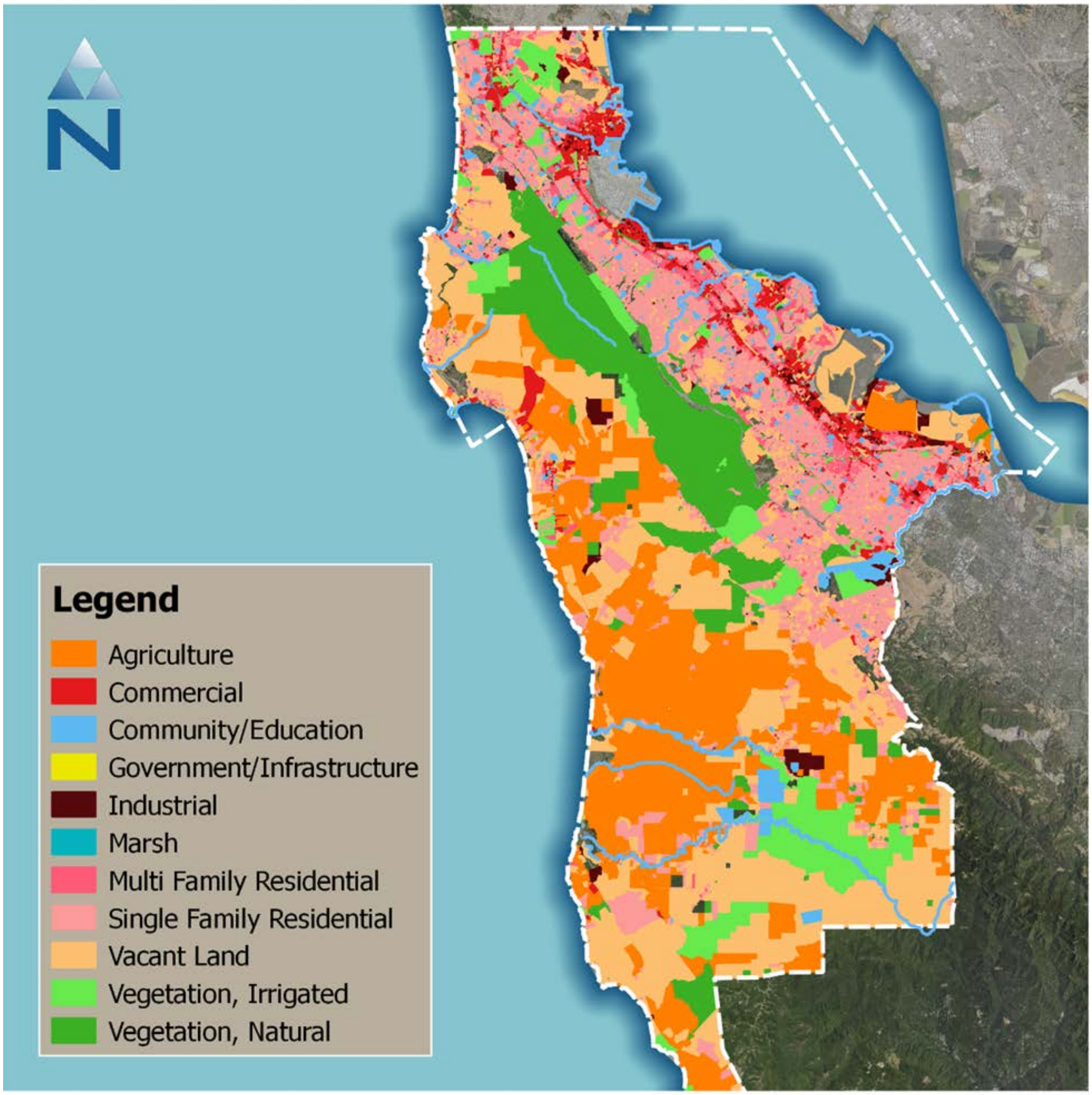


Figure 2-11. Land use within San Mateo County.

2. 6 Native Habitats

San Mateo County contains a diversity of habitats, ranging from aquatic habitat to coastal bluff and ranch lands. These areas are managed by the State of California, SFPUC, National Park Service (NPS), Midpeninsula Regional Open Space District, Stanford University, and San Mateo County. Native habitats within the County are described within a subset of 22 County parks, which outline the major habitats and species in the region (San Mateo County Parks 2002). Several habitats within County parks are rare in California including coastal salt marsh, serpentine bunchgrass grassland, coastal prairie, and maritime chaparral. Other habitats include marine, estuarine, oak woodland, oak savannah, and redwood forest. These parks also provide habitat for rare species, including nine federally listed endangered and eight federally listed threatened plants and animals. These species include the San Francisco garter snake, the California tiger salamander, the California red-legged frog, the San Bruno elfin butterfly, Hickman's potentilla, white-rayed pentachaeta, San Mateo woolly sunflower, Marin dwarf flax, and the San Mateo thornmint. Coastal creeks are also inhabited by threatened steelhead trout and endangered coho salmon. The following summarize unique habitats in each of the watersheds addressed by the SRP.

2.6.1 Native Habitats in the San Francisco Bay Watershed

San Bruno Mountain State and County Parks host a number of rare animals and three endangered butterfly species. Coastal shrub, coastal prairie, and needle grassland cover most of the mountain while oak, woodland, riparian shrub, dune scrub, maritime chaparral, and wetland communities are also present. The spread of invasive species remains the greatest threat to San Bruno.

Junipero Serra Park is set in the bayside foothills of the Santa Cruz Mountains and holds over 100 acres of oak woodland, grassland, arroyo willow riparian, and coyote brush scrub. Oaks are nearly a closed canopy with diverse understory, and the park serves as a wildlife corridor for deer, bobcat, and coyote. The park is threatened by introduced species such as Monterey pine, Monterey cypress, and blue gum eucalyptus, among others.

Crystal Springs Park extends along Crystal Springs and San Andreas Lakes off of Highway 280. The Crystal Springs watershed surrounding the trail is recognized as a wildlife refuge and is considered a biosphere reserve. The park is dominated by oak woodland, evergreen forest, grassland, riparian forest, and coastal shrub. Jepson Laurel is one of the most famous landmarks along the trail and three rare species live in the park. Coyote Point Recreation Area contains vegetation that has been highly altered by urbanization: the area used to be a salt marsh but is now on compacted fill soil. The greatest threat to the salt marsh is smooth cord grass, an intertidal species.

Edgewood Preserve contains undeveloped preserve lands that primarily contain oak woodland, chaparral, scrub and grassland, and some non-native plants. Finally, Flood Park is another open space that contains coast live oaks and valley oaks, as well as California bays. This is a recreational park, and therefore contains various facilities that provide amenities to those who visit.

2.6.2 Native Habitats in the San Francisco Coastal South Watershed

San Pedro Park is about 1,250 acres, of which 433 acres are leased from the North Coast Country Water District. It is located in the foothills of Pacifica, in the northern coastal portion of northern San Mateo, and also spans the northern portion of the Santa Cruz Mountains and abuts other open space lands. Park lands were historically utilized by Native Americans, then mission and European settlers for farming. The South Fork and San Pedro Creek were used recently for a trout farm, and the valley was used for grazing and commercial fishing. The park provides passive recreational uses including picnicking and hiking, some biking, and also spawning areas for migratory steelhead. The majority of land is undeveloped and supports nine principal plant community types, primary vegetation types are riparian woodland, coast like oak woodland, maritime chaparral, coastal scrub, and eucalyptus tree groves, among others. Some areas within the park show past disturbance from non-native plants. Non-native and understory plants are blue gum eucalyptus and Monterey pine which have altered portions of the valley and hillside, also contains non-native shrubs including some considered invasive (Cape ivy, periwinkle, French broom, pampas grass). In addition to non-native plants, the park also contains sensitive habitats and rare species: Montara manzanita, heart-leaved manzanita (two evergreen shrubs).

Fitzgerald Marine Reserve is an Area of Special Biological Significance (ASBS). The Reserve spans 402 acres and extends south near Pillar Point in the Half Moon Bay area of San Mateo County. The majority of the area is intertidal, and abuts residential land uses in the north, as well as undeveloped and open space to the south. It contains the western most portion of San Vincente Creek and the majority of Pillar Point Marsh. The preserve provides passive recreational uses such as picnicking, surf access, and hiking. Most of the preserve land is undeveloped, and the terrestrial portion of the preserve provides seven principal plant communities such as willow riparian woodland, coastal scrub, coastal bluff scrub, coastal salt marsh, and coastal terrace prairie. Historic residential uses of the reserve have resulted in planting non-native trees and understory plants, most commonly Monterey cypress. Other dominant invasive species are Cape ivy, poison hemlock, sea fig, pampas grass, and periwinkle. The reserve has considerable biodiversity and supports plant communities that are sensitive (riparian woodlands along watercourses, coastal salt marsh, coastal terrace prairie, and freshwater marsh).

Pescadero Creek County Park is located in southern San Mateo County about nine miles from Pebble State Beach in northern Santa Cruz Mountains within the coastal fog zone. It is an 8,020-acre park complex with recreational activities for visitors including hiking, camping, horseback riding, and some biking. Redwood forest dominates the majority of the park, but there is also mixed evergreen, live oak woodland, chaparral, and grassland. The federally endangered steelhead and coho salmon. The federally threatened California red-legged frog and marbled murrelet are also found in the park. The greatest threat to the park is logging, and much of Pescadero Creek Park has been logged for redwood and Douglas fir.

2. 7 Watershed Processes

In order to comprehensively evaluate watershed processes and support the prioritization of potential stormwater and dry weather runoff capture projects, it was necessary to develop spatial representation of elements that most affect hydrology and pollutant transport. Natural hydrology is most affected by physical characteristics such as soil type, infiltration rate, and land segment slope. Urban hydrology, alternatively, may be more affected by impervious cover, urban irrigation, and artificial drainage networks. These essential characteristics were combined into a single representation of the landscape termed Hydrologic Response Units (HRUs). The combination of impervious cover, hydrologic soil group, slope, and land use were used to define a set of HRUs for project identification and prioritization. Table 2-4 summarizes the four components of the HRUs and the source datasets used to derive each. Maps showing the spatial distribution of two of the primary HRU components are presented in previous sections: Figure 2-11 as land use of all San Mateo County, Figure 2-13 as impervious cover in San Francisco Bay watershed. Maps of hydrologic soil groups and percent slope for San Francisco Bay watershed are shown in Figure 2-14 and Figure 2-15, respectively.

Table 2-4. Summary of HRU components and source data sets.

Characteristic	Data Source	Approximate Source Date
Land Use	San Mateo County Assessor's Office Parcels	2014
Impervious Cover	National Land Cover Dataset (NLCD)	2011
Hydrologic Soil Group	National Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO)	2016[1]
Percent Slope	Derived from San Mateo County LiDAR Digital Elevation Model (DEM)	2010

[1] NRCS SSURGO dataset was downloaded in March 2016

Precipitation data for San Mateo County was obtained from the Global Historic Climatology Network (GHCN) daily gauge network, and the resulting dataset is presented in Table 2-5 and spatially represented in Figure 2-12. Average 24-hour rainfall ranges from 0.45 inches (80th percentile) to 1.10 inches (95th percentile) in San Mateo County. In other words, 80% of all rainfall events produced 0.45 inches or less of rainfall, and 95% of all rainfall events produced 1.10 inches or less (Table 2-5). Flows in the area are highly seasonal due to precipitation patterns, and more than 90% of annual runoff occurs during the rainy season between October and April (SFRWQCB 2015b). Additional rainfall analysis has been performed through the regional precipitation-frequency study for San Mateo County (in addition to Santa Clara and Alameda Counties), which also compared results to NOAA Atlas 14 (Santa Clara Valley Water District 2016). In the future, these rainfall projections from GHCN and precipitation-frequency analyses will be useful to help predict future precipitation patterns and assess climate change scenarios through a multidisciplinary approach. Future work to evaluate rainfall and climate change is recommended.

Table 2-5. Summary statistics of percentile rainfall values around the 85th percentile, 24-hour depth, for San Mateo County.

Percentile	24-hour Rainfall (inches)			
	Minimum	Median	Maximum	Average
80th	0.23	0.38	0.93	0.45
85th	0.29	0.49	1.20	0.57
90th	0.38	0.64	1.62	0.76
95th	0.54	0.92	2.45	1.10

An analysis was performed to assess the spatial distribution of rainfall in the watersheds based on data from the GHCN stations (Figure 2-12). Rainfall data was processed and 85th percentile storms were calculated for each GHCN station in the watershed and distributed based on assessment of rainfall patterns, elevation, and other factors. The 85th percentile storm was used to normalize data for assessment of spatial distribution of rainfall across the area. As anticipated, areas of higher elevation generally receive more rainfall due to changes in pressure and temperature, as do areas further west from the Bay.

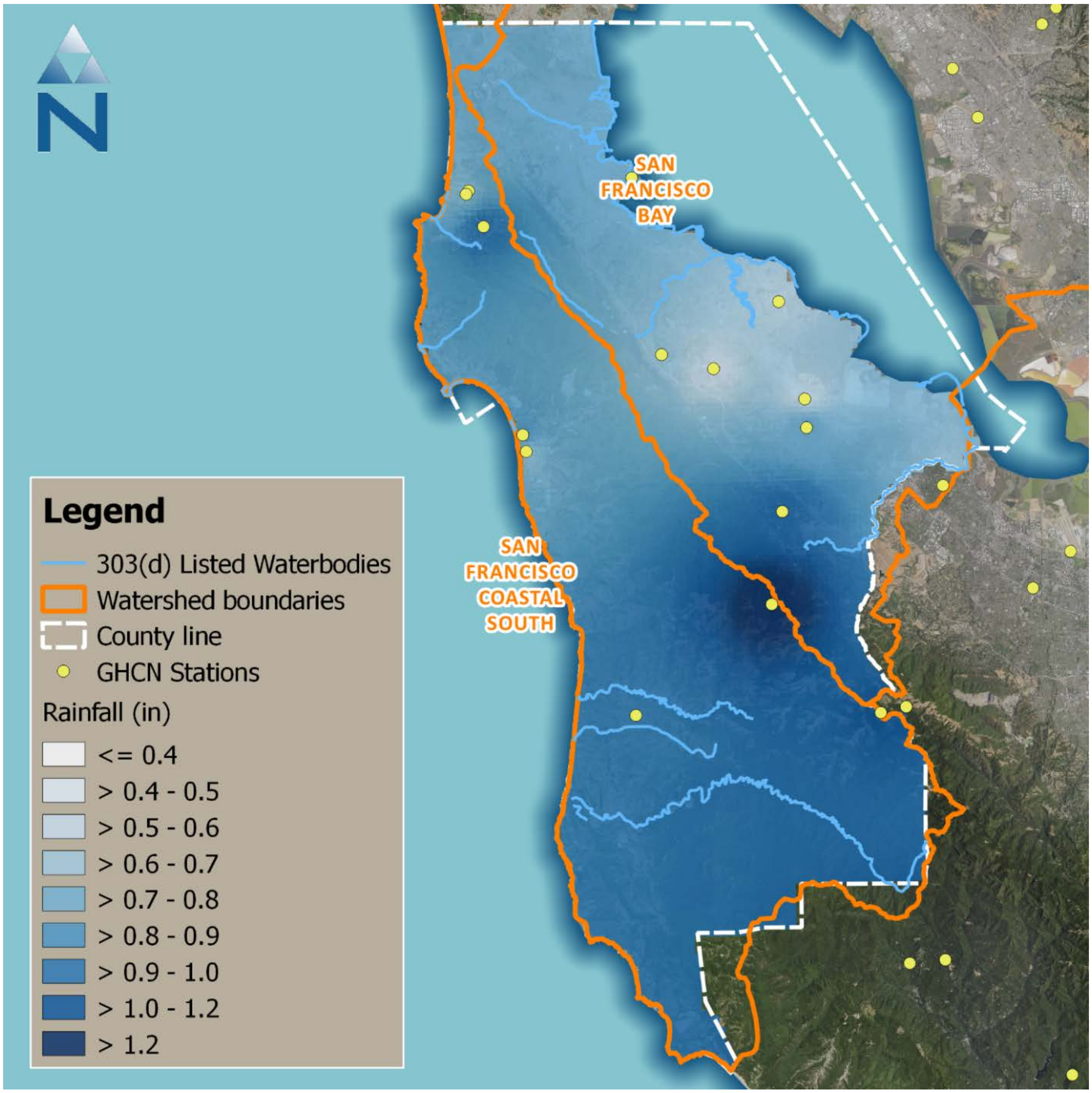


Figure 2-12. Spatial Distribution of the 85th Percentile 24-hour Storm for San Mateo County Watersheds.

2.7.1 Hydrologic Response Units

In the San Francisco Bay Watershed, the Bay side receives less rainfall, and the southern portion of the watershed further inland near the Santa Cruz Mountains receives the greatest amount of rainfall. The station near Black Mountain in the Santa Cruz Mountains received the highest amount of rainfall. In the San Francisco Coastal South Watershed, GHCND stations that collected rainfall directly on the west coast received less rain, and the southern portion of the watershed further inland received the greatest amount.

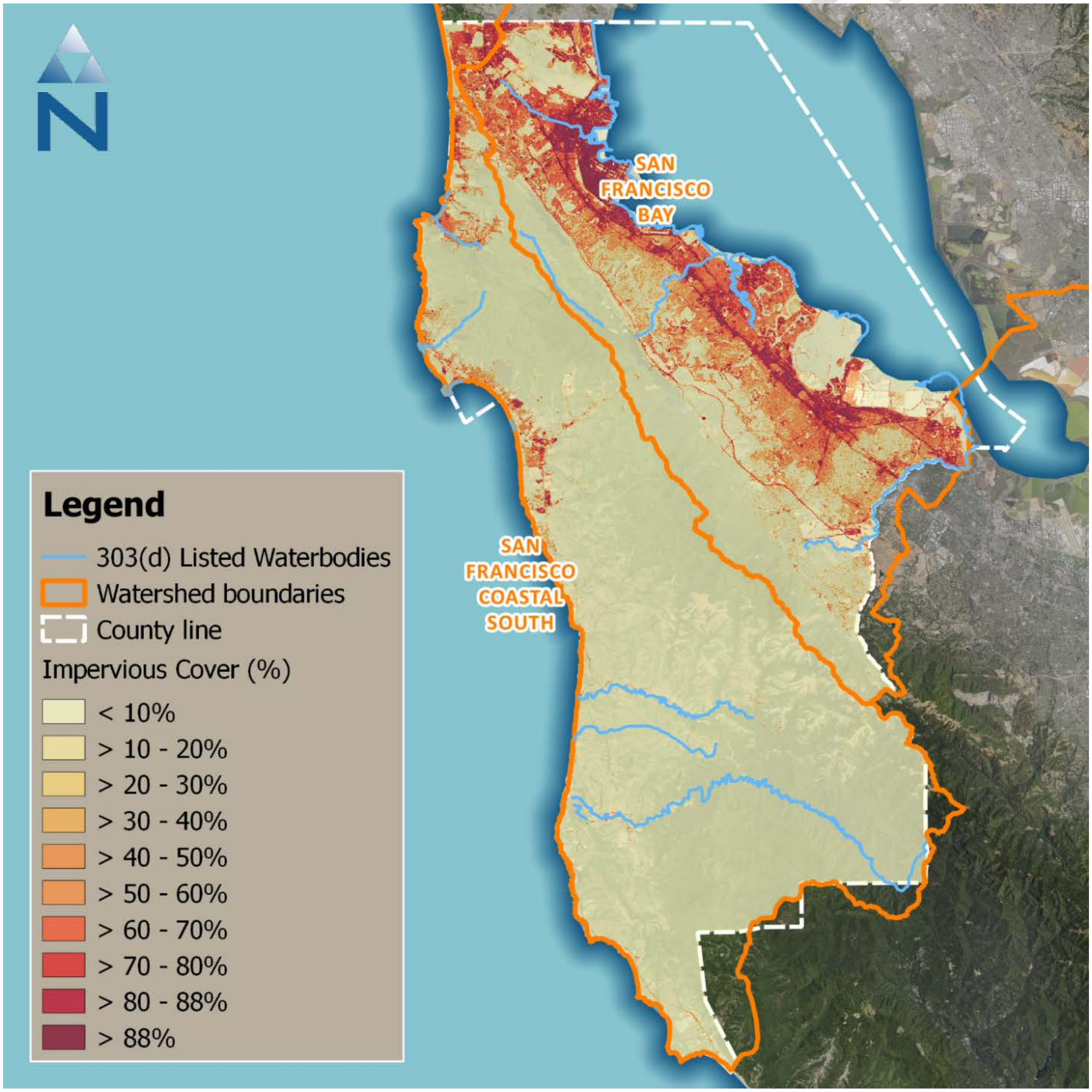


Figure 2-13. Impervious Cover in San Mateo County Watersheds.

Areas along the Bay within the San Francisco Bay watershed contain the greatest levels of impervious cover in the County. Imperviousness is greater than 88% in some areas where land use is primarily industrial and commercial. San Francisco Coastal South watershed, overall, contains less impervious cover compared with the San Francisco Bay watershed. The northernmost part of the watershed and along the coastline have the highest proportions of impervious area, while most of the southern reaches of the watershed are less than 10% impervious. Greater areas of impervious cover limit infiltration of rainfall into the groundwater table, create higher surface runoff volumes, increase flooding, and is correlated with pollution from trash and sedimentation.

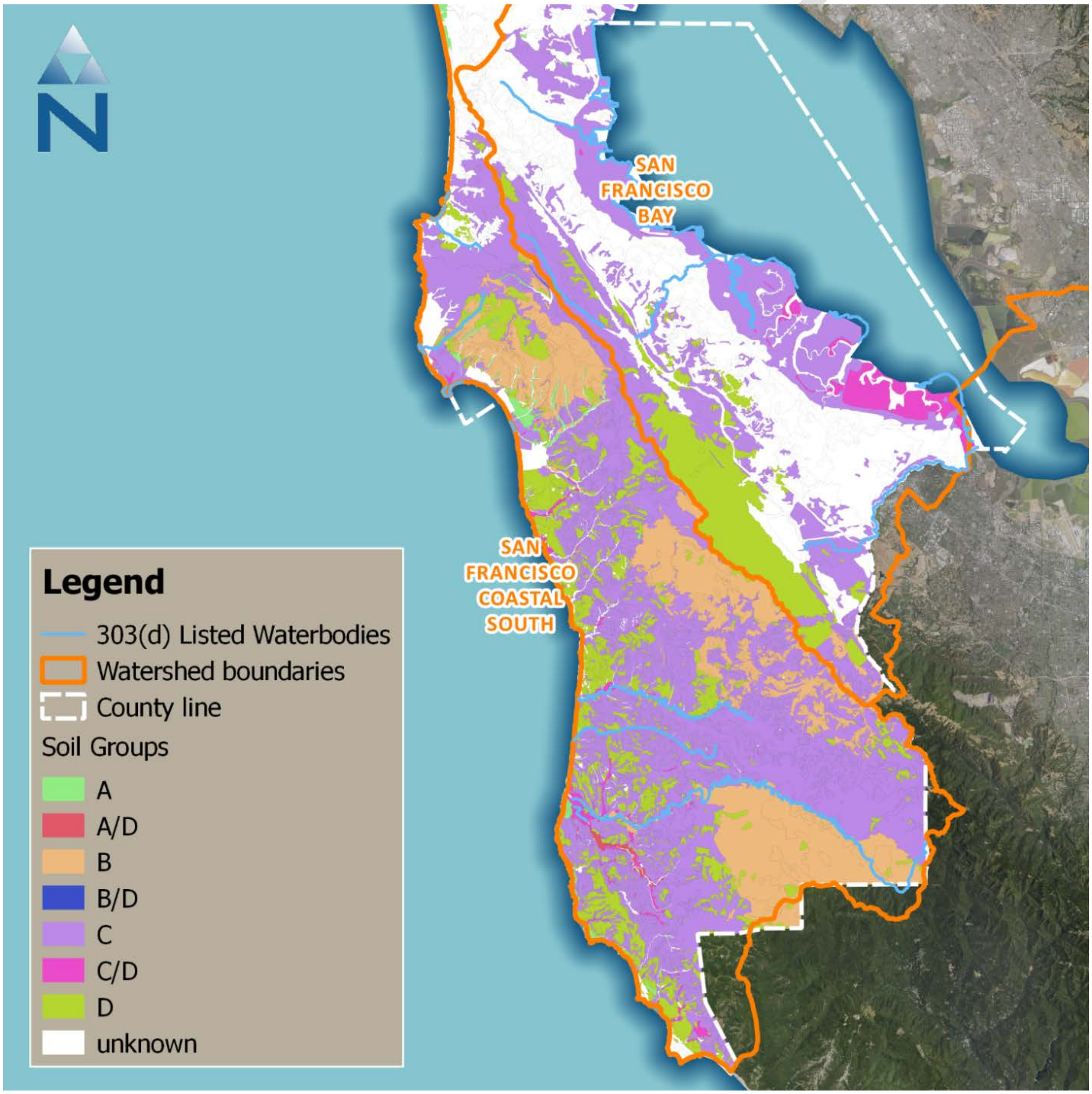


Figure 2-14. Hydrologic Soil Groups in San Mateo County Watersheds.

Much of the San Francisco Bay watershed in San Mateo County contains unknown soil groups, especially along the center of the watershed. The majority of native soils along the Bay are hydrologic soil group C and C/D, which have moderately high runoff potential to high runoff potential. A large portion of land along the Santa Cruz Mountain Range in the south western portion of the watershed contains soils in group D. These soils have high runoff potential and typically contain over 40% clay materials, making it difficult for water to infiltrate the soil (US DOA 2007). It is also likely that this area has exposed rock faces and an exposed ridgeline that cause higher runoff volumes. Hydrologic soil groups in the San Francisco Coastal South watershed are mostly groups B and C, and therefore, soil ranges from moderately low runoff potential when wet to moderately high runoff potential. Areas along the coast and in city centers with soil group D have high runoff potential and generally have greater than 40% clay composition, which is harder for water to infiltrate (US DOA 2007).

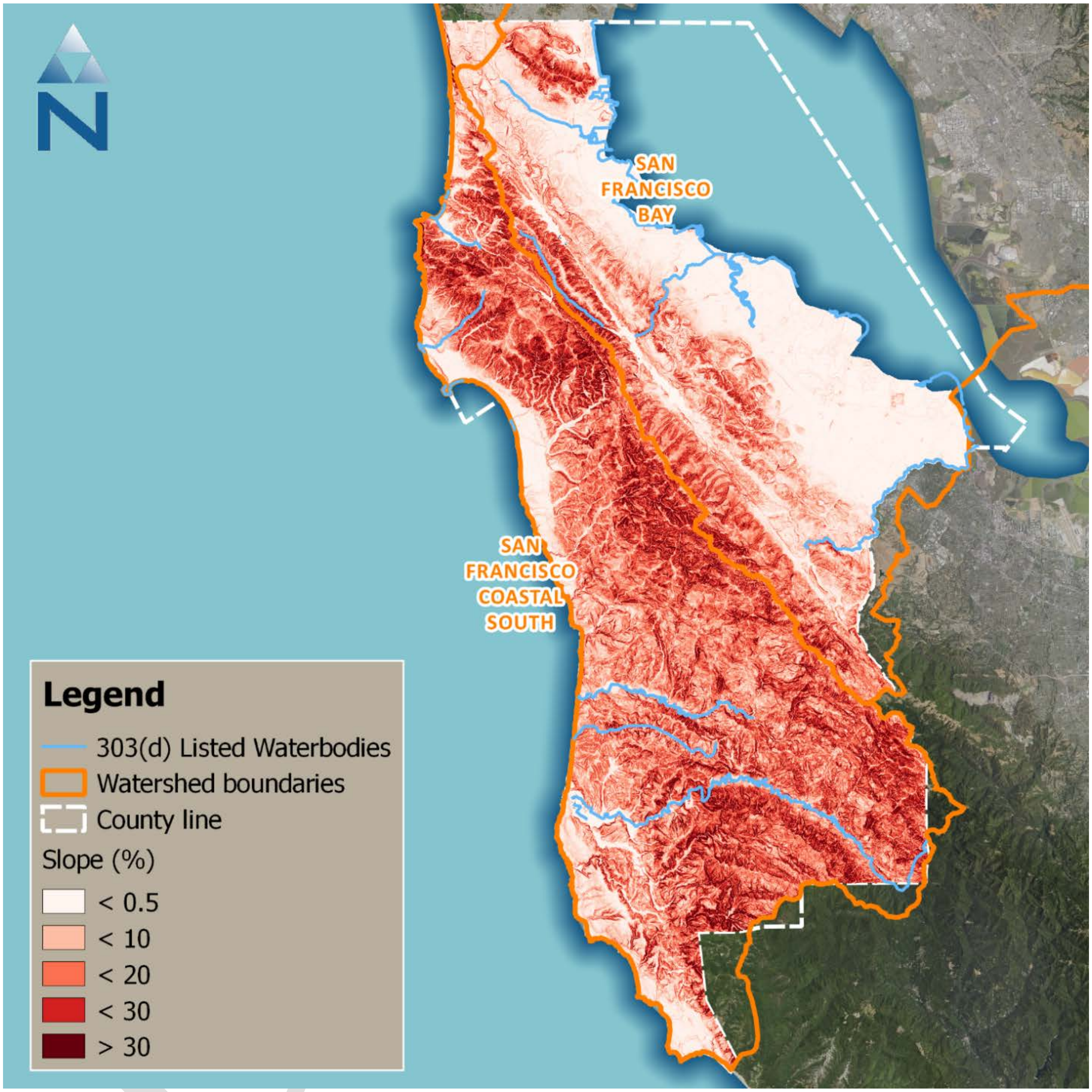


Figure 2-15. Slope percentages in San Mateo County Watersheds.

Slope percentages are high along the western portion of the San Francisco Bay watershed in the Santa Cruz Mountains (20% to over 30%), where higher runoff is generated. The San Francisco Coastal South watershed is defined by large slopes from the Santa Cruz mountains on the eastern side of the watershed which decrease toward the coastline. Higher slope generally indicates higher runoff potential.

The discussion above provides an overview of Countywide hydrologic and land characteristics that impact processes within the two watersheds. The Countywide Program has also performed several additional investigations within individual subwatersheds of the San Francisco Bay and San

Francisco Coastal South watersheds that have provided significant insight into site-specific process that impact the individual creeks (Section 1.3). An example study is provided in Appendix A, which resulted in a detailed assessment of multiple individual creeks throughout each watershed (SMCWPPP 2002). The Countywide Program has since performed several additional investigations that have characterized processes on a subwatershed level (SMCWPPP 2004, 2005, 2007a, 2008, and 2015). Considering both the Countywide and individual subwatershed assessments, the following sections further discuss unique characteristics within each watershed that describe or impact watershed processes.

2.7.2 Processes Specific to the San Francisco Bay Watershed

The northern portion of the Central Valley contains the major sources of freshwater for the San Francisco Bay – Delta system. This freshwater mixes with the saline waters of the Pacific Ocean to form the largest estuary on the West Coast, the San Francisco Bay Estuary (Bay). While the majority of freshwater enters the San Francisco Bay system by the Sacramento and San Joaquin rivers, small streams within San Mateo County also contribute freshwater into the Bay. Much of the freshwater inflow has been redistributed for agriculture, industry, and increasing populations throughout the County which has significantly altered natural watershed processes (Fox, et al. 2015). Under natural conditions, watershed processes would involve periodic overflows of rivers into natural flood basins and large stand wetlands leading into the Bay. Riparian forests still in existence allow rainfall to percolate into the ground and slowly feed rivers and streams and add to the groundwater table.

There are various sources of recharge in San Francisco Bay watershed which differ within each groundwater basin. The San Mateo Plain subbasin within Santa Clara Valley Basin is comprised of alluvial fan deposits formed by tributaries that drain to San Francisco Bay. There are two major water bearing formations within the basin: the Santa Clara Formation and the Quaternary Alluvium. The Quaternary alluvium provides all larger wells with their water, and within this formation, stream channels are typically confined within natural levees. Natural recharge occurs through both percolation from precipitation events and natural seepage through local creeks and streams. These streams have changed course over time, especially closer to San Francisco Bay, where runoff, industry, and urbanization has allowed gravel, sand, and clay layers to infiltrate the streams. Groundwater levels in the Santa Clara Valley basin and the San Mateo Plain subbasin have declined since the early 1900s through the mid-1960s due to groundwater pumpage, but levels have generally increased since 1965 (CA DWR 2004d). Most of the wells in the San Mateo Plain subbasin draw water from deeper confined and semi-confined aquifers (Fio and Leighton 1995). Recharge into the Westside groundwater basin, which spans the center of the watershed, has historically been from spring discharge from shallow aquifers, local runoff, and precipitation (San Francisco City and County WISP Water Supply and System Operations, 2005). Pumping in the Westside basin primarily occurs from municipal pumping for various types of irrigation (managed by Daly City, San Bruno, City of Burlingame and Cal Water) as well as local wells. Other major Westside groundwater users are Golf Clubs and Cemeteries in Daly City, Colma, and San Bruno. In the Islais groundwater basin, recharge sources include infiltration of rainfall, irrigation return flows, and leakage from water and sewer pipes (CA DWR 2006).

Urban development has had the greatest impact on natural watershed processes. Most of the San Francisco Bay watershed within San Mateo County consists of commercial and residential land uses, therefore, urban sprawl and high levels of imperviousness limit the process of infiltration to the groundwater table. Figure 2-13 depicts impervious surface cover within the San Francisco Bay watershed. Higher levels of imperviousness exist along San Francisco Bay, with percentages as high as 88% impervious. Increasing levels of impervious cover create higher surface runoff flows and volumes, which flood waterbodies instead of feeding streams and rivers gradually. Higher runoff also increases erosion and sedimentation, which may damage aquatic habitat, block passage of water, sorb toxic metals and other contaminants, and limit infiltration. Beneficial uses are further impaired by trash pileup from surface water runoff that contaminates waterbodies and negatively impacts ecosystem life. In addition, creek banks subject to erosion caused by increases flows and volumes are often modified by humans to reduce erosion (e.g., channel armoring with rip-rap), causing additional impacts to aquatic habitat and often leading to downstream erosion problems. Urbanization also impairs water quality, as surface runoff carries pollutants such as pesticides, pet waste, trash, and other elements into local waterways. Natural recharge is altered in the San Francisco Bay watershed by increased populations and over pumping. While over pumping has been limited due to recent regulations and drought in California, groundwater is still used to some extent for human consumption, irrigation, and industrial uses.

2.7.3 Processes Specific to the San Francisco Coastal South Watershed

Freshwater creeks in the San Francisco Coastal South watershed originate in the Santa Cruz mountains, where precipitation in the County is highest, and flow west through groundwater basins to the Pacific Ocean. The northern portion of the watershed is characterized by more developed land (Figure 2-11), while the central portion is characterized by valleys along the coast and marine terraces (Fio and Leighton 1995). Further south, there are areas of exposed bedrock, and land used for agriculture and traditionally for logging. Freshwater and groundwater in the region has been used for agriculture, industry, and residential use (especially in the northern portion of the watershed) which has significantly altered natural watershed processes (Fox, et al. 2015).

Urbanization, agriculture, and deforestation are the greatest threats to natural watershed processes. The northern reaches of San Francisco Coastal South watershed within San Mateo County is commercial and residential, therefore, urban sprawl and high levels of imperviousness limit the process of infiltration to the groundwater table. Figure 2-13 depicts impervious surface cover within the San Francisco Coastal South watershed. Higher levels of imperviousness exist in Daly City and Pacifica. Imperviousness tends to surround 303(d) listed waterbodies to the north and beaches along the coast, contributing to their impairment, with percentages over 70% impervious. Increasing levels of impervious cover create higher surface runoff volumes, which flood waterbodies instead of feeding streams and rivers gradually. Higher runoff also increases sedimentation, which may block passage of water, sorb toxic metals and other contaminants, and limit infiltration. Urban runoff also contributes to bacterial loading where pet waste and human fecal material from sewage overflows contaminate beaches and waterways.

Agricultural activities in the southern reaches of the San Francisco Coastal watershed began in the mid 1800's, and associated hydrological modifications occurred in the 1880s and 1890s including water diversions in the uplands, channelization, and removal of woody debris and riparian vegetation (SFRWQCB 2013a, SFRWQCB 2013b). Timbering practices began around the same time, and 19th century logging was intensive during the late 1800s and early 1900s. In Pescadero Creek, now a 303(d) listed waterbody for sedimentation, it was common practice to float timber logs along the waterway. Overfishing of aquatic species and deforestation along these creeks have altered natural watershed processes, and impacted the natural riparian corridor. These actions have caused increased erosion and accumulation of sediment (SFRWQCB 2013a, SFRWQCB 2013b). Deforestation has also limited the ability for rainwater to percolate into the groundwater table slowly, causing flashier entrance of water into local waterbodies. The naturally steep sloping terrain in the southern subwatersheds adds to erosion and sedimentation issues in Pescadero Creek and Butano Creek, among others. Agricultural practices also require large quantities of water, which put pressure on groundwater resources in the southern portion of the watershed.

2. 8 Water Quality Compliance

Section 2.2 identified a number of impairments to beneficial uses of waters of San Mateo County that are associated with key pollutants of concern. The following sections discuss the activities that contribute to the pollution of stormwater and dry weather runoff relevant to these impairments, and compliance requirements associated with TMDLs and the applicable national pollutant discharge elimination system (NPDES) permit that addresses stormwater runoff.

2.8.1 Contributors to Pollution

There are various activities that generate or contribute to pollution in stormwater or dry weather runoff and cause impairments to the beneficial uses discussed in Section 2.2. The following discusses key pollutants of concern that have resulted in impairments of waters impacted by stormwater and dry weather runoff from San Mateo County watersheds.

PCBs

Sources of PCBs in San Francisco Bay come from historical releases, external sources, and internal sources. PCBs exist in the water column within the Bay and, in much greater quantities, in bottom sediments. Bottom sediments are the largest environmental reservoir of PCBs in the Bay, and the processes of deposition of suspended sediments and re-suspension of bottom sediments control the mass of PCBs in this waterbody. The potential for sediments to be suspended and supply PCBs to the water column is significant, as well as the ability for sediment to supply PCBs directly to biota. Large quantities of PCBs come from historic releases into the bay from industrial practices and have also been found in some stormwater conveyance systems. Several case studies from urban and non-urban stormwater runoff research found statistically greater levels of PCBs in industrial, commercial, and residential areas, and additional studies identified elevated levels of PCBs in the public right-of-way and storm drain sediments (SFRWQCB 2008). Specific sources of PCBs in stormwater include transformers or capacitors (with leaking hydraulic fluids), lubricants, plasticizers, building materials, and pesticide extenders. External sources of PCBs to the Bay include direct atmospheric deposition, transport from the Central Valley watershed (specifically the Sacramento and San Joaquin Rivers), municipal and industrial wastewater discharges, and runoff to local tributaries. Within the San Francisco Bay, the active sediment layer (top 15 cm) contains high concentrations of PCBs. In addition, between 2001 and 2005, an annual average of 1.8 million cubic yards per year of dredged sediments containing PCBs were disposed of at in-Bay disposal sites. PCBs are found mostly in the central and southern portion of the Bay, generally in or near areas associated with these historical industrial activities (SFRWQCB 2008).

C/CAG, via its Countywide Program, has performed investigations to identity potential areas where sources of PCBs may be of particular risk. The PCBs risk areas were identified by assessing parcel data and spatial data for a number of risk-factors. Risk-factors were determined through examination of aerial imagery, search of online state and regional databases, and geographic information on previous and current land uses. Parcels within the county were surveyed to identify the number of risk-factors observed for each parcel from a list of 17 risk-factors. The surveyed risk-factors are listed below:

- Land use pre-1980
- Current land use
- Historical or current business type
- Included in online cleanup site trackers, such as Geotracker or Envirostor
- SWRCB Industrial Permitted Facility
- Redevelopment status since 1980
- Violations/citations previously issued by permittee
- Equipment/material seen in aerial imagery on property
- Pavement extent
- Pavement condition via aerial photography
- Stormwater treatment facility present onsite
- Comments on stormwater treatment
- Evidence of heavy or electrical equipment outdoors
- Evidence of sediment transport offsite
- Evidence of outdoor hazardous waste storage (tanks, drums, scrap materials)
- General cleanliness of property
- C/CAG member agency comments/notes

The PCBs risk areas were organized into seven interest categories, representing the likelihood of the parcel being polluted with pollutants of concern. These categories are defined based on the number of risk-factors observed for each parcel. Future monitoring of these sites, such as PCB sediment sampling, will allow for the PCB risk areas to be re-evaluated and for the SRP to be updated accordingly. The interest categories are defined in Table 2-6. Further verification of the PCB areas is required, so the sub-categories were grouped into two larger categories for use in the prioritization process. Parcels that were identified as PCB risk areas are shown in Figure 2-16.

Table 2-6. PCB Risk Levels

Interest Category	Interest Sub-Category	Description
High	High - High	Parcel has the highest risk for elevated pollutant of concern (POC) concentrations, with either a history of PCB pollution or more than 4 risk-factors
	High - Moderate	Parcel has a high risk for elevated POC concentrations, with 2-4 risk-factors (usually unpaved areas and "poor" housekeeping)
	High - Low	Parcel has a relatively high risk for elevated POC concentrations, with at least one risk-factor.
	Redeveloped - High	Parcel has signs of redevelopment based on aerial analysis but is still a high risk for elevated POC concentrations based on risk-factors

Low	**Moderate**	Parcel has zero risk-factors associated with elevated POC concentrations or sediment runoff (fully paved, good housekeeping, etc)
	Redeveloped - Moderate	Parcel is redeveloped and has no more than one minor risk-factor
	Redeveloped - Low	Parcel is redeveloped and has zero risk-factor associated with elevated POC concentrations or sediment runoff

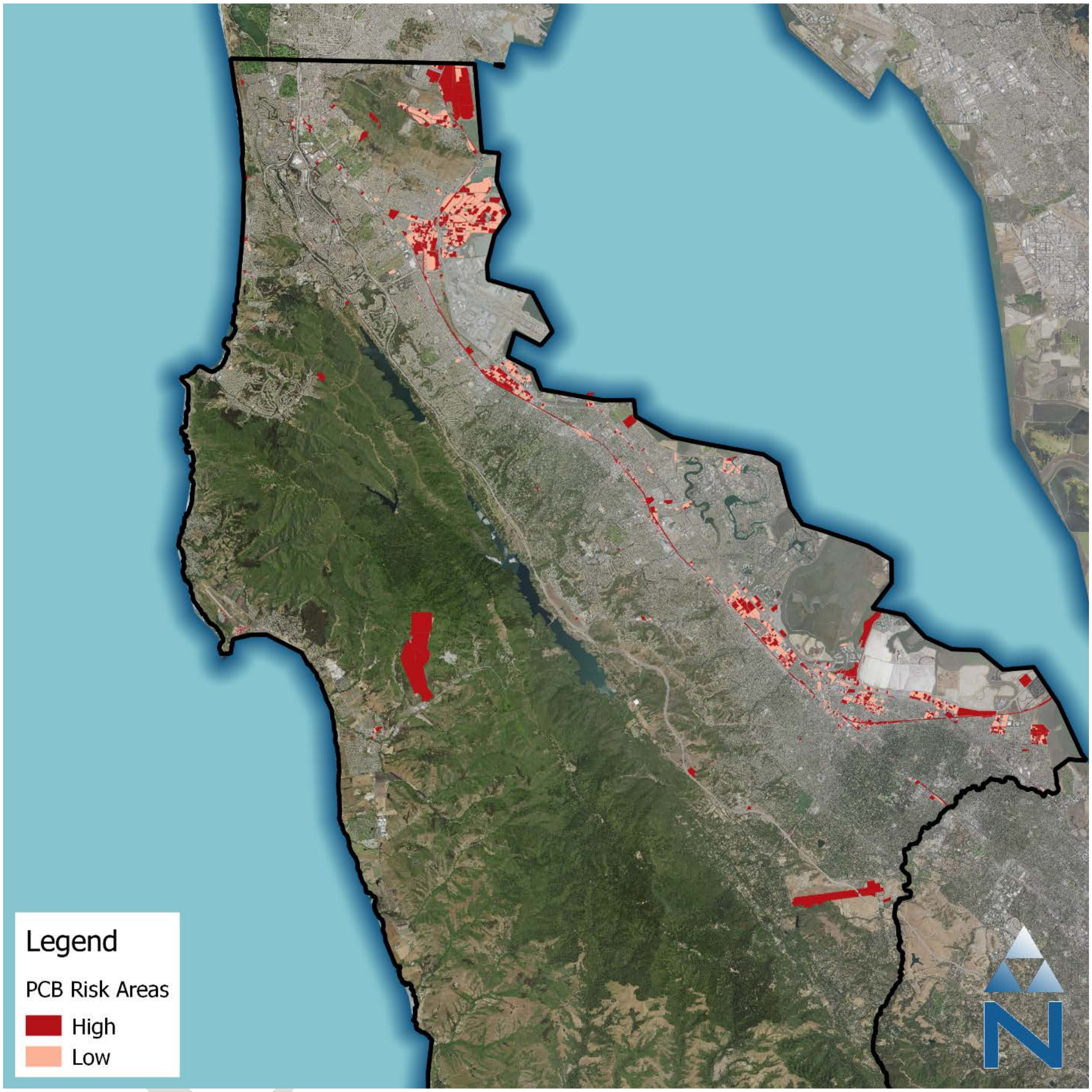


Figure 2-16. PCBs Risk Areas in San Mateo

Diazinon and Other Pesticides

Diazinon and other pesticides were commonly used throughout the San Francisco Bay area to manage many different organisms, such as ants and grubs. A few urban creeks and the San Francisco Bay were deemed impaired primarily due to urban runoff that carried insecticides like Diazinon. Pesticides can be released into the environment during manufacturing, formulation into products, distribution and retail, landscape maintenance, and agriculture usage. The greatest contribution of pesticides through urban runoff is likely use by structural pest control professionals and use by the general public of over-the-counter pest control products (SFRWQCB 2007).

Mercury

Mercury sources within San Francisco Bay and other waterbodies in San Mateo County include runoff from historic mines, urban runoff, wastewater discharges, resuspension of mercury-laden sediment in the Bay, and atmospheric deposition (SFRWQCB 2016a). The SFRWQCB recently published maps of mercury-risk areas due to historic mining in the Bay Area. One of the mines is located within San Mateo County, the Challenge Mine (SRBRWQCB 2016c). The greatest ongoing source of mercury in San Mateo County is atmospheric deposition, and the largest source of mercury in the Bay is the Central Valley, where rivers carry mercury from remote regions of the state (SFEI 1996). Local research in San Mateo County has been performed on mercury through an Integrated Monitoring, and estimated total mercury loading to the Bay from San Mateo County Permittees was 11.9 kg/year Report (SMCWPPP 2014c).

Trash

Trash accumulates in waterbodies due to littering on the street, direct dumping, wind, and stormwater runoff. These activities generate and mobilize trash that, during rain events, may wash off of impervious surfaces and end up in local waterbodies. SMCWPPP has conducted creek walks and trash assessments in urban creeks in San Mateo County to identify sites where most trash accumulates, establish a baseline to track future trends, and collect data for development of BMPs to address trash in the County (SMCWPPP 2008). Trash accumulation from a 2007 study of six watersheds in the County, showed that sites accumulated 9,804 items of trash during the fall and spring of 2006 and 2007, with plastic representing 60% of trash accumulated (SMCWPPP 2007b). In 2015, the State Water Board adopted an amendment to the Water Quality Control Plan for Ocean Waters of California to control trash accumulation, as well as a provision for trash in the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries.

Sediment

Sources of sediment in San Francisquito Creek include suspended sediment carried from dams, creeks and tributaries that deposit sediment to San Francisquito. Other sources are erosion of stream beds, incision of the creek into its streambed, and excavation and deposition of sediment. The greatest sources of sediment are thought to be human contributions to erosion (San Francisquito Creek Joint Powers Authority 2004). Sources of sediment in southern portions of San Mateo County in the San Francisco Coastal watershed include historic logging, agriculture, and associated erosion from runoff.

Indicator Bacteria

Sources of indicator bacteria along San Francisco Bay beaches, Pacific Ocean beaches, Marina Lagoon, and other waterbodies in San Mateo County stem from urbanization as well as natural background sources. The watershed that feeds into Marina Lagoon is almost entirely urbanized, and urban stormwater runoff, carrying pet waste and litter, is a contributor to coliform bacteria. Other sources of bacteria include sanitary sewer leaks and overflows, boat waste in Marina Lagoon, litter associated with recreation, and direct deposit by wildfowl (SFRWQCB 2013c). Beaches along the Pacific Ocean are impaired from bacteria due to sewer overflows, sanitary sewer leaks, pet waste, horse and wildlife waste, and associated transport from stormwater runoff.

2.8.2 Compliance with TMDL implementation plans and waste discharge permits

This SRP supports efforts to implement TMDLs and meet waste discharge and National Pollutant Discharge Elimination System Permit (NPDES) requirements of the San Francisco Bay Municipal Regional Stormwater Permit (MRP). The MRP addresses stormwater runoff from city and County jurisdictions of San Mateo County, Alameda County, Contra Costa County, and Santa Clara County, and the cities of Fairfield, Suisun City, and Vallejo (permittees). San Mateo County permittees' MRP compliance efforts are collectively supported by C/CAG's Countywide Program. The MRP includes provisions for the implementation of the following TMDLs, which prescribe requirements and schedules for Permittees to manage discharges that may cause or contribute to violations of water quality standards for pesticides, mercury, PCBs, and bacteria (SFRWQCB 2015).

- TMDL for Diazinon and Pesticide-Related Toxicity for Urban Creeks
- San Pedro Creek and Pacifica State Beach Indicator Bacteria TMDL
- San Francisco Bay and Guadalupe River Watershed mercury TMDLs
- TMDL for PCBs in San Francisco Bay

The MRP requirements for the diazinon and pesticide-related toxicity TMDL are primarily focused on the implementation and maintenance of an Integrated Pest Management (IPM) Policy or ordinance and standard operating procedures. The IPM is an ecosystem-based strategy that focuses on reducing the use of pesticides through long-term prevention of pests based on measures such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. As a result, pest control materials are selected and applied in a manner that minimizes risks to human and ecological health (SFRWQCB 2015).

The MRP includes requirements for addressing the bacteria TMDL through the implementation of specific measures to manage the sources of bacteria and their discharge into the storm sewer system. These include measures to eliminate illicit discharges from sanitary sewer overflows, address bacteria discharges from existing and future dog kennel and horse facilities into the storm sewer system, encourage the cleanup of dog waste through increased signage and availability of waste bag dispensers, implement a visual inspection and cleanup program for high dog waste accumulation areas, and implement a pet waste public outreach and education campaign (SFRWQCB 2015).

To address TMDLs for both PCBs and mercury, permittees are to develop Implementation Plans that outline the control measures to meet interim and final pollutant reductions consistent with schedules specified in the MRP. These control measures include implementation of pollution prevention, source control, stormwater treatment, green infrastructure, and other measures. Key to the Implementation Plans is the planning of green infrastructure projects and a quantitative reasonable assurance analysis demonstrating that sufficient control measures will be implemented to attain TMDL wasteload allocations within their compliance schedule. These wasteload allocations and associated schedules for phased load reductions over time are aggregated for all urban runoff to San Francisco Bay, inclusive of MRP permittees. Table 2-7 summarizes schedules for mercury and PCB interim and final aggregate wasteload allocations for urban runoff to San Francisco Bay (SFRWQCB 2015).

Table 2-7. TMDL Interim and Final Wasteload Allocation Schedules

Year	Aggregate Wasteload Allocation for All Sources of Urban Runoff to

	San Francisco Bay	
	PCBs (kg/yr)	Mercury (kg/yr)
2003 (baseline)	20	160
2018	19.5[1]	120
2020	17[2]	
2028		82
2030	2[3]	

[1] 0.5 kg/yr aggregate load reduction from all MRP permittees, with 60 g/yr load reduction specific to San Mateo County permittees.
[2] 3 kg/yr aggregate load reduction from all MRP permittees, with 370 g/yr load reduction specific to San Mateo County permittees.
[3] 18 kg/yr load reduction for all sources of urban runoff to the Bay, with 14.4 kg/yr aggregate load reduction from all MRP permittees.

The implementation of green infrastructure is to play an integral role in the Implementation Plans and reduction of mercury and PCBs to meet TMDL load reduction schedules. The MRP outlines a specific PCB and mercury load reduction schedule attributable to green infrastructure, as summarized in Table 2-8.

Table 2-8. Green Infrastructure and Load Reduction Schedules

Year	Aggregate Load Reduction Resulting from Implementation of Green Infrastructure by all MRP Permittees	
	PCBs (kg/yr)	Mercury (kg/yr)
2020	0.120[1]	0.048[2]
2040	3	10

[1] 0.015 kg/yr load reduction specific to San Mateo County permittees.
[2] 0.006 kg/yr load reduction specific to San Mateo County permittees.

The MRP includes a provision for the integration of low impact development (LID) within new development and redevelopment. As LID techniques are implemented as new development and redevelopment occurs throughout the County, the benefits of these practices in terms of reducing urban runoff flows and associated pollutant loads can be considered within the Implementation Plans and as part of the pollutant load reductions attributed to implementation of green infrastructure. C/CAG has been working with San Mateo County permittees to compile information on LID practices that have been implemented within new development and redevelopment since 2003 (baseline year for the TMDL). The reasonable assurance analysis will then consider these existing LID practices in combination with projections of LID in future new development and redevelopment and other green infrastructure projects planned by San Mateo County permittees, and provide quantifiable demonstration that the load reduction requirements will be met by scheduled milestones.

The San Mateo County permittees, through collaboration with C/CAG and the Countywide Program, have initiated development of processes for green infrastructure planning and performing the reasonable assurance analysis. This includes formation of the Countywide Program's Green Infrastructure Committee that includes key staff from each member agency, and initiating development of a model framework to be used as a roadmap for each individual permittee to adopt and facilitate the implementation of green infrastructure within their jurisdiction. C/CAG has also begun developing a modeling system that will support the reasonable assurance analysis and strategizing of green infrastructure and LID projects to be implemented to meet TMDL pollutant load reduction targets. This modeling system, based on a combination of the Hydrologic Simulation Program – FORTRAN (HSPF) (Bicknell et al. 1997) and the U.S. Environmental Protection Agency's (EPA) System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) (USEPA 2009), will provide:

(1) Simulation of hydrology and pollutant loading throughout subwatersheds of the San Francisco Bay watershed,
(2) Estimation of load reductions associated with proposed LID and green infrastructure projects to meet TMDL pollutant reductions, and
(3) Analysis of alternative green infrastructure and LID implementation scenarios to inform the planning process.

An overview of the components of the modeling system is presented in Figure 2-17. The HSPF watershed model is based on previous regional efforts that developed the Bay Area Hydrology Model (BAHM; http://bayareahydrologymodel.org), which utilizes local rainfall and climate data and calibrated parameters to provide continuous simulation of hydrology. The HSPF models supporting the reasonable assurance analysis is initially parameterized based on the BAHM, and is currently undergoing extensive reconfiguration and calibration based on datasets previously discussed (e.g., HRUs, meteorological data). C/CAG also initiated the development of a web-based Stormwater Capture Model (Figure 2-18), which provides a user interface for accessing results of HSPF and SUSTAIN to estimate volume capture and pollutant reductions resulting from green infrastructure and stormwater capture projects. Although the modeling system supporting the reasonable assurance analysis is still under development and expected to be completed in 2017, a preliminary system was prepared to support quantitative analyses for stormwater capture projects proposed in the SRP. This system relies on hydrologic modeling parameters currently available within BAHM, with initial parameterization of SUSTAIN to simulate processes associated with green infrastructure, LID, and other stormwater capture projects. Section 4.2.1.8 provides a summary of the results of applying the preliminary modeling system to support the SRP. As the reasonable assurance analysis is completed and the modeling system is fully developed and calibrated, the SRP can continue to be updated and refined with improved estimates of stormwater capture associated with proposed projects.

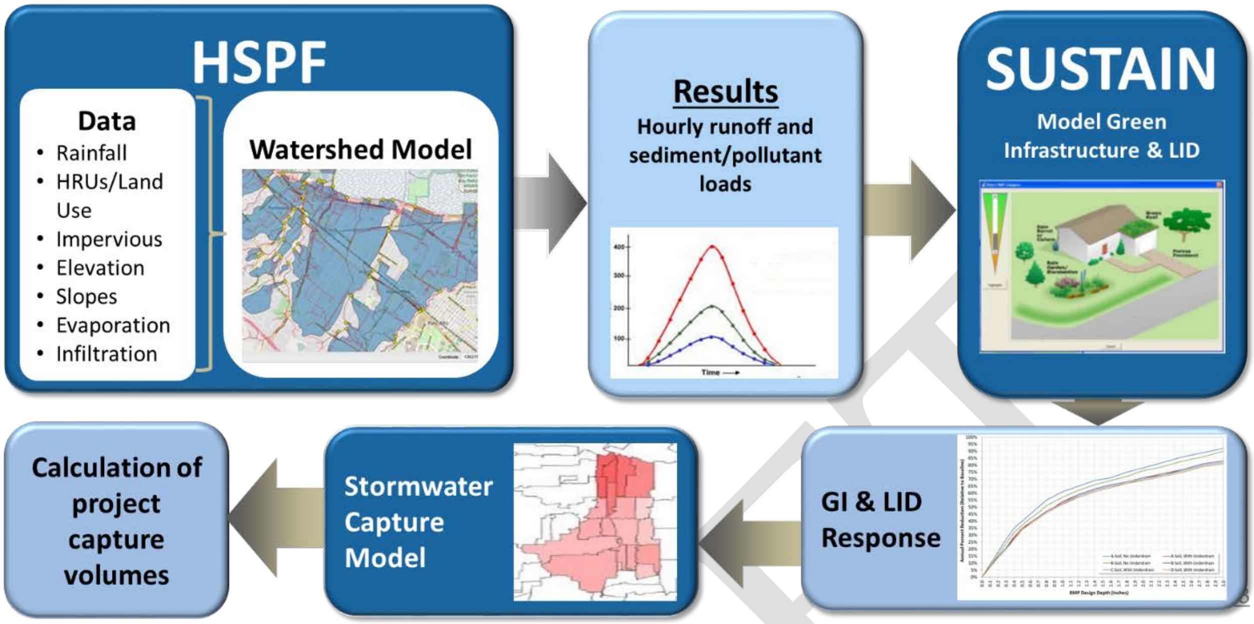


Figure 2-17. Summary of Modeling System Supporting the Reasonable Assurance Analysis

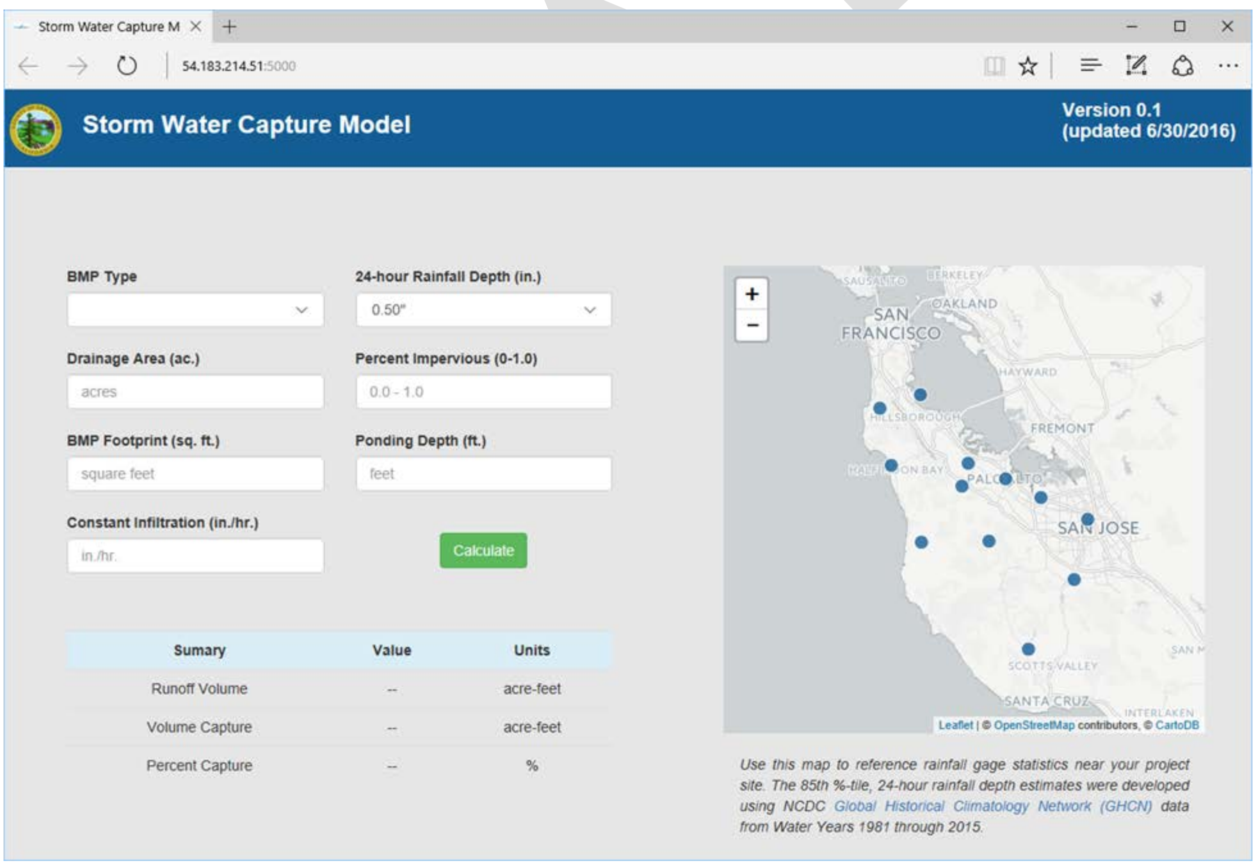


Figure 2-18. Stormwater Capture Model

The green infrastructure planning requirements of the MRP represent a major opportunity for the SRP to initiate a multi-benefit project planning process that contributes to TMDL implementation requirements. This will ensure that green infrastructure projects meet their intended purpose of stormwater capture and mercury and PCB load reduction, while also considering opportunities for integrating other project benefits that can increase the likelihood of project implementation and addressother goals for improving watershed processes (e.g., reduced flooding, groundwater recharge, reuse). The following sections discuss the process for identification and prioritization of stormwater capture project opportunities (including LID and green infrastructure) that consider capabilities to capture stormwater and reduce pollutant loads, while addressing multiple other benefits central to the SRP. In addition, the MRP includes a provision for trash load reduction to demonstrate compliance with a discharge prohibition for trash. Green infrastructure is anticipated to provide opportunity for trash capture through design and operation and maintenance procedures, which will be further assessed by C/CAG as the green infrastructure and trash reduction policies and implementation plans are more fully developed. Through adaptive management, it will be paramount that the SRP continues to align with future development of the TMDL Implementation Plan, green infrastructure planning procedures, reasonable assurance analysis, and trash reduction policies associated with the MRP.

3 ORGANIZATION, COORDINATION, COLLABORATION

3. 1 Contribution from Local Agencies

Overall success of the SRP hinges on coordinated efforts and contributions by multiple entities throughout San Mateo County. As a Joint Powers Authority, C/CAG's member agencies include the County and the 20 cities and towns in the county. C/CAG addresses issues of countywide significance, including congestion management and water quality. With respect to the SRP, C/CAG serves as the lead agency developing the SRP, but implementation of stormwater and dry weather runoff capture projects will largely fall to C/CAG's member agencies, the cities, towns, and County. Those agencies are also essential participants in ongoing adaptation of the plan over time, including contributing data, staff resources, and information on built and future projects.

In developing the SRP, C/CAG solicited from its member agencies GIS data layers and local planned projects for inclusion in the plan. In addition to many useful electronic data layers, C/CAG member agencies provided 60 projects for inclusion in the plan as opportunities for co-location of stormwater capture projects. Datasets and projects were summarized in a technical memo provided to member agencies for review and comment.

Key guidance was also provided via C/CAG's Stormwater Committee, which primarily consists of public works directors from each of the 21 member agencies as well as a representative from the Regional Water Quality Control Board. The Stormwater Committee advises the C/CAG Board of Directors and staff regarding stormwater management-related actions, especially in relation to the MRP. The Committee provided guidance and feedback as the SRP was under development, especially in regard to the screening and prioritization process and criteria that are an essential piece of the overall plan. The Stormwater Committee received presentations on various aspects of the SRP throughout development, including an overview of the screening and prioritization process and criteria and the resultant stormwater capture project opportunities throughout the County in April

2016 and an overview of the 22 developed project concepts and a summary of linkages to the MRP-required reasonable assurance analysis process in June 2016. C/CAG released an Administrative Draft of the SRP to its member agencies for review and comment on October 13, 2016, and a summary of comments and responses was presented to the Stormwater Committee in November 2016. At that meeting, the Stormwater Committee voted to recommend the C/CAG Board accept the draft SRP and authorize its release as a public review document. The final SRP, including a summary of comments and responses from the public and interested stakeholders, will be presented to the Stormwater Committee in January 2017 in advance of submitting to the C/CAG Board for adoption in February 2017.

In addition to the C/CAG Stormwater Committee, C/CAG created a new Water Committee to serve as a forum for countywide discussion regarding integrated water issues. This was in response to proposals by San Mateo County to consolidate countywide efforts on stormwater, flooding, and sea level rise, and a San Mateo County Civil Grand Jury report titled, "Flooding Ahead: Planning for Sea Level Rise" that identified concerns related to integrated water planning efforts in the County. C/CAG established an ad-hoc committee to evaluate options for integrated water management in San Mateo County, including whether a new agency was needed.

After many months of meetings and presentations from other water management agencies throughout the Bay Area, the ad-hoc committee recommended the C/CAG Board convene a standing Water Committee to serve as a forum for ongoing communication, collaboration, and coordination on stormwater management, flood control, and sea level rise. The C/CAG Board supported the ad-hoc committee recommendation and approved creation of the Water Committee in October 2016. The new committee will advise the C/CAG Board of Directors regarding countywide collaboration strategies relative to water issues and consist of five elected officials from specific geographic areas of San Mateo County (one city council member each from north, central, and south Bayside jurisdictions, one from the Coastside jurisdictions, and one at-large member from the County Board of Supervisors). The Water Committee is expected to provide ongoing policy-level guidance and political support for SRP implementation, especially in regard to opportunities to manage stormwater in ways that simultaneously support flood control and sea level rise adaptation efforts. Once the Water Committee is seated, C/CAG staff expects to provide a presentation on the adopted SRP.

3. 2 Public Engagement

As part of the coordination and collaboration efforts of the SRP, C/CAG staff and consultants gave the following presentations on the SRP to the Stormwater Committee (public meetings):

- SRP Project Screening and Prioritization Update – April 21, 2016
- SRP Draft Concept Plans Update – June 16, 2016
- SRP and Reasonable Assurance Update – November 17, 2016

In addition, C/CAG staff has presented on or mentioned the SRP planning process in various related public forums in an effort to engage stakeholders and expand its list of interested parties, including presentations at Sustainable San Mateo County's November 2015 Water Indicator Summit and San Mateo County's Office of Sustainability's Sea Level Rise July 2016 joint meeting of its policy advisory committee, technical working group, and citizens advisory committee, and mention at San Mateo County Environmental Health's San Mateo Plain groundwater basin study meetings in May, September, and November 2016.

Beyond presenting to the Stormwater Committee on the purpose and process of developing the SRP, C/CAG staff has planned three public workshops in January 2017 for soliciting public and stakeholder feedback on the SRP. These workshops will provide an opportunity for local stakeholders and members of the general public to learn about the basis for creating a countywide SRP for San Mateo County, and will also provide a forum for a dialogue regarding the long-term transition towards more green infrastructure and stormwater capture projects. It will also provide an opportunity to inform the public about continued stormwater planning at the individual jurisdictional level through the MRP-mandated Green Infrastructure Plans. These workshops will include presentations detailing the SRP's projects, their components and the impact for the community and its members. Following the presentations will be question and answer periods where attendees can ask questions and submit their feedback.

Promotion of the workshops will take place on social media with Facebook and Twitter advertisements targeted to San Mateo County residents. These ads will inform the community of the purpose, times, dates and locations of the workshops as well as where they can read a draft of the SRP and submit comments online. Ads will also be specifically targeted to disadvantaged communities such as East Palo Alto and Daly City, where ads will run at a higher frequency. In an attempt to identify and address runoff-related environmental injustice issues, ads will also be targeted in areas where historical flooding issues have occurred, such as recent floods of trailer parks in Belmont and Redwood City, and for which some of the regional project concepts have been developed to help address (see Section 4.3).

Further promotion of the workshops will take place through public relations efforts with a press release that will be distributed to local media outlets, including both print and online publications. The press release will call attention to the release of the SRP draft as well as publicize the workshops and drive readers to the flowstobay.org website where they can find a draft of the SRP to review and submit comments through an online form.

Tentative dates for the workshops are as follows: January 6, 2017; January 9, 2017; January 10, 2017.

3. 3 Coordination with Other Stakeholders

C/CAG has attempted to identify other key stakeholders that may have an interest or role in plan implementation. These entities are detailed in Appendix E. C/CAG will ensure each of these entities is notified of the availability of the draft SRP and public workshops and encourage their participation in finalizing the plan and engaging with local agencies on existing and future stormwater capture opportunities.

C/CAG has engaged stakeholders in the regional project concepts that were created as part of the SRP development and detailed in Section 4.3 and Appendix C, including South San Francisco, Colma, Daly City, the San Mateo County Flood Control District, Caltrans, and Cal Water with regard to the Orange Memorial Park regional project concept in South San Francisco; participation in multi-jurisdictional (Belmont, San Carlos, Redwood City, San Mateo County) and stakeholder meetings (Novartis and Caltrans) related to flooding on Belmont Creek, for which the Belmont Creek regional project concept was developed in Belmont; and working with stakeholders involved in addressing flooding on the Bayfront Canal and Atherton Channel (Redwood City, Menlo Park, and Atherton), including development of the Holbrook-Palmer Park regional project concept in Atherton and Redwood City submitted a Bayfront Canal Flood Control Project to the State Water Resource Control Board under its Proposition 1 stormwater grant program, details of which are included in Appendix D. C/CAG has also coordinated with Daly City on its Vista Grande Canal project, which was also submitted to the State Water Resources Control Board for Proposition 1 grant funds, a summary of which is also included in Appendix D.

4 QUANTITATIVE METHODS FOR IDENTIFICATION AND PRIORITIZATION OF STORMWATER AND DRY WEATHER RUNOFF CAPTURE PROJECTS

As a part of the Water Code requirements, the SRP includes an evaluation of project benefits addressing several key metrics: Water Quality, Water Supply, Flood Management, Environmental, and Community benefits. Based on these key metrics, watershed characteristics, and processes discussed in Section 2, a number of stormwater projects were identified and prioritized to address water quality impairments, reduce flooding, and provide more natural groundwater recharge to the Region.

A screening and prioritization method was developed to reasonably site stormwater capture projects. Publicly owned parcels and street rights-of-way throughout the County were initially screened based on physical attributes to identify locations amenable for stormwater management. Once the site opportunities were identified, a quantitative process was used to prioritize and rank the sites for potential implementation of stormwater capture projects. There are two main stages in the prioritization process: potential locations were ranked based on quantitative indicators of project benefits, and highest opportunity projects were further modeled:

1. A ranking method for all screened potential project locations determined which sites would offer the greatest opportunity for stormwater capture and other multiple benefits. This mechanism also provided (1) opportunities to co-locate stormwater capture projects with other currently planned capital improvement projects, and (2) evaluation and incorporation of stormwater capture projects at future sites planned for capital improvement projects. The result is a flexible framework in which the cities and the County can continue to evaluate benefits of new projects and add to the SRP project list over time. The screening and prioritization methodology is discussed in greater detail in Section 4.1 and 4.2.
2. A subset of the highest ranked project opportunities was further analyzed to provide detailed quantification of project benefits and develop preliminary conceptual designs and project costs. Modeling was performed to quantify stormwater volume and pollutant load reductions that could be achieved with these projects, and details of the projects were developed to meet the required capture volumes from the modeling step. The quantitative analysis is discussed in greater detail in Section 4.2.1.8 and conceptual designs are discussed in Section 4.3.

In order to support municipalities with future efforts to quantify project benefits, tools were developed that will aid in following the same steps outlined in Section 4.2. The tools are made publicly-available online so that anyone will be able to replicate the process. One of these tools is the stormwater capture model used in Stage 2 of the quantitative process, which the public can use to estimate project-specific stormwater capture volumes. Another available tool is a geographic information systems (GIS) web viewer that will allow the public to view the results of project prioritization.

4. 1 Screening of Project Opportunities

Publicly owned parcels and street rights-of-way were analyzed to identify potential stormwater retrofit sites. GIS datasets were used to characterize ownership and physical attributes of each site to identify benefits and limitations of projects that could be potentially implemented. Ideal conditions for a suitable stormwater capture project varies by project type, therefore separate project identification and prioritization processes were developed for three project types: regional stormwater capture, green street, and LID. These project types were identified as the most likely projects to be implemented throughout the County.

Regional Stormwater Capture Projects

Regional stormwater capture projects consist of facilities that capture and treat stormwater from off-site. The primary objective of regional projects is often flood attenuation, but many also contain a water quality treatment or infiltration component. Common examples of regional stormwater capture are detention basins, retention basins, and subsurface infiltration galleries. These projects can either be online or offline of the storm drain network or stream. In highly developed areas, subsurface structures may be preferable to retain the functionality of the land in the project footprint. For example, some of the most ideal locations for regional stormwater capture exist in public open spaces, such as public parks, sports fields, parking lots, and even school grounds. Subsurface structures allow for the function of sites to be restored after construction. Subsurface infiltration systems can take the form of perforated metal or plastic pipes, concrete arches or vaults, or plastic chambers and crates with open bottoms (SMCWPPP 2014a). Figure 4-1 shows an example of an offline subsurface infiltration system designed to capture and infiltrate stormwater runoff from the nearby storm drain.

Figure 4-1. Subsurface infiltration system installation under a parking lot (SMCWPPP 2014a).

Green Streets

Green streets consist of stormwater capture infrastructure that is implemented in public rights-of-way. Green streets are intended to capture only runoff that is generated from the street and adjacent land uses that drain to the street. There are several types of improvements that can be utilized in a green street, including permeable pavement, bioretention (rain gardens), planter boxes, and bioswales. The primary objective of green streets is to capture and infiltrate or filter stormwater runoff. Although they only treat runoff from on-site, if distributed throughout a watershed, green streets can significantly reduce downstream runoff volumes and pollutant loads, reducing the need for large-scale regional projects. In addition to stormwater treatment, green streets often introduce several auxiliary benefits such as increased property values, reduced urban heat island effect, and increased pedestrian use (USEPA 2008 and 2016).

Figure 4-2. Example stormwater planter box (SMCWPPP 2009) and bioretention curb extension at a crosswalk (SMCWPPP 2009).

Low Impact Development Retrofit

LID is a form of on-site urban infrastructure design that uses a suite of technologies intended to imitate pre-urbanization (natural) hydrologic conditions. One of the most prominent effects of urbanization is the drastic increase in impervious surfaces, and thus, stormwater runoff. LID is meant to capture, remove (through infiltration), and slow runoff to reduce the impacts of the urban landscape. Designed to capture stormwater on-site, LID treats runoff before it can reach downstream waterbodies. Examples of LID include green roofs, bioswales, bioretention, permeable pavement, and gravel infiltration trenches. Green streets and LID utilize several of the same technologies. In the prioritization process, LID retrofit refers to projects that incorporate green infrastructure to treat runoff from individual parcels on-site, while green streets refer to infrastructure located in the public right-of-way that manage roadway and some adjacent parcel runoff.


Figure 4-3. Example permeable pavers with bioretention cell at a parking lot (SMCWPPP 2009) and a vegetated swale along an arterial street (SMCWPPP 2009).

4.1.1 Screening of Public Parcels

Beginning with the County Assessor's parcels dataset, the first step was to identify suitable publicly-owned parcels. As no readily identifiable attribute is available flagging public ownership, such as a special attribute within the Assessor's Parcel Number (APN), the owner attribute was parsed to distinguish public entities. Parcels with an owner attribute that began with "City of", "County of" or "Town of" were selected. The land use attributes were also used to select a set of additional parcels as publicly owned. For example, parcels with a land use designation that are considered public use (e.g., park or school) were selected. Parcels that were part of a waterbody were excluded.

Once a set of suitable parcels was selected, additional criteria were imposed to identify locations that were most suitable for either a regional stormwater and dry weather runoff capture project (capturing runoff from larger surrounding areas) or onsite LID retrofits (capturing onsite runoff only)[4]. All parcels that were less than 0.25 acres were removed from consideration for regional stormwater capture, and were categorized as opportunities for onsite LID retrofits. Hydrologic Response Units (HRUs) were developed for the County that characterized physical watershed attributes such as imperviousness, land use, and slope. The development of HRUs is discussed in detail in Section 2.7. The HRUs were used to eliminate parcels with physical limitations, such as steep slopes that would impede the primary goal of stormwater capture. A summary of the screening factors for both (1) selecting parcels, and (2) eliminating parcels based on physical constraints is presented in Table 4-1.

Table 4-1. Screening factors for identifying potential project sites

Screening Factor	Parcel Characteristic	Criteria	Reason

[4] Note that regional stormwater and dry weather runoff capture projects will likely be most cost-effective from a countywide standpoint of maximizing the capture of stormwater. However, onsite green infrastructure projects are also often very useful as public demonstration projects to promote wider-scale green infrastructure and LID on privately owned land.

Screening Factor	Parcel Characteristic	Criteria	Reason
Public Parcels	Ownership	City, County, or Town	Identify all public parcels for regional storm and dry weather runoff capture projects or onsite LID retrofits
	Land Use	Park, School, Other (e.g., Golf Course)	
Suitability	Parcel Size	>0.25 acres	Adequate space for regional stormwater and dry weather runoff capture project
		<0.25 acres	Opportunity for onsite green infrastructure retrofit
	Average Parcel Slope	< 10 %	Steeper grades present additional design challenges

4.1.2 Screening of Street Rights-of-Way

In addition to public parcels, street rights-of-way were identified and screened for potential green street implementation. Street type, ownership, and slope were used to screen rights-of-way suitable for green streets. Street use variables such as high traffic volumes and road speed limit can impact suitability in terms of both system performance and long-term operation and maintenance costs. Selection of streets was focused on local neighborhood roads, city streets, parking lots, and alleys as these functional classes typically exhibit characteristics of lower traffic volume and lower speed limits as opposed to major arterials, collector roads, and highways. The 2015 Census TIGER road lines (USCB 2015) were used to assign a functional class to each street in the County's street dataset. The right-of-way dataset was used to remove any private roads from consideration. Because mild slopes are more suitable for green streets, sections of street that have greater than a 5% slope were removed from consideration. A summary of the screening factors for (1) selecting potential streets and (2) eliminating streets based on physical or ownership constraints is presented in Table 4-2.

Table 4-2. Screening Criteria for Streets & Right-of-Way

Screening Factor	Street Section Characteristic	Criteria	Reason
Selection	Functional Class	S1200[1] S1400[2] S1730[3] S1780[4]	Local neighborhood road, rural road, city street, alley, parking lot roads
Suitability	Ownership	Public	Potential projects are focused on public and right-of-way opportunities
	Road Slope	< 5%	Steep grades present additional design challenges; reduce capture opportunity due to increased runoff velocity

[1]TIGER classification: Secondary road (arterial streets)
[2]TIGER classification: Local neighborhood road, rural road, city street
[3]TIGER classification: Alley
[4]TIGER classification: Parking lot road

4. 2 Integrated Metrics-Based Benefits Analysis

A two-step integrated metrics-based analysis was conducted using the screened project opportunities: (1) a quantitative prioritization method for screened projects, and (2) modeling of volume and pollutant load reductions for a subset of the highest ranked projects selected for further conceptualization. The prioritization method was applied to all screened project opportunities and utilized several surrogate indicators of effectiveness to quantitatively assess project benefits. Volume and pollutant reductions were then modeled for a subset of the prioritized projects to validate the prioritization method and to further quantify benefits of select highest ranked projects. The following subsections describe the benefits received from typical stormwater capture projects, the metrics used in prioritization to maximize these benefits, and the processes for the quantitative analysis.

4.2.1 Prioritization of Project Opportunities

Physical characteristics of opportunity sites are key considerations in the prioritization process, as these typically serve as surrogate indicators of the expected effectiveness of each project in terms of volume capture and pollutant load reduction. For each indicator, quantitative scores and project ranking were assigned based on anticipated project effectiveness of stormwater capture.

In addition to physical site characteristics, several special considerations were included to account for high opportunity and currently planned capital improvement projects as well as consideration of potential multiple benefits. Because the conditions for a suitable project differ between project type, regional stormwater capture, green streets, and LID retrofit projects were evaluated independently and given a separate prioritization score.

Every screened parcel was given a score for regional stormwater capture and a score for onsite LID retrofits. This was performed to allow further selection of alternative project types in the future. For instance, although a site may score poorly for a regional stormwater capture project due to characteristics of a larger surrounding potential drainage area, the site can score positively for LID retrofit. Every screened street right-of-way segment was given a score for green streets. The following subsections outline a quantitative methodology for prioritizing stormwater capture project opportunities.

4.2.1.1 Physical Characteristics

REGIONAL STORMWATER CAPTURE PROJECTS

After the identification of feasible project locations, screened parcels were prioritized to aid in the selection of projects that would be the most effective and provide the greatest number of benefits. A scoring system was developed to take into account key physical characteristics obtained in the development of the HRUs, as well as the considerations in Section 4.2.1.3 through 4.2.1.6 that act as surrogate indicators of project benefits. Prioritization scoring criteria for stormwater capture projects on public parcels are presented in Table 4-3.

In order to determine the physical characteristics of each parcel, some characteristics required averaging of values over the potential drainage area. Since it is infeasible to accurately delineate every parcel drainage area at this stage, a method was derived to establish a *representative drainage area* for each parcel. Several assumptions were made in determining the representative drainage area: (1) a regional project footprint accounts for 50 percent of its parcel area, and (2) the estimated drainage area is 250 times the area of the project footprint. Using these assumptions, the representative drainage area is drawn as a circular buffer around each parcel centroid using the estimated area. For large parcels, the buffer was limited to 1,000 acres to limit uncertainty. Additionally, buffers were clipped to the County land boundary to remove sections that extend into a waterbody. The representative drainage area for each parcel was used to obtain an average value for imperviousness and slope that was used in the prioritization scoring method.

There were five physical characteristics used in the prioritization of parcels for regional stormwater capture:

1. ***Parcel land use*** was used to prioritize sites that are most likely to have adequate space for a regional project and cause minimal disturbance of existing use. Parks or other public open space were given the highest priority, followed by parking lots, parcels that require full or partial demolition of public buildings, and, finally, schools and golf courses.
2. ***Impervious area***, averaged over the representative drainage area, was included in the prioritization due to the connection between highly impervious areas and large runoff potential. Because the primary goal is to reduce runoff via stormwater capture, regional projects should be placed to treat areas that produce high runoff volumes. Higher priority is given to parcels with representative drainage areas with high imperviousness.
3. ***Parcel size*** was prioritized to ensure that regional project sites have adequate space to treat large drainage areas. Larger parcels are given higher priority scores.
4. ***Hydrologic Soil Group*** at the parcel was also considered in the prioritization. Soil groups were categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the objectives of stormwater capture, highest priority was given to Soil Group A, with each subsequent group assigned fewer points.
5. ***Slope***, averaged over the representative drainage area, was the last physical characteristic in the prioritization of parcels for regional projects. Sites with mild slopes often provide the most feasible opportunities for stormwater capture. Constructing on steep slopes presents difficulties with implementation and performance of the stormwater capture structure.

Green Street Projects

In order to evaluate the physical characteristics of each street, street lines must be discretized into segments of appropriate length for evaluating feasibility of green infrastructure practices at the proper scale. Street lines in GIS were broken at each intersection to further segment continuous roads into well-defined segments. Each physical characteristic was then averaged over the potential drainage area.

It is infeasible to accurately delineate drainage areas to every street, therefore; a method was derived to establish a *representative drainage area* for each street segment. Representative drainage areas were based on an assumed ratio of contributing drainage area per length of street. An analysis of sample streets suggested a ratio of approximately 20 acres of drainage area per 1 mile of suitable street. Using these assumptions, the representative drainage area was drawn as a buffer (approximately 85 feet on both sides) around each street line. Buffers were clipped to remove sections that extend into a waterbody. The representative drainage area for each street was used to obtain an average value for imperviousness and slope that was used in the prioritization scoring method.

Prioritization scoring criteria for green streets in rights-of-way are presented in Table 4-5. There were four physical characteristics used in the prioritization of suitable green streets:

1. ***Street type*** was used to prioritize sites that are most suitable for green street retrofit. Heavily-used streets can require increased maintenance and reduce system performance. Highest priority was given to local neighborhood roads, city streets, parking lot roads, and alleys, while lower priority was given to major arterials, collector roads, and highways.
2. ***Impervious area***, averaged over the representative drainage area, was included in the prioritization due to the connection between highly impervious areas and large runoff potential. Because the primary goal is to reduce runoff via stormwater capture, green streets were prioritized to maximize implementation in areas that produce high runoff. Higher priority was given to streets with representative drainage areas with high imperviousness.
3. ***Hydrologic Soil Group*** in the right-of-way was also considered in the prioritization. Soil groups were categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the benefits of green streets, highest priority was given to Soil Group A, with each subsequent group assigned fewer points.
4. ***Slope***, averaged over the length of street segment, was the last physical characteristic in the prioritization of rights-of-way for green streets. Sites with mild slopes are ideal for green streets because it allows for street design that capture more volume and reduces maintenance requirements.

ONSITE LID RETROFIT PROJECTS

While many of the same characteristics for regional projects were used to evaluate LID retrofit projects, the scale of the projects required different spatial evaluation. LID typically treats runoff generated onsite. This means that the drainage area for LID is typically no larger than the parcel size. For prioritization of LID retrofit projects, all physical characteristics were evaluated at the parcel spatial scale. Prioritization scoring criteria for LID retrofit projects on public parcels are presented in Table 4-4.

There were four physical characteristics used in the prioritization of LID retrofit projects:

1. ***Parcel land use*** was used to prioritize sites that are ideal for LID retrofit projects. Because LID treats runoff generated onsite, it is typically located where imperviousness is high, such as existing buildings, walkways, and pavements. Public buildings and parking lots were given the highest priority, followed by public open space, schools, and golf courses.
2. ***Impervious area***, averaged over the parcel area, was included in the prioritization because of the connection between highly impervious areas and large runoff potential. Because the primary goal is to maximize stormwater capture, LID projects should be prioritized to treat sites that produce high runoff. Higher priority was given to parcels with high imperviousness.

3. ***Hydrologic Soil Group*** at the parcel was also considered in the prioritization. Soil groups are categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the objectives of stormwater capture, highest priority was given to Soil Group A, with each subsequent group assigned fewer points.
4. ***Slope***, averaged over the parcel, is the last physical characteristic in the prioritization of parcels for LID retrofit projects. Sites with mild slopes often provide the most feasible opportunities for stormwater capture. Constructing on steep slopes presents difficulties with implementation and performance of the LID structures.

4.2.1.2 Flood-prone Streams

Regional, LID retrofit, and green street project sites were given higher priority according to proximity to flood-prone streams. Projects opportunities located within the subwatersheds of flood-prone streams will help to mitigate flood risks and reduce hydromodification impacts by limiting the volume of runoff that reaches the impacted streams. Regional stormwater capture projects can either slow the travel of runoff to the flood-prone stream through capture and slow release or remove the runoff volume entirely through infiltration or reuse. Distributed LID and green streets in subwatersheds of flood-prone streams would alter the imperviousness and hydrology of the area so that less runoff contributes to flooding. Higher priority was given to sites closest to the flood-prone streams with the assumption that more upstream area could potentially be captured. Project sites that are not within the subwatersheds of flood-prone streams received no additional points.

4.2.1.3 PCB Risk Areas

PCB risk areas were examined during prioritization to give higher priority to projects with the potential for source control[5]. PCBs are one of the primary pollutants of concern within the Bay Area, therefore; siting of stormwater capture projects in PCB risk areas can potentially address water quality issues. Section 2.8.1 provides a summary of PCB risk areas that were used in project prioritization. Areas with High-High and High-Moderate were given the highest priority, while areas that show signs of redevelopment with moderate to low risk were given the lowest priority. Regional capture and green street projects received points in this category if the PCB risk area was within the project's representative drainage area. LID retrofit projects received points if the project parcel is a PCB risk area.

4.2.1.4 Co-located Planned Projects

Higher priority scores were given to project opportunities that may be implemented in parallel with new development and redevelopment projects or other municipal capital improvement projects currently in planning phase throughout the various jurisdictions within the County. Co-locating stormwater capture and treatment projects with other priority projects increases opportunities for cost-sharing and maximizes multiple benefits achieved by a single project.

[5] As part of the reasonable assurance analysis required by the MRP to address PCB and mercury TMDLs and support the TMDL Implementation Plan, further analysis will be performed after completion of the SRP to determine the full extent that TMDLs will be addressed with green infrastructure. Future updates of the SRP can incorporate finding of the RAAs.

Each jurisdiction was given the opportunity to submit projects for co-location with stormwater capture. Through a survey, the County and cities submitted planned projects with the project description, contact information, and multiple benefits received from each project. A total of sixty-six projects were submitted. Parcels and rights-of-way that are located near potential co-located projects are given higher priority, with additional points awarded for each benefit anticipated to be an outcome of the project. A parcel was considered to be co-located with a project if it was within 500 feet of the project location.

C/CAG, in coordination with the San Mateo County Office of Education, supported walk audits at schools throughout San Mateo County to identify recommended improvements for the Safe Routes to School program. These walk audits provide recommendations on projects that would increase safety for children walking or biking to school, and include infrastructure improvements such as new crosswalks, pedestrian bulb-outs, sidewalks, and ADA-compliant curb ramps. These types of improvements are prime opportunities for incorporation of green infrastructure, as any project that is tearing out and replacing curb and gutter is a chance for drainage improvements. Pedestrian bulb-outs can be converted to vegetated curb extensions to capture and treat stormwater, new curb ramps can be created in conjunction with vegetated curb extensions, new sidewalks can be constructed of permeable pavements or with sidewalk planters, and new crosswalks can incorporate vegetated curb extensions to reduce pedestrian crossing distances and increase visibility while also managing stormwater. These project opportunities were considered in the prioritization of rights-of-way.

4.2.1.5 Drains to TMDL Waters

All projects in the SRP contain some element of stormwater capture resulting in volumetric reductions of runoff. The San Francisco Bay is subject to several TMDLs that require reductions in pollutant loads over the next several decades. As discussed in Section 2.8.2, PCBs and mercury are the primary pollutants of concern in the Bay Area. Since stormwater is identified as the primary contribution of these pollutants to the Bay (SFRWQCB 2013d), volume reduction from stormwater capture projects will also result in reduction of these pollutants.

Stormwater capture will aid in the removal of pollutants from runoff downstream. Projects that are located in watersheds that drain to Bay TMDL waters were given higher scores. Implementation of SRP projects will result in the enhancement of streams that lead to TMDL waters.

4.2.1.6 Multiple Benefits

One of the objectives of project prioritization was to maximize the number of benefits received for each opportunity. While there are many direct benefits that result from satisfying the primary objectives, auxiliary benefits can also be achieved to improve cost effectiveness. Mindful planning and design to include some of these auxiliary benefits can aid in public acceptance, community engagement, and funding acquisition. As part of the prioritization scoring criteria, each project received one additional point for each of the following multiple benefits determined to apply. Points were assigned based on project type. For example, all projects were considered to provide groundwater recharge if located above an aquifer. Green street and LID projects were considered to provide source control.

Groundwater Recharge

An auxiliary benefit of stormwater capture projects is infiltration and potential groundwater. All stormwater projects listed in the SRP can include infiltration as a major element and help to restore natural watershed process. The implementation of these projects can provide more areas for recharge of groundwater aquifers below urban areas.

Source Control

Source control includes design practices that treat or prevent stormwater runoff or pollutants on-site before it is able to enter a storm drain system or waterbody. These design practices can include considerations for landscape planning, roof runoff controls, efficient irrigation, and signs that alert the public about the effects of and prohibition against waste disposal in storm drain systems. Alternative building materials can be used for source control, such as permeable pavements that reduce runoff and newer building materials that are treated with safer and less mobile chemicals. Special areas, such as fueling areas, maintenance bays, trash or material storage, and vehicle washing stations, can be designed in such a way to limit drainage and pollutants from the site by redirecting towards an on-site BMP (CASQA 2003).

Natural Hydrology Restoration

One of the goals of projects listed in the SRP is to either reestablish natural drainage and infiltration systems or to mimic natural system functions to the maximum extent feasible. As discussed in more detail in Section 2.7, urbanization replaces pervious soils with impervious land cover, effectively converting infiltration to overland flow. The increase in runoff volume that results from increased impervious land cover presents several challenges.

Stormwater capture projects are designed to mimic pre-development hydrology by either slowly releasing captured runoff (e.g. detention basin) to emulate natural peak flows or through removal of volume through infiltration (e.g. rain gardens, infiltration chambers, trenches), reducing both peak flows and runoff volume. The reduction of overland flow will improve water quality in downstream waterbodies, as pollutants that are conveyed by runoff will be removed and treated when captured by a project.

Interflow is another natural process that will be restored through implementation of the projects in the SRP. Because captured water is allowed to infiltrate, some of the infiltrated water will percolate down to deeper groundwater, while some will emanate as interflow, or shallow groundwater flow. In urban settings, both infiltration and interflow are effectively removed and are seen as overland flow. These projects restore the balance between these hydrologic processes towards a more natural balance.

Habitat and Open Space Enhancement

Stormwater capture projects can also be designed with a focus on habitat enhancement and maximization of open space. Vegetated treatment types often provide the auxiliary benefit of habitat enhancement. Examples are wetland treatment systems, riverine habitats, and rain gardens. Vegetation supports local insect, aquatic, and bird populations while enhancing open space and providing opportunities for recreation. Recreational trails and parks are often constructed alongside these types of stormwater capture projects.

Community Enhancement

The projects would introduce urban green space and connectivity. Green street and LID projects would create the most opportunities for additional urban green space, as these projects will substitute vegetation in previously impervious areas. Because regional projects will be sited in already designated open space, the land use from pre-construction can be retained after construction. The attainment of water quality standards through achieving the TMDLs will preserve beneficial uses, such as commercial and sport fishing and recreational uses.

4.2.1.7 Process for Quantitative Prioritization of Projects

Separate prioritization scoring processes were developed for each of the three project types defined in Section 4.1. Three separate scoring systems were used because different conditions determine the suitability of a project type. Scoring criteria for each project type are presented in Table 4-3 through Table 4-5. A project's priority score was determined by summing all of the points assigned from the evaluated physical characteristics, proximity to areas of interest, potential for co-locating projects, and the various multiple benefits. A factor is assigned to each individual category to modify the weight given during the prioritization step. The scoring criteria and associated weighting factors were established based on discussions with C/CAG member agencies regarding their importance to the community (e.g., reduce flood risk), regulatory drivers (e.g., TMDLs for PCBs), and ability to leverage other funding opportunities to increase likelihood of implementation (e.g., co-location with currently planned projects).

Table 4-3. Parcel prioritization criteria for regional stormwater capture

	Points						Weight Factor
	0	1	2	3	4	5	
Parcel Land Use	--	--	Schools/Golf Courses	Public Buildings	Parking Lot	Park / Open Space	--
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Parcel Size (acres)	0.25 ≤ X < 0.5	0.5 ≤ X < 1	1 ≤ X < 2	2 ≤ X < 3	3 ≤ X < 4	4 ≤ X	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	5 < X ≤ 10	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	--	--	Low	--	High	2
Currently planned by City or co-located with other City project	No					Yes	2
Drains to TMDL water	No					Yes	
Above groundwater basin	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

Table 4-4. Parcel prioritization criteria for LID

	Points						Weight Factor
	0	1	2	3	4	5	
Parcel Land Use	--	--	Schools/Golf Courses	Park / Open Space	Parking Lot	Public Buildings	--
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	5 < X ≤ 10	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	--	--	Low	--	High	2
Currently planned by City or co-located with other City project	No					Yes	2
Drains to TMDL water	No					Yes	--
Above groundwater basin	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

Table 4-5. Right-of-Way prioritization criteria for green streets

	Points						Weight Factor
	0	1	2	3	4	5	
Street Type	Highway	--	Arterial	Collector	Alley	Local	--
Imperviousness (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	--	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	--	--	Low	--	High	2
Currently planned by City or co-located with other City project	No					Yes	2
"Safe Routes to School" program	No					Yes	2
Drains to TMDL water	No					Yes	--
Above groundwater basin	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

4.2.1.8 Results of Quantitative Prioritization of Projects

Based on the process described above, all public parcels and streets throughout the County were prioritized to identify opportunities for regional stormwater capture projects, green streets, and LID retrofit projects. Note that many public parcels were identified as potential candidates for both regional stormwater capture and LID retrofit opportunities. The following Figure 4-4 through Figure 4-9 show the results of this prioritization, which are presented for each type of project. These results are shown at the Countywide scale, as well as an example closer view at a city-scale to demonstrate the spatial resolution of the resulting database of project opportunities. Prioritization scores were categorized as high (red), medium (orange), and low (yellow) priority for implementation, as shown in Figure 4-4 through Figure 4-9. Appendix B contains lists of high and medium priority public parcels and green streets identified for each type of project opportunity. These lists also include additional information about the sites and final scores resulting from the prioritization criteria outlined in Section 4.2.1.7.

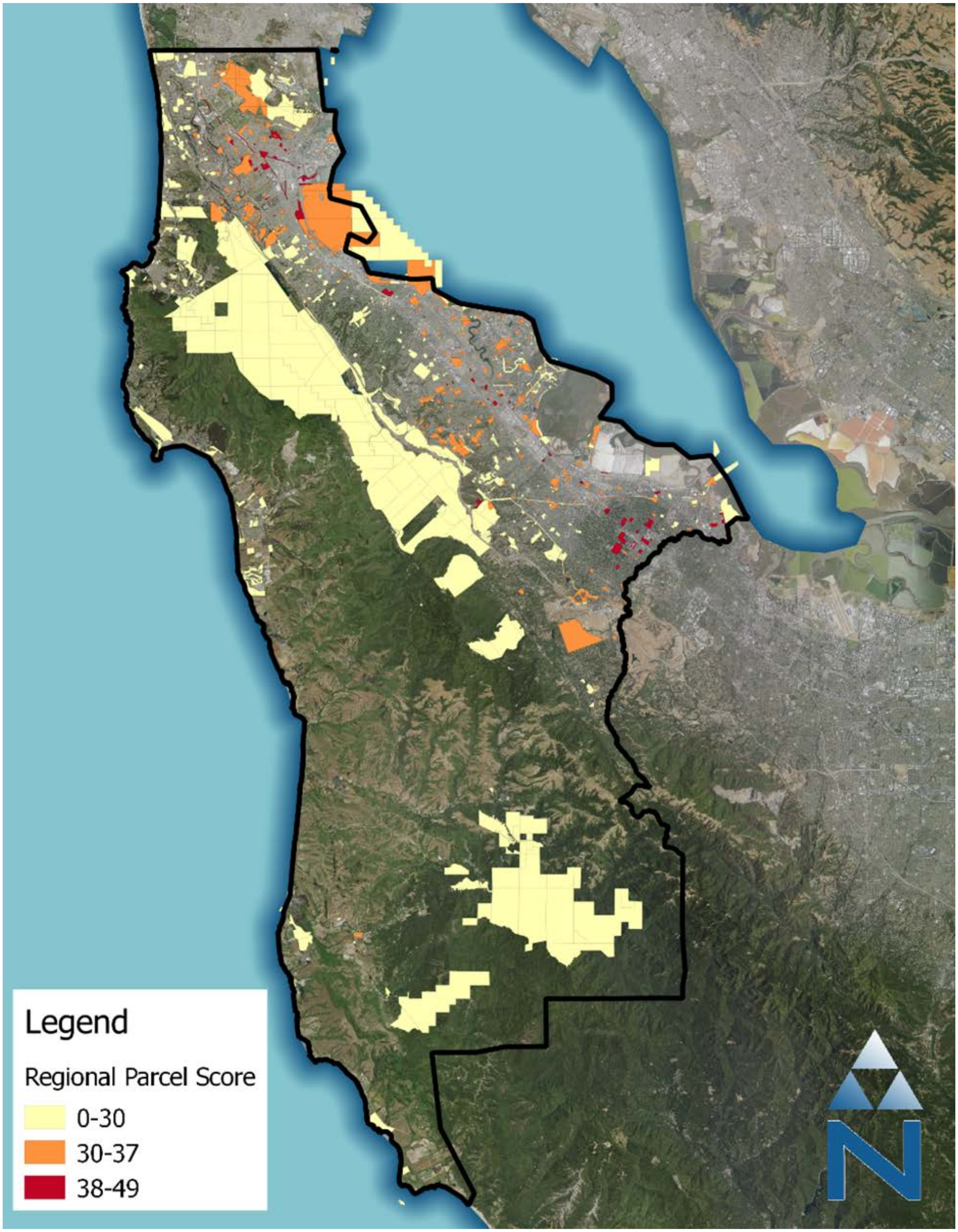


Figure 4-4. Prioritization of Opportunities for Regional Stormwater Capture Projects – Countywide

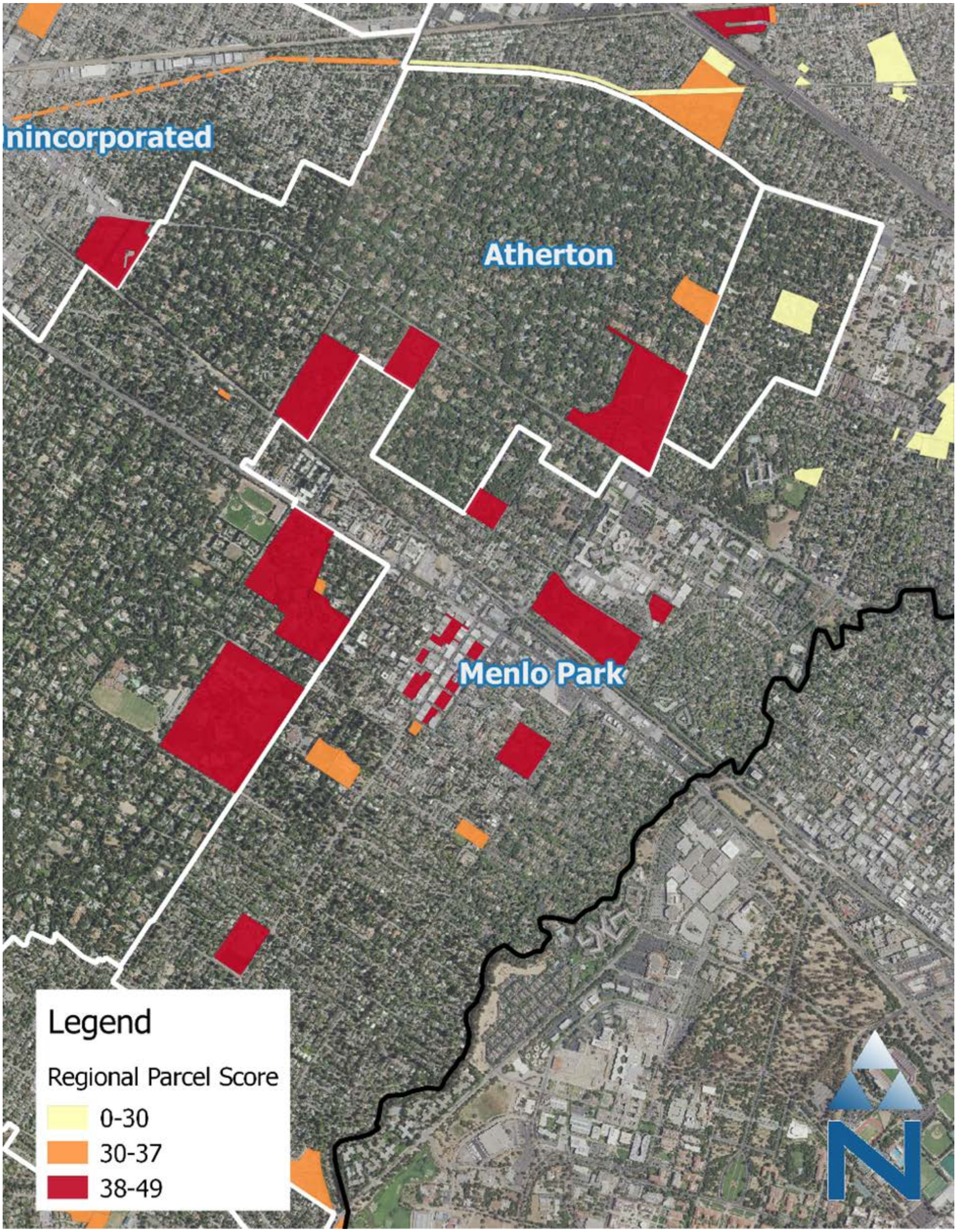


Figure 4-5. Prioritization of Opportunities for Regional Stormwater Capture Projects – Example City-Scale

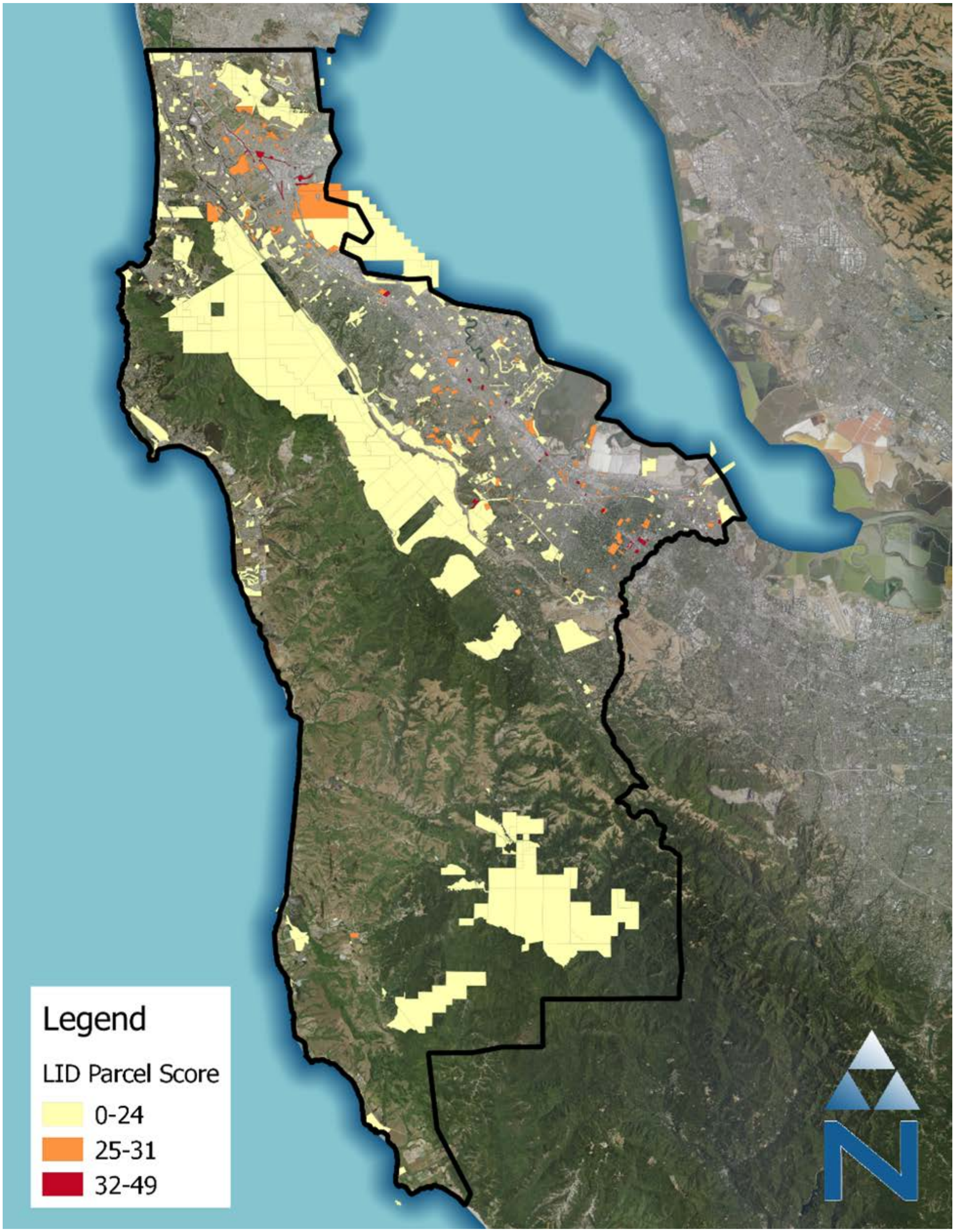


Figure 4-6. Prioritization of Opportunities for LID Retrofit Projects – Countywide

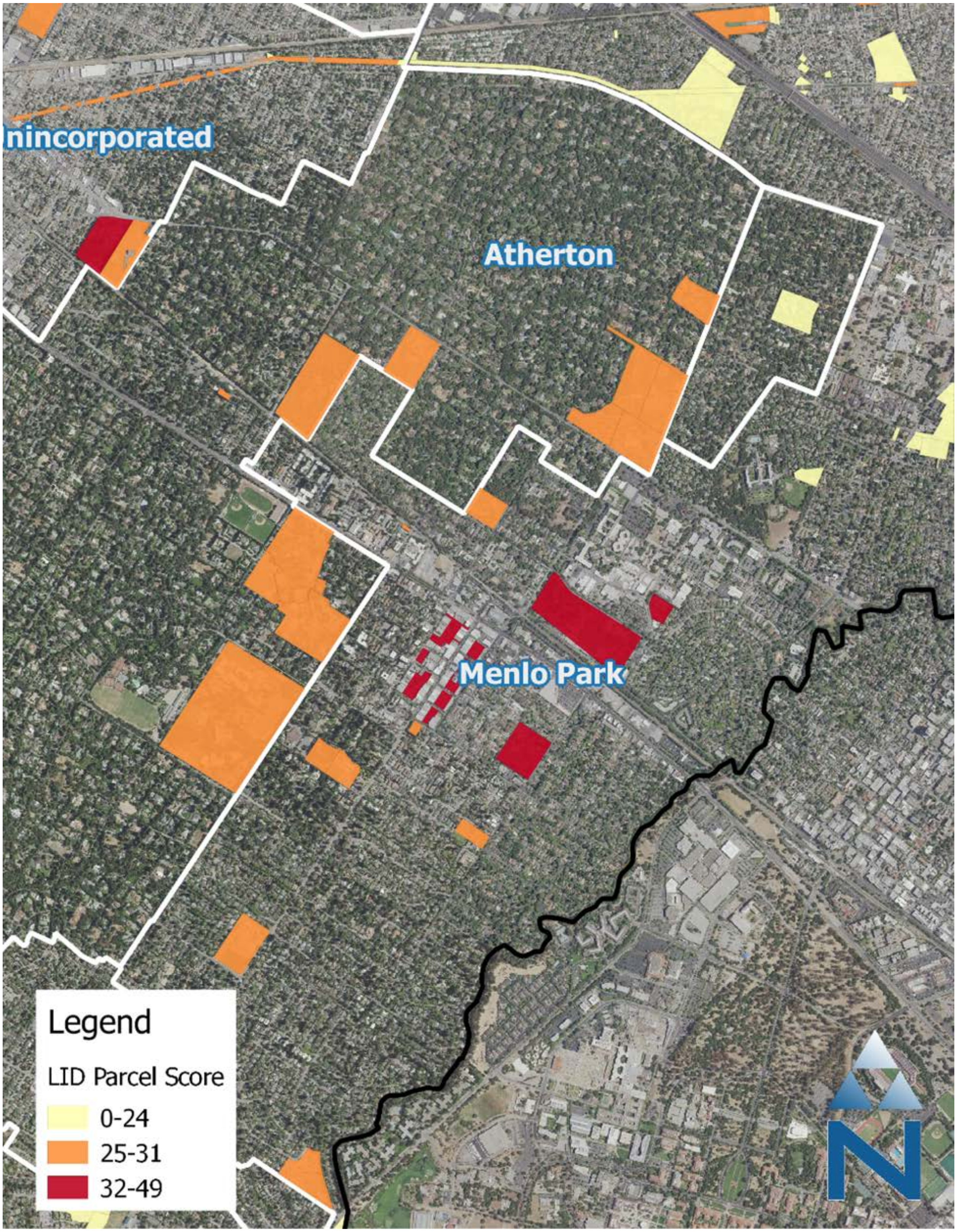


Figure 4-7. Prioritization of Opportunities for LID Retrofit Projects – Example City-Scale

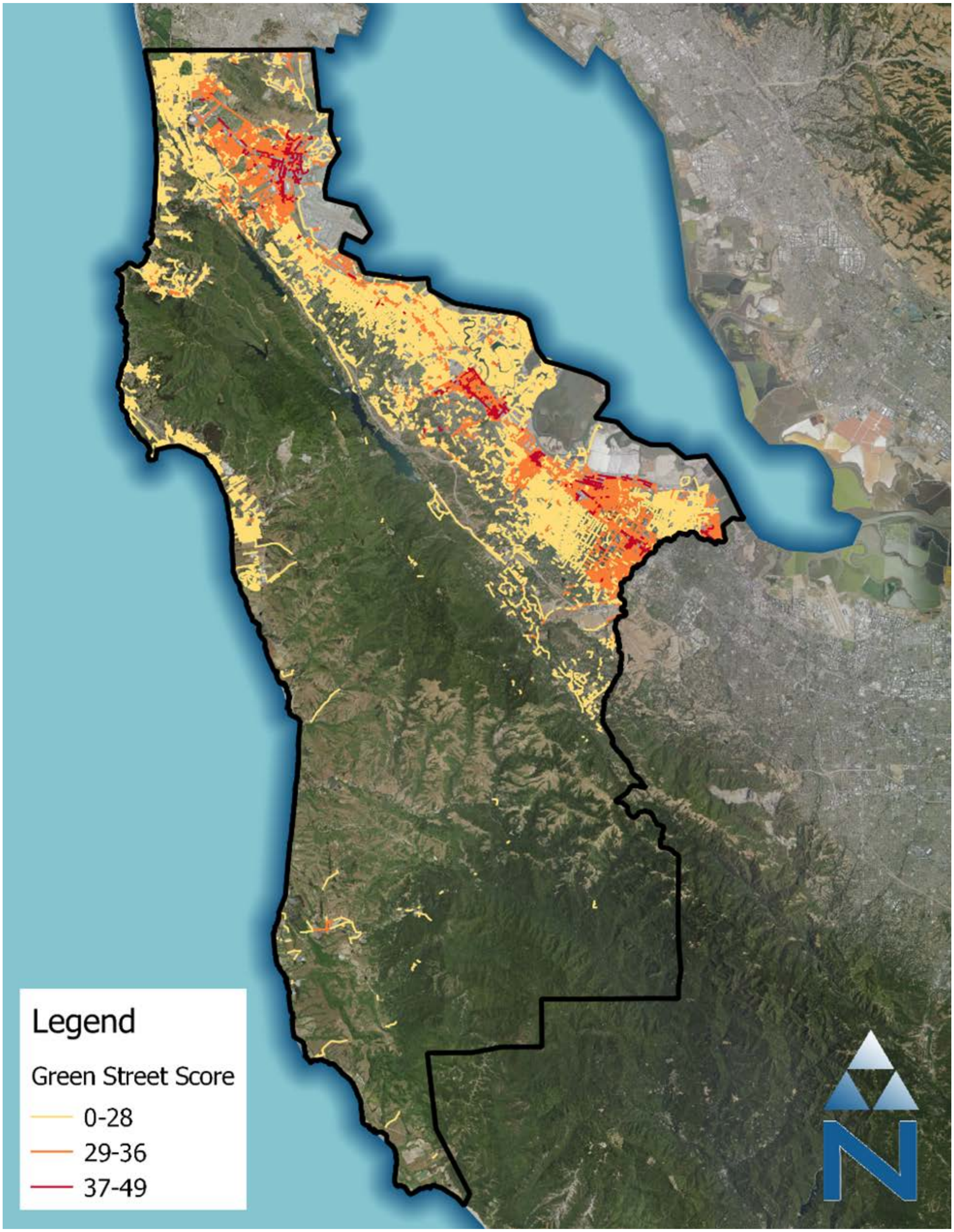


Figure 4-8. Prioritization of Opportunities for Green Streets – Countywide

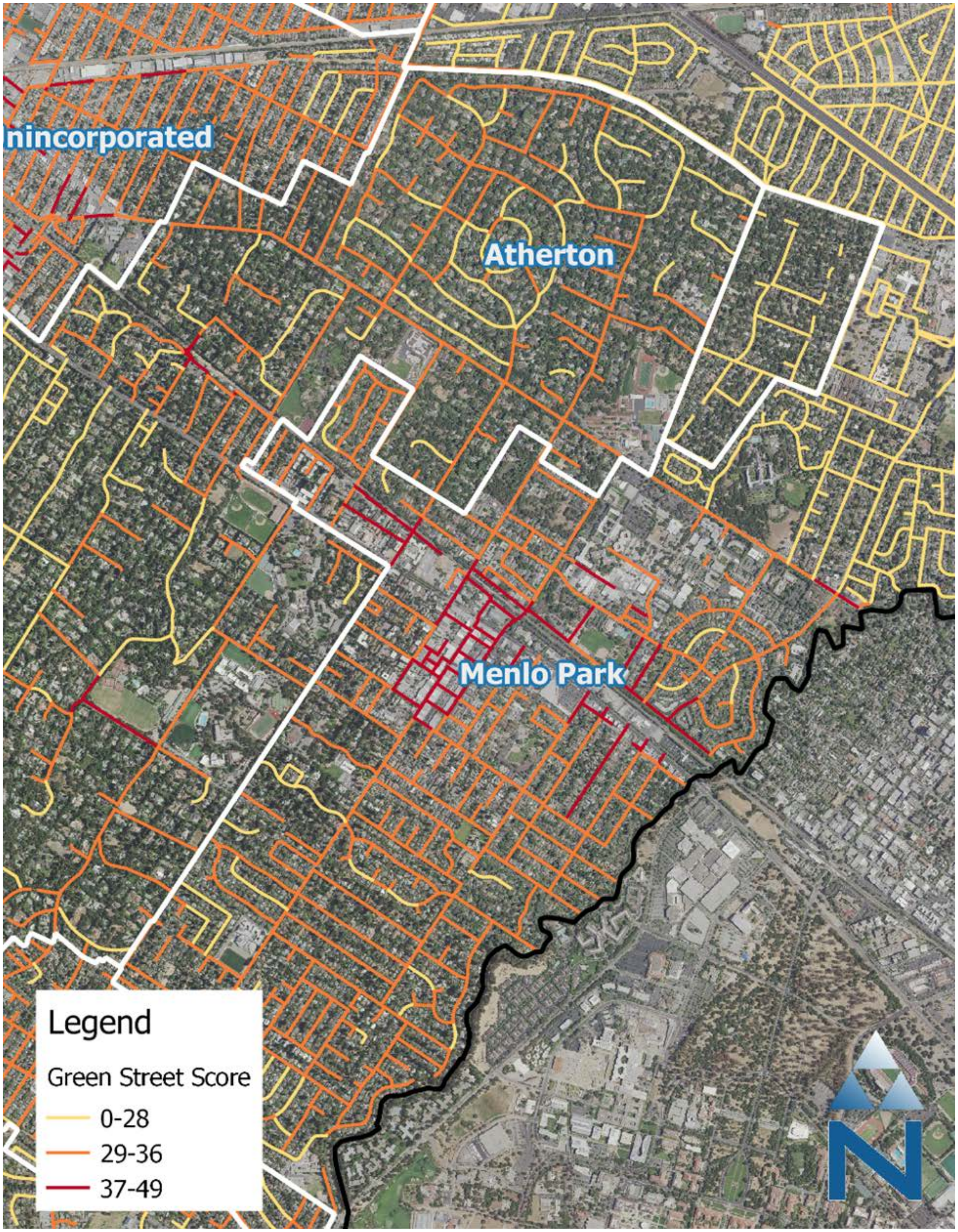


Figure 4-9. Prioritization of Opportunities for Green Streets – Example City-Scale

4.2.2 Quantitative Analysis of Stormwater Capture and Pollutant Load Reductions

A subset of 22 projects was selected from the prioritized list developed during the quantitative prioritization process. The subset was used to perform in-depth quantitative analysis. The 22 projects were selected based on several factors, including distribution across the county, proximity to impairments or flood prone streams, and opportunities for co-location of planned projects. Projects were also selected to provide as many jurisdictions as possible with concepts to pursue funding. Modeling of average annual stormwater capture volume and pollutant load reductions was conducted to provide more detailed quantitative analysis for the subset of projects and to act as a validation of the quantitative prioritization process.

The distribution of projects across the county enabled the testing of variability between project locations, types, and characteristics. Due to orographic effects, precipitation varies widely throughout the County. Varying levels of urbanization (and imperviousness) also exist throughout the County. Differences in precipitation and imperviousness incidentally affect the amount of stormwater runoff received and pollutants conveyed to downstream waterbodies and, potentially, the response of stormwater capture infrastructure. Additionally, projects were selected to proportionally represent existing TMDLs in the County. Since the San Francisco Bay PCB and mercury TMDLs require specific green infrastructure implementation requirements in the MRP (Section 2.8.2), most of the selected projects are in watersheds that drain to the Bay. Projects were also selected to ensure a variety of stormwater capture and green infrastructure types were examined. Three regional stormwater capture projects, fifteen green street, and four LID projects utilizing a variety of green infrastructure technologies were selected so that the effectiveness of several project types was evaluated.

The Stormwater Capture model, discussed in greater detail in Section 2.8.2, was used to estimate the average annual runoff volume to be captured by the subset of high opportunity projects. Average annual volume reduction calculations were then used to support estimation of pollutant load reductions based on the interim accounting methodology reported in the MRP[6]. The results of the quantitative analysis for each project is shown in Table 4-6.

Table 4-6. Volume and pollutant load reductions of stormwater capture projects

Project Name	Jurisdiction	Project Type	Volume Reduced (ac-ft/yr)	PCB Reduced (mg/yr)	Hg Reduced (mg/yr)
Orange Memorial Park	South San Francisco	Regional	455	7,081	50,242
Twin Pines Park	Belmont	Regional	9.95	155	1,098
Holbrook-Palmer Park	Atherton	Regional	242	3,769	26,746

[6] To calculate the pollutant load reductions, assumed values of generated pollutant mass/acre/year for old urban land use were assumed, obtained from the MRP. The MRP suggests that old urban land use generates 30.3 mg/acre/year of PCBs and 215 mg/acre/year of mercury in the San Francisco Bay Area. These assumptions, along with project drainage areas and modeled volume reductions, were used to estimate PCB and mercury load reductions.

Project Name	Jurisdiction	Project Type	Volume Reduced (ac-ft/yr)	PCB Reduced (mg/yr)	Hg Reduced (mg/yr)
Addison Avenue	East Palo Alto	Green Street	1.55	24.2	171.5
East Poplar Avenue	San Mateo	Green Street	1.46	22.7	161.1
Grand Avenue	South San Francisco	Green Street	1.31	20.3	144.3
San Anselmo Avenue	Millbrae	Green Street	4.56	71.0	503.7
Chapin Avenue	Burlingame	Green Street	4.93	76.6	543.7
Valley Drive	Brisbane	Green Street	2.16	33.5	237.9
Ruth Avenue	Belmont	Green Street	3.80	59.1	419.4
Alma Street	Menlo Park	Green Street	7.26	113.0	801.7
Rosewood Avenue and Elm Street	San Carlos	Green Street	16.93	263.3	1,868.5
Middlefield Road	Redwood City	Green Street	4.47	69.5	492.8
Hillside Boulevard	Colma	Green Street	2.67	41.5	294.8
Kennedy Middle School Green Streets	Redwood City	Green Street	3.51	54.6	387.7
Beach Park Boulevard	Foster City	Green Street	7.51	116.8	828.8
San Bruno Avenue East	San Bruno	Green Street	3.73	58.1	412.0
Rosita Road	Pacifica	Green Street	1.50	23.3	165.1
Middlefield Parking Lot	San Mateo County	LID Retrofit	0.56	8.7	61.6
City Hall Parking Lot	Half Moon Bay	LID Retrofit	0.66	10.3	73.0
Beresford Park	San Mateo	LID Retrofit	1.50	23.4	166.0
Doelger Senior Center	Daly City	LID Retrofit	3.07	47.8	339.4

4. 3 Development of Project Conceptual Designs

In addition to the detailed quantification of the subset of highest ranked project opportunities, preliminary conceptual designs and project costs were developed. The conceptual designs provide a platform to discuss project benefits with various audiences, including potential funding sources, project beneficiaries, stakeholders, and the community. The concepts provide project details and capital costs that will aid in the future design and implementation and seeking funding. Project details were developed using the results of the quantitative analysis described in Section 4.2.1.8.

Of the twenty-two concepts from the subset, three were developed for regional stormwater capture projects, fifteen for green street projects, and four for LID retrofit projects. While green street and LID concepts were contained to a single page, regional capture projects were more complex in design and implementation and so project details were considered in greater depth and were extended to multiple-page concepts. All concepts are included in Appendix C.

4.3.1 Regional Stormwater Capture Concepts

In examining the list of high priority projects from the prioritization method outlined in Section 4.2, three locations were identified as opportunities for regional stormwater capture. The projects were selected through an evaluation of the prioritization scoring, a preliminary examination of potential capture of a multi-jurisdictional area, and discussions with cities who own the project sites. When available, relevant watershed plans and park master plans were referenced in the development of project details and analysis of benefits. Figure 4-10 shows the location of all regional projects within the County.

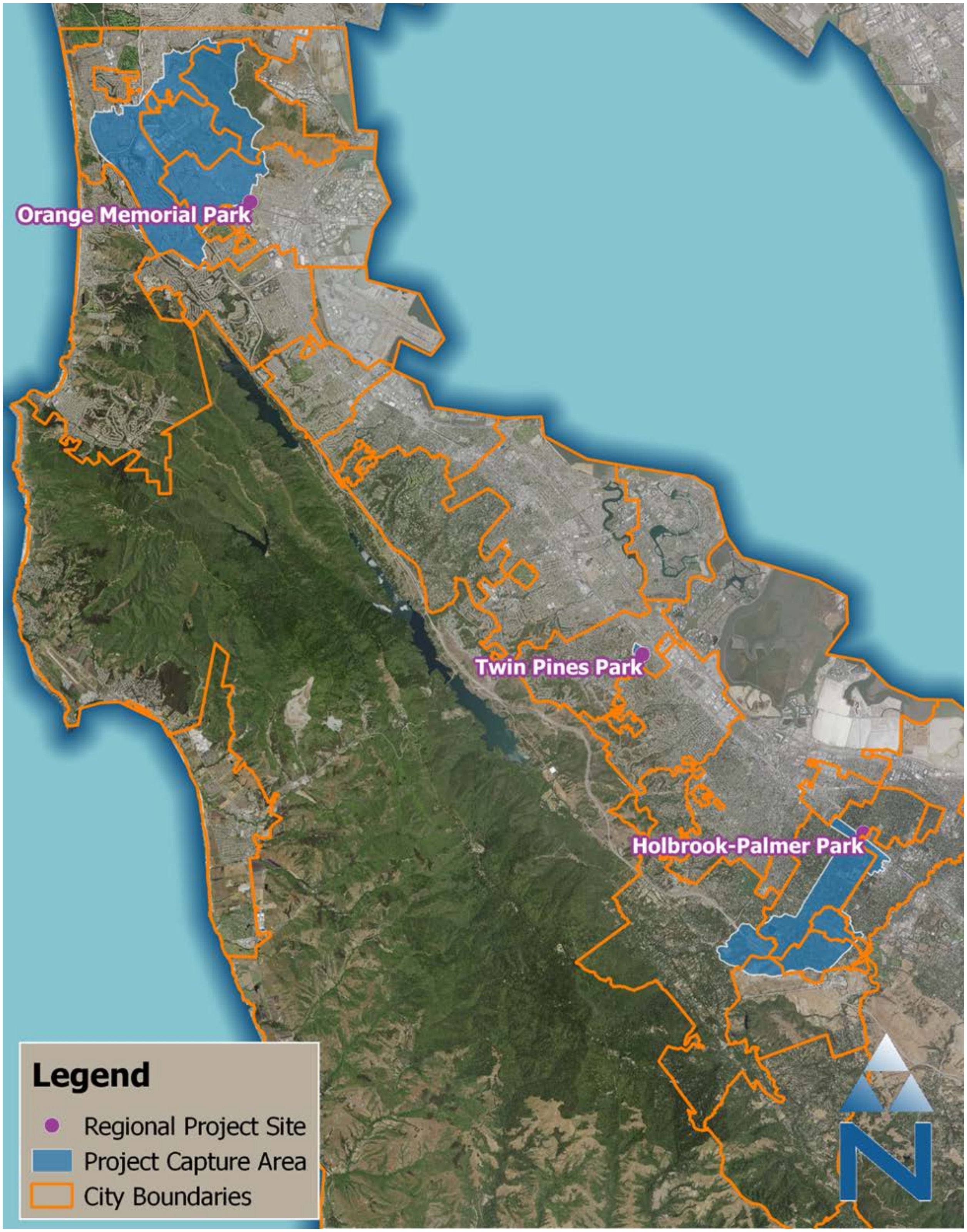


Figure 4-10. Regional stormwater potential capture project locations.

Orange Memorial Park (South San Francisco, CA)

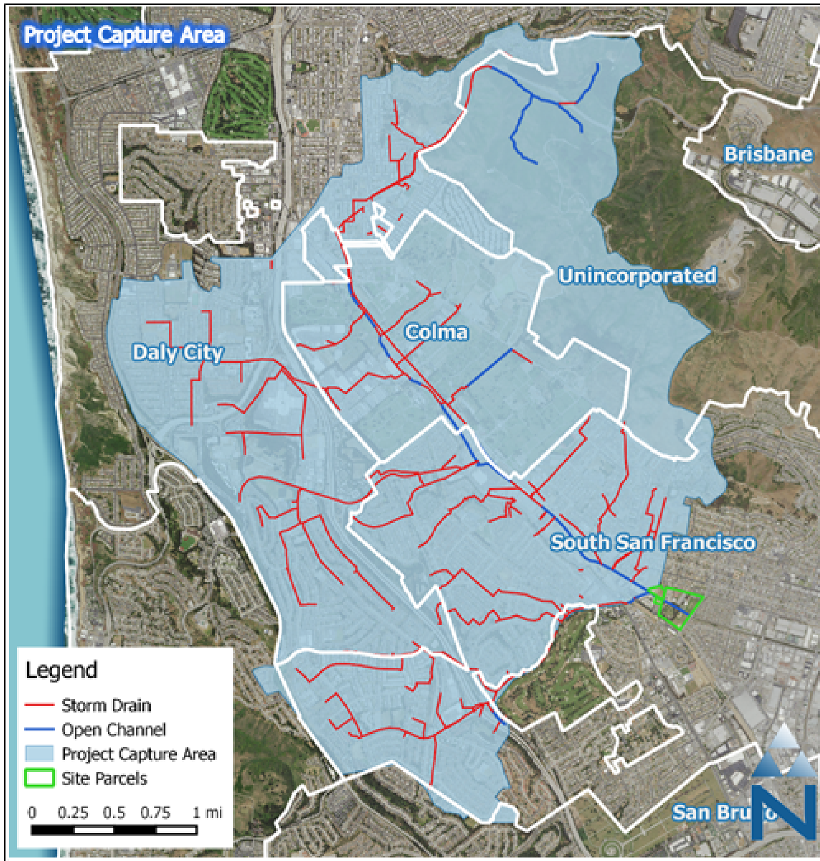
Orange Memorial Park, owned and maintained by the City of South San Francisco, was identified as a high opportunity stormwater capture project with a large multi-jurisdictional capture area approximately 6,300 acres. The project would divert runoff from a channelized section of Colma Creek that runs through the park. Colma Creek is a designated flood control channel and has downstream capacity issues that contribute to localized flooding. The project would receive runoff from a large portion of South San Francisco, Daly City, the entirety of the Town of Colma, and unincorporated San Mateo County. The first page of the concept is shown in Figure 4-11.

Twin Pines Park (Belmont, CA)

Twin Pines Park, owned and maintained by the City of Belmont, was identified as a potential location for a regional stormwater capture project. Belmont Creek is the primary receiving water for the City and runs through the park, and is identified as a flood-prone channel impacting downstream properties, including a pharmaceutical manufacturing facility. Several locations were explored at this site to divert runoff to a proposed subsurface infiltration gallery. The creek is not channelized at this segment and flows naturally. Although diversion from the creek would allow for the largest potential capture area, diversion from a natural channel is not feasible at this location. A nearby storm drain was identified as the most feasible opportunity for stormwater capture, and contains a drainage area of approximately 30 acres. The storm line has an outfall directly to the creek, so a regional project would still mitigate downstream flooding. The first page of the concept is shown in Figure 4-12.

Holbrook-Palmer Park (Atherton, CA)

Holbrook-Palmer Park was identified as a high opportunity project for regional stormwater capture. The park is owned and maintained by the Town of Atherton and is adjacent to a channelized segment of Atherton Creek, which drains to the Bayfront Canal, another flood-prone channel. The proposed project is a subsurface infiltration gallery at the sports field of the park that could divert runoff directly from the creek. The project would capture a large portion of the upper Atherton Creek watershed and would alleviate downstream flooding issues, as well as reduce pollutant loads to the creek and its receiving water, San Francisco Bay. The first page of the concept is shown in Figure 4-13.



Site Description:

This project concept consists of two offline subsurface infiltration chambers at Orange Memorial Park. The park is a prime location to site a regional stormwater capture project and captures stormwater from large portion of the upper Colma Creek watershed and multiple city and county jurisdictions. The potential capture area of the project is roughly 6,300 acres that drains portions of the cities of South San Francisco, Colma, and Daly City and Unincorporated San Mateo County. A stormwater capture project at this location would aid these jurisdictions in meeting stormwater permit compliance and alleviate flooding in the lower reaches of Colma Creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (including TMDLs that require reductions of mercury and PCB loads), augment water supply by recharging the Westside groundwater basin, and provide community enhancement through integration with the recreational facilities of the park. With the incorporation of a hydrodynamic separator for pretreatment of diverted water from the creek, the project also provides the reduction of trash transported through the creek to the San Francisco Bay. The Orange Memorial Park Master Plan (2007) was referenced in this design to ensure that the concept is consistent with the goals of future development for the park.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

Drainage Characteristics

Capture Area (acres)	6,300
Impervious Area (%)	38
Dominant Land Use	Residential
Jurisdictions	South San Francisco, Colma, Daly City, Unincorporated San Mateo County

Site Information

Land Owner	City of South San Francisco
Street Address	Orange Ave, South San Francisco, CA 94080
Latitude/Longitude	37° 39' 13.1" N / 122° 25' 35.4" W
Watershed	Colma Creek

Orange Memorial Park: street view facing upstream of Colma Creek from W Orange Ave

Concept for a Multi-jurisdictional Regional Stormwater Capture Project
Site: Orange Memorial Park (City of South San Francisco)

Figure 4-11. Excerpt from Orange Memorial Park concept.

Site Information

Land Owner	City of Belmont
Street Address	30 Twin Pines Ln, Belmont, CA 94002
Latitude/Longitude	37° 31′ 02.3″ N / 122° 16′ 40.4″ W
Watershed	Belmont Creek

Site Description:

This project concept consists of an offline subsurface infiltration chamber at Twin Pines Park. The park is owned and operated by the City of Belmont and is adjacent to City Hall. The park provides the opportunity to treat runoff from a 30-acre area that is primarily residential and drains directly to Belmont Creek. Due to the heavy tree cover that dominates most areas of the park, the parking lots represents some of the few opportunities for stormwater capture. The project would capture flows and associated pollutant loadings from a small portion of the upper Belmont Creek, entirely within the City of Belmont. The project would help to alleviate flooding issues in lower reaches of Belmont Creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (mercury and PCBs), augment water supply by recharging the Santa Clara Valley groundwater basin, and provide community enhancement through integration with the recreational facilities of the park.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

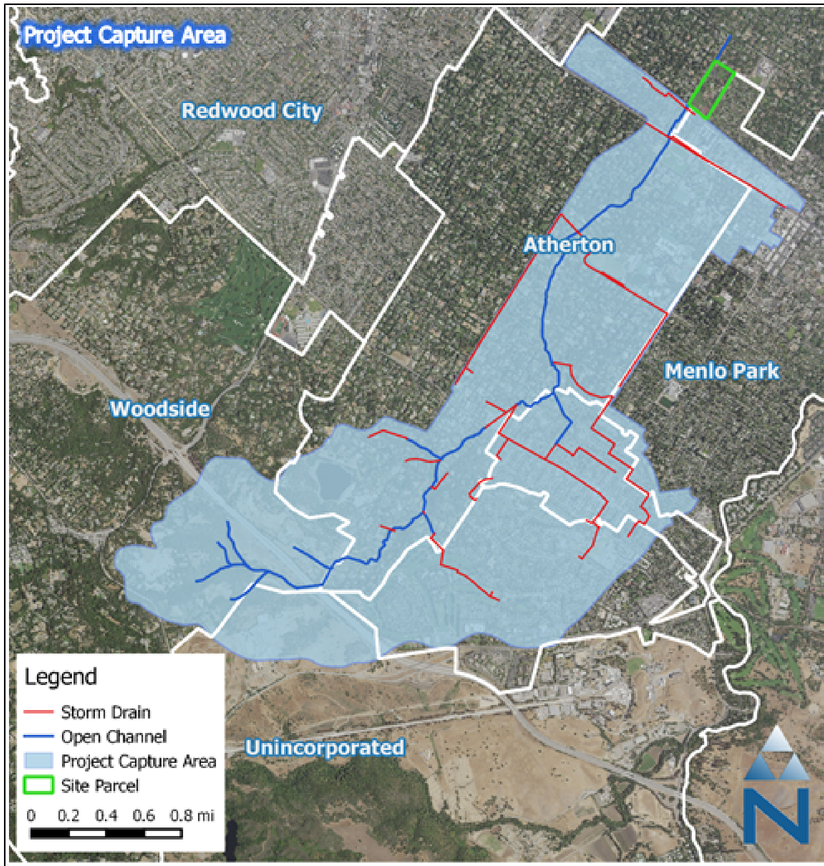
Drainage Characteristics

Capture Area (acres)	30
Impervious Area (%)	27
Dominant Land Use	Residential
Jurisdictions	Belmont

Twin Pines Park: west parking lot

Concept for a Multi-jurisdictional Regional Stormwater Capture Project
Site: Twin Pines Park (City of Belmont)

Figure 4-12. Excerpt from Twin Pines Park concept.



Site Description:

This project concept consists of an offline subsurface infiltration chamber at Holbrook-Palmer Park, owned and operated by the Town of Atherton. This is an ideal site for a regional stormwater capture project because of its proximity to Atherton Creek and the potential to treat a large multi-jurisdictional area. The project would capture flows and associated pollutant loadings from a large portion of the upper Atherton Creek watershed, encompassing sections of the Towns of Atherton and Woodside, City of Menlo Park, and Unincorporated San Mateo County. The project would help to address known flooding issues in the lower reaches of the creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (including TMDLs that require reductions of mercury and PCB loads), augment water supply by recharging the Santa Clara Valley groundwater basin, and provide community enhancement through integration with the recreational facilities of the park. With the incorporation of a hydrodynamic separator for pretreatment of diverted water from the creek, the project also provides the reduction of trash transported through the creek to the San Francisco Bay.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

DISCLAIMER: All elements of this conceptual design are planning-level, based on desktop analysis. All assumptions and parameters must be re-evaluated during the detailed design process. Costs estimates are based on available data. Actual costs will vary.

Drainage Characteristics

Capture Area (acres)	2,875
Impervious Area (%)	19
Dominant Land Use	Residential
Jurisdictions	Atherton, Menlo Park, Woodside Unincorporated San Mateo County

Site Information

Land Owner	Town of Atherton
Street Address	150 Watkins Ave, Atherton, CA 94027
Latitude/Longitude	37° 27′ 44.9″ N / 122° 11′ 34.8″ W
Watershed	Atherton Creek

Concept for a Multi-jurisdictional Regional Stormwater Capture Project
Site: Holbrook-Palmer Park (Town of Atherton)

Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Figure 4-13. Excerpt from Holbrook-Palmer Park concept.

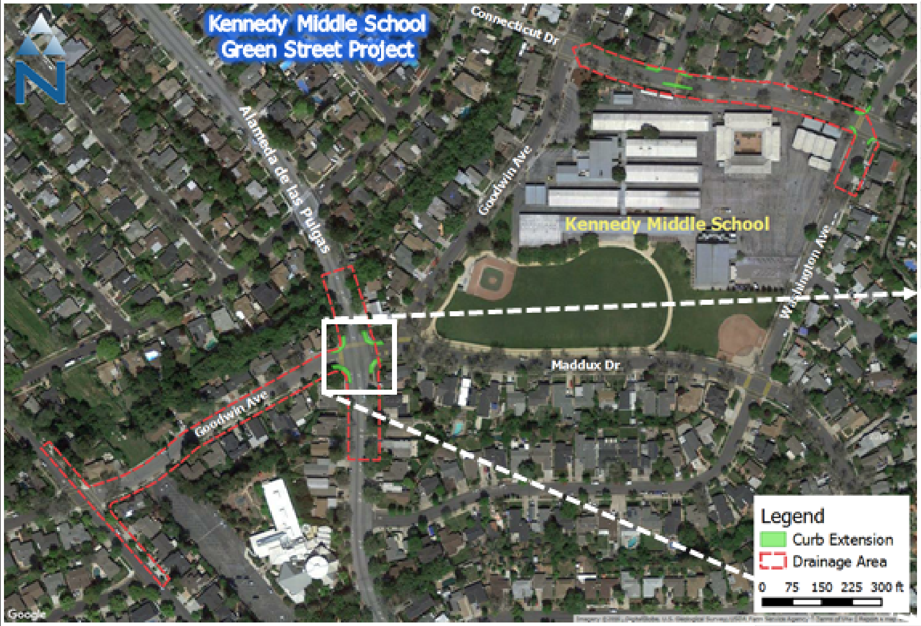
4.3.2 Green Street Concepts

In most watersheds, green streets were selected as the primary alternative. A total of fifteen sites were selected for the development of green street concepts from the highest ranking project sites in the prioritized list. Green street opportunities that were specifically identified by cities as co-located with a planned project were included in this selection. In a few cases, cities that did not have a preference for a green street project site or where no co-location opportunities exist requested that the highest ranked green street site be selected for calculation of benefits and concept development. A majority of green street projects with co-location opportunities were due to the County's Safe Routes to School program. The Safe Routes to School program aims to enhance the safety of school walking routes by implementing walkway features that increase visibility, calm traffic, and shorten the distance of pedestrian crossings. Improvements typically require replacement of curb and gutter, presenting opportunities for drainage improvements and green infrastructure projects. Locations of selected green street projects within the County are shown in Figure 4-14.

Conceptual designs for green streets were developed to portray benefits from green infrastructure implementation. These details were based on quantitative analysis of benefits through a stormwater capture model. All project details were developed to meet volume and pollutant load reductions modeled using the design storm. A variety of green infrastructure solutions were implemented between projects, depending on site characteristics and constraints, previous plans provided by cities, and city input. Bioretention elements and permeable pavements were the primary improvement recommendations. In general, bioretention was recommended as often as possible due to reduced imperviousness and increasing urban greenery benefits. Permeable pavements, however, reduce imperviousness but do not contribute to urban greenness. Permeable pavement, alternatively, was utilized in space-limited sites where bioretention elements could not treat the entire design storm and did not significantly impact the use of the roadway (curbside parking, adequate number of lanes, lane width, etc.). Permeable pavement, while not adding greenness, has the alternate benefit of retaining usability of the footprint.

The green street concepts were developed as one-page fact sheets as a presentable format to present project details and benefits. An example concept is shown for the Safe Routes to School project at Kennedy Middle School in Redwood City in Figure 4-15. The remaining green street concepts are in Appendix C.

Figure 4-14. Green street project locations.



Site Information	
Jurisdiction	City of Redwood City
Street Name	Goodwin Ave & Connecticut Dr
Street Typology	High-Density Residential
Co-Located Project	Safe Routes to School
Capture Area (acres)	3.32
Impervious Area (%)	90
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.21

Site Description:

The proposed project consists of green street improvements along Connecticut Drive between Goodwin Avenue and Washington Avenue, and the intersection of Goodwin Avenue and Alameda de las Pulgas. The site is characterized by high-density residential streets that border the John F. Kennedy Middle School. Curb extensions are recommended as the primary treatment type. This project will integrate with the Safe Routes to School Program to implement green infrastructure that will also improve pedestrian safety. Curb extensions are proposed at crosswalks to improve pedestrian visibility and decrease crossing distance. The project also presents an opportunity for public education and signage can be implemented to inform the public on the benefits of green infrastructure.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.21 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, safer pedestrian routes, and other multiple benefits.

DISCLAIMER: All elements of this conceptual design are planning-level. Locations of opportunities for placement of green infrastructure shown in the map are preliminary and subject to further site assessment and design. Percent imperviousness is based on best professional judgement. All design assumptions/parameters and cost estimates must be re-evaluated during the detailed design process.

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	12	405	0.210

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	900	CY	$50.00	$45,000
Bioretention	4,860	SF	$25.00	$122,000
Curbs and Gutters	405	LF	$17.25	$7,000
			CONSTRUCTION SUBTOTAL	$174,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$148,000
			TOTAL COST	**$322,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Kennedy Middle School Green Streets (City of Redwood City)

Figure 4-15. Example green street concept from Kennedy Middle School 'Safe Routes to School' project.

4.3.3 Low Impact Development Retrofit Concepts

A total of four projects were identified for LID Retrofit. These projects were identified by cities as sites that were already being planned for redevelopment and so presented opportunities for implementation of green infrastructure. Figure 4-16 shows locations of all LID projects within the County. The LID retrofit concepts were developed as one-page fact sheets as a presentable format to present project details and benefits. An example concept is shown in Figure 4-17 for a City of San Mateo parking lot at Beresford Park. The remaining green street concepts are in Appendix C.

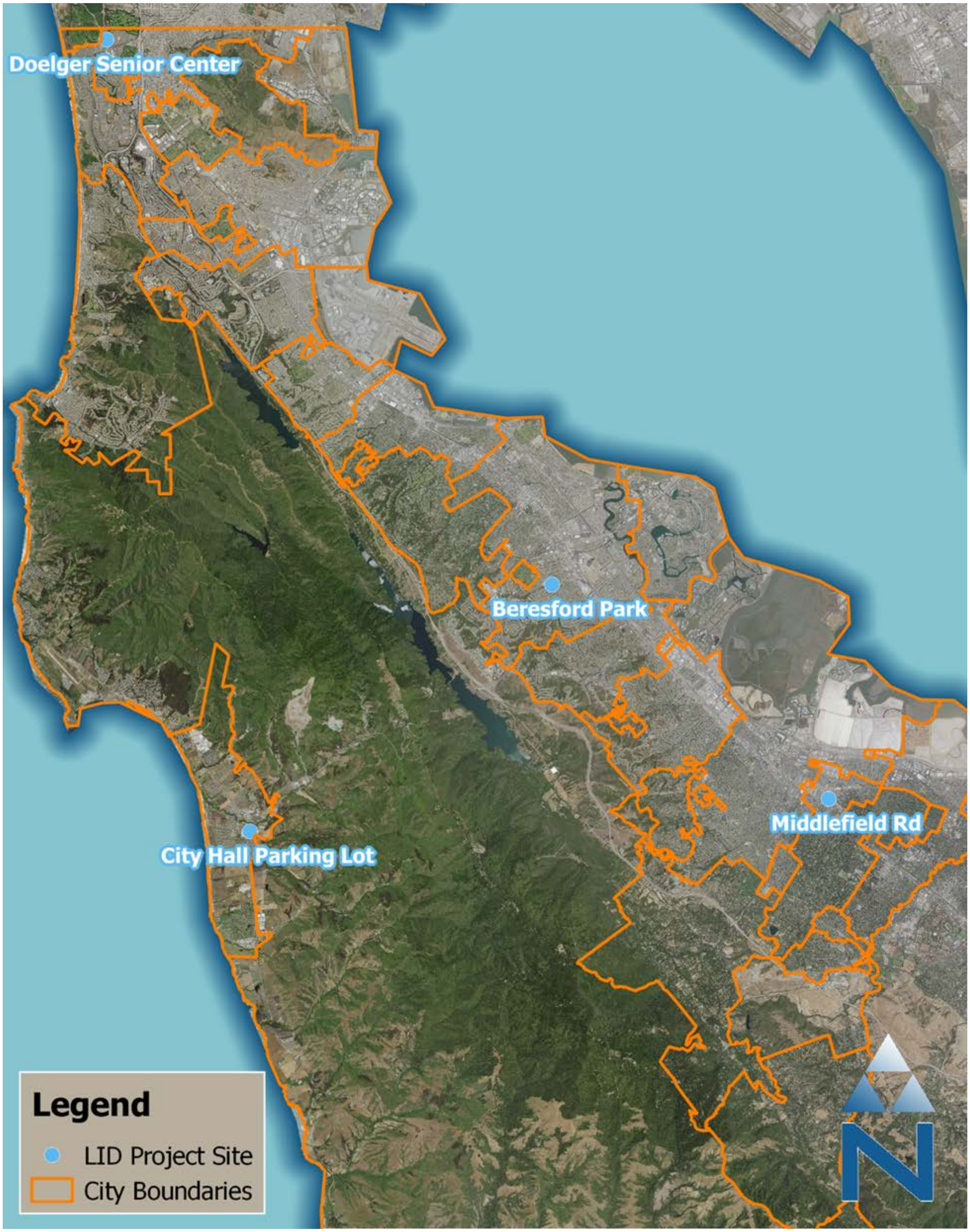


Figure 4-16. LID project location

Site Information	
Jurisdiction	City of San Mateo
Address	2720 Alameda de las Pulgas, San Mateo, CA 94403
Co-Located Project	Beresford Park Parking Lot Resurfacing
Capture Area (acres)	1.42
Impervious Area (%)	90
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.09

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Rain Garden)	8	260	0.090

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	385	CY	$50.00	$19,000
Bioretention	2,080	SF	$25.00	$52,000
Curbs and Gutters	520	LF	$17.25	$9,000
			CONSTRUCTION SUBTOTAL	$80,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$68,000
			TOTAL COST	$148,000

Site Description:

The proposed project consists of low impact development (LID) retrofits at the parking lot of Beresford Park along Alameda de las Pulgas. LID will be implemented to capture stormwater from on-site. Bioretention is recommended as the primary treatment type. Implementation of LID improvements will coincide with a resurfacing project for the parking lot. The parking lot layout depicted in the figure above is conceptual in order to show how a rain garden can be implemented in a typical parking lot. Actual traffic flow and available area for parking stalls must be evaluated separately during the actual design phase.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.09 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits. Additionally, signage can be implemented to provide opportunities for public education on green infrastructure.

DISCLAIMER: All elements of this conceptual design are planning-level. Locations of opportunities for placement of green infrastructure shown in the map are preliminary and subject to further site assessment and design. Percent imperviousness is based on best professional judgement. All design assumptions/parameters and cost estimates must be re-evaluated during the detailed design process.

Concept for a Low Impact Development Retrofit for Stormwater Capture
Site: Beresford Park Parking Lot (City of San Mateo)

Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Figure 4-17. Example LID Retrofit Concept for Beresford Park Parking Lot.

5 PLAN IMPLEMENTATION STRATEGY AND SCHEDULING OF PROJECTS

For the SRP to be effective, an adaptive management and funding strategy is needed to transition from planning to implementation. The following sections outline the strategy for funding and implementation performance measurement to inform the adaptive management process.

5. 1 Resources for Plan Implementation

As discussed in Section 2.8.2, TMDL pollutant reduction schedules will drive the pace for the implementation of projects within San Mateo County watersheds. Green infrastructure planning efforts and the reasonable assurance analysis of the TMDL Implementation Plan will be completed in the coming years. These planning efforts will determine the amount of green infrastructure and other stormwater capture projects necessary to achieve pollutant reductions to meet interim and final wasteload allocations. Two broad categories of projects are being considered for these efforts:

- **LID for New Development and Redevelopment:** As a requirement of the MRP, San Mateo County public agencies are already using their planning authorities to require appropriate source control, site design, stormwater treatment, and hydromodification management measures in new development and redevelopment to address stormwater runoff. As a result, the green infrastructure planning and reasonable assurance analysis associated with the TMDL Implementation Plan will consider: (1) LID implemented within new development and redevelopment since 2003 (baseline loading scenarios of the TMDLs), and (2) future projections of development and redevelopment occurring throughout the County with the incorporation of LID. It is expected that LID for new development and redevelopment will play a major role in reducing pollutant loads associated with stormwater. The funding for these LID implementation efforts will come from the development community, and are therefore not considered within the SRP.
- **Publicly Funded Stormwater Capture Projects:** Parallel ongoing efforts of the reasonable assurance analysis for the TMDL Implementation Plan will determine the amount of pollutant load reduction expected to be achieved through the implementation of LID projects above, and if that load reduction is insufficient to meet TMDL load reduction goals, additional stormwater capture projects will be required to be implemented by public agencies. These projects will likely include a combination of LID retrofits, regional stormwater capture projects on publicly owned parcels, and green streets, as summarized in Section 4.2.1.8.

In summary, the SRP is focused on the implementation of publicly funded stormwater capture projects, and the extent of long-term implementation will not be determined until the reasonable assurance analysis for the TMDL Implementation Plan is completed in 2019-2020. Although these stormwater capture projects have several additional multiple benefits (beyond pollutant load reduction) that justify their implementation and investment, the TMDL implementation schedules and regulatory requirements of the MRP drive present decisions for additional funding needs beyond current stormwater management and integrated regional water management planning. Once the TMDL Implementation Plan is completed and a thorough understanding of stormwater capture project needs is reached, the SRP plan, through adaptive management, will be revisited and updated with a comprehensive assessment of funding needs and associated opportunities. Funding needs will span 23 years to the final MRP green infrastructure/TMDL compliance milestone in 2040. In the meantime, C/CAG agencies are taking a proactive approach to prepare for the anticipated need for stormwater capture projects by focusing on necessary pollutant reduction while maximizing multiple benefits. The development of this SRP is an outcome of that proactive approach. C/CAG agencies engaged in a comprehensive review of watershed processes, management needs, and the identification of hundreds of project opportunities. Projects were prioritized for selection and planning of key multi-benefit projects that may be pursued in the near future. A subset of the highest priority projects was selected for development of project concepts to facilitate near-term project planning. The following is a summary of costs for these high priority project concepts. Additional summaries of the projects, including conceptual designs and cost assumptions, are included in Appendix C.

Table 5-1. Costs of high priority projects with concepts included in SRP

Project Name	Jurisdiction	Project Type	Capital Cost[1]
Orange Memorial Park - Phase 1	South San Francisco	Regional	$7,176,000
Orange Memorial Park - Phase 2	South San Francisco	Regional	$27,355,000
Twin Pines Park	Belmont	Regional	$778,000
Holbrook-Palmer Park	Atherton	Regional	$18,610,000
Addison Avenue	East Palo Alto	Green Street	$982,000
East Poplar Avenue	San Mateo	Green Street	$161,000
Grand Avenue	South San Francisco	Green Street	$131,000
San Anselmo Avenue	Millbrae	Green Street	$498,000
Chapin Avenue	Burlingame	Green Street	$629,000
Valley Drive	Brisbane	Green Street	$215,000
Ruth Avenue	Belmont	Green Street	$344,000
Alma Street	Menlo Park	Green Street	$577,000
Rosewood Avenue and Elm Street	San Carlos	Green Street	$1,362,000
Middlefield Road	Redwood City	Green Street	$422,000
Hillside Boulevard	Colma	Green Street	$302,000
Kennedy Middle School Green Streets	Redwood City	Green Street	$322,000
Beach Park Boulevard	Foster City	Green Street	$703,000
San Bruno Avenue East	San Bruno	Green Street	$357,000
Rosita Road	Pacifica	Green Street	$157,000
Middlefield Parking Lot	San Mateo County	LID Retrofit	$187,000

Project Name	Jurisdiction	Project Type	Capital Cost[1]
City Hall Parking Lot	Half Moon Bay	LID Retrofit	$115,000
Beresford Park	San Mateo	LID Retrofit	$148,000
Doelger Senior Center	Daly City	LID Retrofit	$496,000
		TOTAL	**$62,027,000**

[1] Capital costs only include estimates of green infrastructure and stormwater capture elements, and do not account for long-term operations and maintenance.

As funding becomes available, these projects will be further assessed and investigated as options to support TMDL implementation and green infrastructure planning to meet the first near-term MRP milestones in 2020 (Table 2-8). For larger regional projects, schedules will likely require more time for planning, phasing, design, and construction, and are therefore expected to be implemented beyond 2020. For example, Orange Memorial Park is divided into two phases for retrofit of different portions of the park with infiltration basins. The smaller project will likely be pursued first (Phase 1), with the second more expensive project pursued later to take advantage of lessons learned from Phase 1. Also, implementation of both phases will require integration into the scheduling plans for overall park improvements and expansion.

All the priority projects included in Appendix C provide ideal opportunities to demonstrate to the public and local agencies the many benefits of green infrastructure and regional stormwater capture. These educational opportunities will help garner support for more substantial changes and increased funding for green infrastructure and stormwater capture, which will become paramount to future implementation to meet TMDL and MRP compliance schedules. As a result, the present funding strategy is through current stormwater and transportation funds, matched with grant opportunities and potential partnerships with federal and state agencies. The following are examples of opportunities currently sought to supplement local funding for project implementation:

- Current discussions with Caltrans for potential partnership to fund regional projects (Orange Memorial Park Phase 1 and Holbrook-Palmer Park) and contribute to their state-wide TMDL implementation and NPDES permit requirements.
- Two proposals submitted for the Round 1 Proposition 1 Stormwater Implementation Grant: (1) San Mateo Sustainable Streets and Parking Lot (3 projects), and (2) Redwood City Sustainable Streets Project (2 projects).

Upon completion of green infrastructure planning, reasonable assurance analysis, and the overall TMDL Implementation Plan between 2017 and 2020, specific goals for green infrastructure and stormwater capture projects will be determined for each municipality within San Mateo County. As required by the MRP, these goals will define the level of green infrastructure/stormwater capture needed by 2020, 2030, and 2040. Once these planning efforts are completed, the SRP can be revisited through the adaptive management process to incorporate the individual implementation plans for each agency. The substantial addition of projects to the SRP will also result in the development of a more-detailed funding strategy. As a result, this initial SRP sets the stage for a more comprehensive implementation and funding strategy that will grow and expand over time.

5. 2 Implementation

The SRP includes 22 detailed project concepts (Appendix C) that provide information to support project implementation. The following are additional considerations and components of the SRP that will support project implementation.

5.2.1 Incorporation of the SRP into the Bay Area Integrated Regional Water Management Plan

Upon approval of the SRP by the State Water Board, projects included in Appendix B and C will be submitted for inclusion in the next update of the Bay Area Integrated Regional Water Management Plan (IRWMP). The IRWMP is a nine-County effort that requires coordination with numerous agencies for updates. The last update of the IRWMP occurred in 2013. Presently, there are plans to potentially update the climate change section of the IRWMP, but no other updates to the IRWMP are planned at this time, including the addition of new projects and the resulting prioritization process that occurs to assess projects relative to IRWMP goals. However, as the SRP correlates with many of the planning and project goals of the IRWMP, C/CAG will continue to coordinate with the San Francisco Bay IRWMP Coordinating Committee on integration of the SRP into the IRWMP, including submittal of SRP projects for grant submittals associated with the IRWMP.

5.2.2 Actions, Projects, and Studies by which the SRP will be Implemented

Section 2.8.2 identified a number of planning efforts associated with the MRP that will be considered throughout implementation of the SRP, including development of the TMDL Implementation Plan that will include extensive green infrastructure planning and modeling to support the reasonable assurance analysis. These separate planning efforts greatly impact the SRP as they will identify projects between now and 2040 to meet green infrastructure and TMDL implementation requirements of the MRP for each C/CAG member agency. Results of these separate projects and planning efforts will then require close coordination with the SRP in two ways:

1. The green infrastructure planning and reasonable assurance analysis for the TMDL Implementation Plan will provide new information on green infrastructure and stormwater capture projects that can be integrated into the SRP in future updates.
2. The SRP can inform the selection of projects for the TMDL Implementation Plan that considers multiple benefits beyond improving water quality, potentially influencing projects selected for implementation to meet MRP and TMDL implementation goals.

For this reason, the SRP has been developed in close coordination with these separate projects and planning efforts, and implementation will continue along this path. For instance, many of the tools used for the quantification of stormwater capture and pollutant load reductions associated with projects in the SRP are consistent with tools to be used for the reasonable assurance analysis that will inform the TMDL Implementation Plan.

5.2.3 Entities Responsible for Project Implementation

For each of the priority projects included and planned for implementation in Appendix C and Table 5-1, also listed is the primary entity that will be responsible for project implementation, should funding become available. However, if other city/County jurisdictions or other agency jurisdictions (e.g., Caltrans, water districts) are located within a project drainage area, partnerships may be developed to support project funding and implementation. C/CAG and the Countywide Program will support coordination of member agencies and lead entities of projects on the overall SRP strategic planning efforts. Currently, C/CAG staff is collaborating with staff from San Mateo County's Office of Sustainability and Department of Public Works on the role of stormwater management and green infrastructure in regard to sea level rise and flooding. C/CAG intends to continue these partnerships to ensure that stormwater capture and green infrastructure is effectively integrated with other Countywide and multi-jurisdictional planning and implementation efforts.

5.2.4 Community Participation Strategy for SRP Implementation

Section 6 provides an overview of the community participation strategy that supported development of the SRP and will provide a springboard for continued community participation through implementation. Community participation will also occur during individual project implementation, which will focus on the community where the project is located. The present form of the SRP focuses on projects throughout the County that will serve the dual purpose of public demonstration of green infrastructure and stormwater capture projects. These near-term projects will provide an ideal opportunity to showcase the many benefits of green infrastructure and multiple benefit projects, particularly regarding features and functionality that will serve the community. These projects will provide many functions such as improved aesthetics, traffic calming, improved pedestrian access, etc., and with proper educational tools such as interpretive signage, the public can gain a better understanding of opportunities to capture, treat, and conserve water. As a result, the near-term projects in Appendix C provide a mechanism for community participation and education that will help garner support for more aggressive project implementation likely needed in the future to meet MRP and TMDL requirements. As more projects are selected from the prioritized list of opportunities in Appendix B through the separate green infrastructure planning and the TMDL Implementation Plan, additional project details and concepts can be added to the SRP through the adaptive management process. The near-term projects will set the stage for local community tours and information packages that will support a growing community participation process.

5.2.5 Procedure to Track Status of the SRP

A database containing project opportunities (Appendix B), example concept templates (Appendix C), and a web-based GIS tool discussed in Section 5.4 form the basis of a planning and tracking system that will continue to evolve during SRP implementation. Additional tools such as the Stormwater Capture Model (Figure 2-18) provide a mechanism for the estimation of stormwater capture volume and pollutant load reduction, which will further support project sizing and other design considerations. As the near-term projects in Appendix C are implemented, these projects will serve as demonstrations that will continue to inform subsequent project planning efforts. For example, project cost estimates in Appendix C will benefit from information gained through early project implementation. As projects are implemented and more information gathered, cost estimates will continue to improve for project planning. The resulting collection of information and tools will also continue to evolve as additional modeling and project identification occurs as the result of green infrastructure planning and the reasonable assurance analysis for the TMDL Implementation Plan. Upon development of the TMDL Implementation Plan in 2020, these tools will support all individual agencies in the planning and design of projects within their jurisdictions, with the aforementioned database available to log project information and status as projects enter phases of feasibility analyses, design, and construction.

5.2.6 Timelines for All Active or Planned Project Components and Institutional Structure

Through separate planning efforts of the TMDL Implementation Plan, project timelines are currently under development that will outline necessary project needs to meet TMDL milestones in 2020, 2030, and 2040. A detailed timeline is, therefore, not presently available, but will be developed by C/CAG from 2017-2020. Near-term projects (Appendix C) will be implemented as funding becomes available, and detailed timelines for feasibility analyses, design, and construction will also be developed.

Once funding is identified, there are assumptions that can be made in terms of cost estimation and scheduling for different phases of a project. These assumptions typically vary depending on the size of the project. For instance, a large regional project typically requires more time for design and construction than a green street. Cost estimates of various phases of project planning, design, and construction can be based on a percentage of the estimated construction (CON) costs, and added to the CONS costs for an overall cost estimate for each project that includes all phases. An example distribution of costs for typical project phases is shown in Table 5-2.

Table 5-2. Project Cost Distributions

Project Phase	Percent of CONS
Agency Planning/Design (APD)	8.00%
Consultant Planning/Design (CPD)	12.00%
Right-of-Way (R/W)	0.00%
CONS	100.00%
Agency Construction Management (ACM)	4.25%
Consultant Construction Management (CCM)	12.75%
Total Project Cost	**137.00%**

Timelines for scheduling projects can be estimated based on the size or type of project, as shown in Table 5-3. Scheduling of Project Phases. These schedules can be based on the percentage of each project phase occurring within each year following project initiation. As funding is identified for each project in the SRP, these assumptions for estimating project phasing costs and schedules can be used for proper planning of individual project implementation timelines.

Table 5-3. Scheduling of Project Phases

Project Type	Phase[1]	Year 1	Year 2	Year 3	Year 4	Year 5
Green Streets or LID Retrofit Projects (under $1M CONS)	APD	100.0%				
	CPD	100.0%				
	R/W					
	CONS		100.0%			
	ACM	25.0%	75.0%			
	CCM	25.0%	75.0%			
Small/Medium Regional Projects (less than $10M CONS)	APD	100.0%				
	CPD	50.0%	50.0%			
	R/W					
	CONS		25.0%	75.0%		
	ACM		33.0%	67.0%		
	CCM		33.0%	67.0%		
Large Regional Projects (over $10M CONS)	APD	100.0%				
	CPD	17.0%	67.0%	16.0%		
	R/W					
	CONS			33.0%	67.0%	
	ACM			37.5%	50.0%	12.5%
	CCM			37.5%	50.0%	12.5%

[1]APD – Agency Planning/Design, CPD – Consultant Planning/Design, R/W – Right-of-Way, CONS – Construction, ACM – Agency Construction Management, CCM – Consultant Construction Management

As the lead entity for each project will vary depending on the location of the project, and multiple C/CAG member agencies will be individually responsible for project implementation, institutional structures that will ensure project implementation currently vary for each agency. However, as part of the green infrastructure planning process associated with the MRP, all agencies are currently considering similar institutional procedures that will support the implementation of green infrastructure. The Countywide Program has formed a Green Infrastructure Committee consisting of local agency staff to discuss green infrastructure planning efforts and development of a model plan. Once completed, the model plan will be adapted and adopted by each agency, and will support a consistent and effective institutional structure to support project implementation throughout the County.

5.2.7 Ongoing Review, Updates, and Adaptive Management

Section 5.3 outlines an adaptive management framework that will be used to support implementation of the SRP. A Stormwater Committee of C/CAG (consisting of primarily public works directors) currently meets bi-monthly to discuss all aspects of stormwater management throughout the County, and will continue to provide the primary forum for discussion of ongoing review, updates, and adaptive management of the SRP. The Stormwater Committee provides technical guidance to C/CAG staff and the Board of Directors on the parallel planning efforts associated with the MRP, including the recently initiated reasonable assurance analysis supporting the TMDL Implementation Plan. Once that plan is completed in 2020, the Stormwater Committee will consider a timeline for updates to the SRP that provides substantial additional detail regarding green infrastructure and stormwater capture projects necessary to meet pollutant load reduction targets of 2020, 2030, and 2040. This will constitute a major update to the SRP with the addition of more projects. Subsequent updates of the SRP will be assessed as projects are implemented, lessons learned, and other changes occur regarding regulatory requirements of the MRP.

5.2.8 Strategy and Potential Timeline for Obtaining Necessary Permits

As funding is identified for projects, the initial task for project implementation will involve a planning phase that will identify necessary permits. This task is performed within the Agency Planning/Design (APD) and Consultant Planning/Design (CPD) project phases outlined in Table 5-2 and Table 5-3. Permits will vary depending on the type of project. Sufficient time will be considered within each project implementation schedule consistent with Table 5-3 for identifying and obtaining necessary permits to support project implementation.

5. 3 Adaptive Management – Maintaining a Living Document

The SRP will act as a living document that will continue to be updated over time to incorporate multiple benefit projects as they are identified. Appendix B contains a comprehensive list of priority-ranked locations for project opportunities on publicly-owned parcels and street rights-of-way. This database of potential project locations will serve as a resource for the selection of green infrastructure and stormwater capture projects throughout time to meet MRP requirements for TMDL pollutant load reductions. Once those projects are more fully conceptualized, the SRP will be used as the primary mechanism for ensuring that other multiple benefits are incorporated into project concepts. The following summarizes the adaptive management program and timeline that will provide a linkage between the SRP and parallel planning efforts, while updating the SRP over time to represent the primary repository and documentation of stormwater capture projects planned for San Mateo County watersheds.

1. Completion and approval of the SRP (2017).
2. Modeling supporting the reasonable assurance analysis that identifies project goals throughout the period to 2040 that will result in pollutant load reductions to meet TMDL wasteload allocations (2017).
3. Green infrastructure planning efforts to identify opportunities and impediments to green infrastructure implementation, and development of model plans for adoption by each C/CAG member agency (2017-2019).
4. TMDL Implementation Plan that reports green infrastructure and stormwater capture projects and progress towards reducing pollutant loads by 2020, 2030, and 2040. The Implementation Plan will include maps of impervious area to be treated, and will build upon project opportunities identified in the SRP (Appendix B) to define a specific project implementation plan (2019).
5. SRP update to incorporate findings and projects identified in #1-4 above. The updated SRP will provide opportunity to incorporate multiple benefit considerations into the implementation plan of green infrastructure and stormwater capture projects that are not emphasized in the TMDL Implementation Plan (2020-2022).
6. As projects are implemented and lessons learned through wider scale integration of LID, green streets, and regional stormwater capture projects within traditional infrastructure, the SRP will be periodically updated to provide revisions to the project implementation plan. This is expected to occur once every five years, coinciding with the five-year cycle for updates to the MRP.

Other considerations that may inform updates of the SRP over time may include the following:

- Increased understanding of the sources of pollutants and their presence within the watersheds that result in prioritization of management activities.
- New water quality priorities resulting from 303(d) impairments or the development of new TMDLs, including updated requirements of the MRP to implement management actions to reduce pollutant loads.
- Increased understanding of the effectiveness of green infrastructure and stormwater capture projects through infiltration or treatment processes.
- Identification of new project opportunities that may offset the need for other projects included within the SRP. For example, a public park may be identified as a candidate for upgrades that can incorporate regional stormwater capture, reducing the need for green streets upstream of the park.

Projects identified through Countywide efforts to address flooding, sea level rise, and groundwater management.

Throughout implementation of the SRP and TMDL Implementation Plan, C/CAG, via the Board of Directors, committees, and Countywide Program committees will continue to meet to discuss both planning efforts. Planning tools discussed in the next section will provide C/CAG opportunities to continuously assess implementation efforts and the potential considerations above, and will determine when updates to the SRP are necessary to provide documentation of any changes that occur through the adaptive management process.

5. 4 Implementation Performance Measures

The SRP planning effort included the development of multiple tools that will be maintained by C/CAG to support the continuous evaluation of expected project outcomes. These include:

- **Project Database**: Appendix B provides a summary of the database that will be used to store project opportunities and track implementation efforts. This database will be refined during the TMDL Implementation Planning efforts (2017-2020) to identify targeted projects for implementation, track implementation progress, and store key project information that can be used for evaluating project performance. This database will provide a repository of information on project identification and tracking of implementation, with outputs that can support annual reporting requirements of the MRP as well as updates to the SRP through the adaptive management program.
- **Web-based GIS Tool**: C/CAG developed a web-based GIS tool that enables users to view watershed information and track planned and implemented projects. This web-based platform provides users access to a wealth of GIS information produced by the SRP, and will support C/CAG members in the planning and tracking of project implementation. Figure 5-1 depicts the web-based GIS tool, which shows the locations and drainage areas for project concepts provided in Appendix C. The tool is accessible from any web browser, and can be used for internal C/CAG or city/County project planning efforts, or future public education efforts through linkages to C/CAG, the Countywide Program, or agency websites.
- **Stormwater Capture Model**: C/CAG developed the web-based Stormwater Capture Model that provides access to watershed (HSPF) and green infrastructure and stormwater capture project models (SUSTAIN) in a user-friendly environment (Figure 2-18). The Stormwater Capture Model allows planners and engineers to enter project information and site characteristics (e.g., drainage area size, land use, imperviousness, project type, infiltration rate), and the cloud-based system will model the project and estimate stormwater volume and pollutant load reduction. A preliminary system was developed for use in the SRP, which will be refined during the reasonable assurance analysis of the TMDL implementation plan to improve estimates of pollutant load reductions relative to TMDL goals. As projects are continuously conceptualized and designed, the tool will provide estimation of stormwater capture benefits (e.g., amount captured and available for infiltration or groundwater recharge, pollutant reduction). The tool can also support conceptual and actual designs through analysis of alternative project configurations (e.g., different types of green infrastructure, varying sizes) and the impact on stormwater capture and costs. Throughout the

adaptive management process, the Stormwater Capture Model can be updated to reflect the many lessons learned through project implementation.

- **Project Concept Templates**: Appendix C contains several examples of templates that can be used to convey project information once projects are continuously conceptualized. The concept templates summarize much of the output from the tools above, including ability to present maps produced in the web-based GIS tool as well as stormwater capture volumes and pollutant reductions produced from the Stormwater Capture Model. The concept templates also provide methods for presenting project cost information, other design considerations, and summaries of project benefits. These concept templates provide an ideal mechanism for sharing project and performance information to decision-makers and stakeholders to obtain support for implementation and funding.

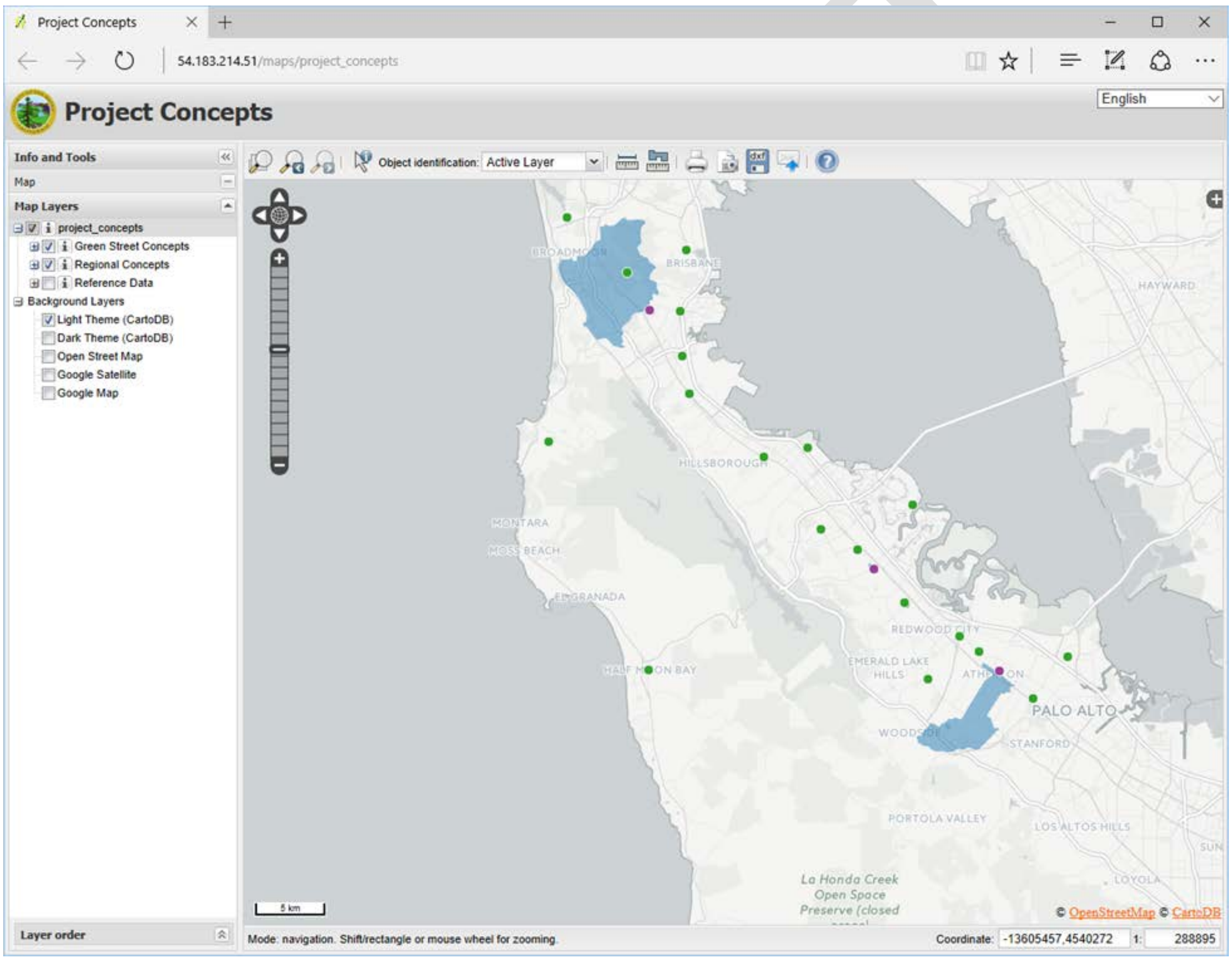


Figure 5-1. Web-based GIS tool

The above tools and performance measures will be used in combination with other monitoring efforts to provide ongoing analysis and information-management of the performance of the SWRP in meeting management objectives. The MRP requires permittees to submit Urban Creeks Monitoring Reports (UCMRs) and Integrated Monitoring Report (IMRs) which identify and interpret water quality monitoring findings of impaired waters. These reports usually include background of waterbody impairments and information about the IMR, pollutants in question, completed monitoring projects, citizen monitoring and stakeholder involvement, and a summary of results by waterbody or watershed. A recent IMR was prepared by SMCWPPP (2014a) to address San Francisco Estuary receiving water monitoring, creek status monitoring, monitoring projects (stressor/source identification, best management practices, geomorphic projects, pollutants of concern (POC) monitoring, long-term trends monitoring, sediment delivery estimates, emerging pollutants, citizen monitoring and participation, monitoring costs summary, and recommendations and next steps. Recommendations outlined in the report were: focus on answerable high priority management questions, increase coordination among local, regional, and statewide monitoring programs, further evaluate the need for POC loads monitoring, and continue tiered practicable approach to creek status/trend monitoring. Data managed for the UCMRs and IMR were submitted electronically to the Regional Board and is available to the public via the California Environmental Data Exchange Network (CEDEN) (http://water100.waterboards.ca.gov/ceden/sfei.shtml).

Additional past and ongoing regional monitoring can supplement C/CAG efforts to provide analysis of trends and the improvement of San Francisco Bay Region water quality resulting from implementation of the SRP and other planning efforts in the region. The following is a summary of these regional efforts, which include participation from C/CAG:

- The Regional Monitoring Program for Water Quality in the San Francisco Bay (RMP) is a long-term contaminant monitoring program for the San Francisco Bay implemented by the San Francisco Estuary Institute (SFEI). The RMP is a collaborative effort between SFEI, the Regional Water Board, and the regulated discharger community and provides water quality regulators with information they need to manage the San Francisco Bay Estuary effectively. The program is an adaptive, long term program of study that includes committees and workgroups who meet regularly to keep the program efficient. The RMP produces annual monitoring results that document activities of the program each year, a summary report, and technical reports for specific studies. (SFEI 2016, SMCWPPP 2014b). The RMP status and trends data are available online using a mapping and graphic tool. The online Contaminant Data Display and Download (CD3, http://cd3.sfei.org) can be used to view, manipulate, and download all water, sediment, and tissue monitoring results. CDT profile data is available in a database maintained by SFEI and are available upon request.
- Under the Bay Area Stormwater Management Agencies Association (BASMAA), Phase I Municipal Stormwater Permittees work together to collect receiving water quality data. The BASMAA Regional Monitoring Coalition (RMC), developed by Permitees, acts as a multi-year work plan that provides a road map for successful implementation of stormwater programs and projects. The work plan provides a general overview of RMC tasks, project profiles, and scopes of work on a project-by-project basis. In 2014, BASMAA submitted an IMR for mercury and PCBs in the San Francisco Bay area, outlining MRP requirements associated with the control measure type, status of control measure implementation including baseline, current, and enhanced implementation, loads avoided and reduced and their calculation methodology, and summaries of uncertainties. BASMAA participated in the collection of mercury-containing devices and equipment at the consumer level and reported on these efforts with an estimate of mass of mercury collected via enhanced actions post-TMDL. Estimated mass of mercury avoided or reduced was estimated as a result of fluorescent lamp control measures, thermostat collection and recycling, and other devices such as barometers, thermometers, and switches. For PCB loads, inspectors were required to identify PCB-containing equipment and document incidents in inspection reports. Staff training occurred and training materials were developed regionally for industrial practices. A conceptual approach was documented to estimate PCB loads avoided/reduced for future use. Key uncertainties were found in differences in mercury and PCB mass between types and manufacturers and complexities in transport and percentage calculations of mercury and PCBs to the Bay (BASMAA 2014).

6 EDUCATION, OUTREACH AND PUBLIC PARTICIPATION

As part of the coordination and collaboration efforts of the SRP, C/CAG staff and consultants gave the following presentations on the SRP to the Stormwater Committee (public meetings):

- SRP Project Screening and Prioritization Update – April 21, 2016
- SRP Draft Concept Plans Update – June 16, 2016
- SRP and Reasonable Assurance Update – November 17, 2016

In addition, C/CAG staff has presented on or mentioned the SRP planning process in various related public forums in an effort to engage stakeholders and expand its list of interested parties, including presentations at Sustainable San Mateo County's November 2015 Water Indicator Summit and San Mateo County's Office of Sustainability's Sea Level Rise July 2016 joint meeting of its policy advisory committee, technical working group, and citizens advisory committee, and mention at San Mateo County Environmental Health's San Mateo Plain groundwater basin study meetings in May, September, and November 2016.

Notice of availability of the draft SRP will be broadly disseminated, including to all identified local agencies, non-governmental organizations, and other stakeholders, as detailed in Appendix E.

C/CAG is planning for three public workshops in January 2017 to solicit public and stakeholder feedback on the SRP. These workshops will provide an opportunity for local stakeholders and members of the general public to learn about the basis for creating a countywide SRP for San Mateo County, and will also provide a forum for a dialogue regarding the long-term transition towards more green infrastructure and stormwater capture projects. It will also provide an opportunity to inform the public about continued stormwater planning at the individual jurisdictional level through the MRP-mandated Green Infrastructure Plans. These workshops will include presentations detailing the SRP's projects, their components and the impact for the community and its members. Following the presentations will be question and answer periods where attendees can ask questions and submit their feedback.

Promotion of the workshops will take place on social media with Facebook and Twitter advertisements targeted to San Mateo County residents. These ads will inform the community of the purpose, times, dates and locations of the workshops as well as where they can read a draft of the SRP and submit comments online. Ads will also be specifically targeted to disadvantaged communities such as East Palo Alto and Daly City, where ads will run at a higher frequency. In an attempt to identify and address runoff-related environmental injustice issues, ads will also be targeted in areas where historical flooding issues have occurred, such as recent floods of trailer parks in Belmont and Redwood City, and for which some of the regional project concepts have been developed to help address (see Section 4.3).

Further promotion of the workshops will take place through public relations efforts with a press release that will be distributed to local media outlets, including both print and online publications. The press release will call attention to the release of the SRP draft as well as publicize the workshops and drive readers to the flowstobay.org website where they can find a draft of the SRP to review and submit comments through an online form.

Tentative dates for the workshops are as follows: January 6, 2017; January 9, 2017; January 10, 2017.

7 REFERENCES

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