# DRAFT Green Infrastructure Plan

County of San Mateo

Approved on: [DATE]
Approved by: [insert]

Submitted by:
County of San Mateo
455 County Center
Redwood City, CA 94063

# ACKNOWLEDGEMENTS

The County of San Mateo gratefully acknowledges the following individuals and organizations that contributed to this Green Infrastructure Plan:

**County of San Mateo GI Workgroup**

Office of Sustainability
- Breann Liebermann
- John Allan
- Susan Wright

Planning & Building Department
- Joe LaClair
- Camille Leung
- Ofelia Guner
- Sherry Liu
- Melody Eldridge

Department of Public Works
- Julie Casagrande
- Ann Stillman
- Gilles Tourel
- Joe LoCoco

Parks Department
- Samuel Herzberg

**Consultant Team**

- EOA, Inc.
- Lotus Water
- Paradigm Environmental

The County would like to thank and acknowledge the City of Palo Alto and the City of San Jose for sharing text from their Green Stormwater Infrastructure Plans.

# TABLE OF CONTENTS

# LIST OF TABLES



# LIST OF FIGURES

# EXECUTIVE SUMMARY

## INTRODUCTION

Urban development has resulted in replacement of natural landscapes with impervious pavement and buildings, and the use of storm drain systems to carry increased amounts of stormwater runoff and pollutants directly into local streams and eventually the San Francisco Bay and the Pacific Ocean. To reduce the impact of urban development on waterways, Bay Area cities and counties are required by state and regional regulatory agencies to gradually shift from traditional ("gray") stormwater infrastructure systems to "green" infrastructure systems over time. Furthermore, cities and counties are required to prepare a Green Infrastructure Plan (GI Plan) that will serve as an implementation guide for this process, and submit this plan to the regulatory agency by September 30, 2019.

Green infrastructure (GI) uses vegetation, soils, and stormwater capture facilities to mimic natural processes, manage stormwater as a resource, and create healthier urban environments. GI measures provide water quality benefits by storing and treating stormwater, reducing peak flows and runoff volumes, and infiltrating treated water to groundwater aquifers. In addition, GI can provide many environmental and community benefits such as creation of attractive streetscapes, reduction of heat island effect, improved air quality, increased wildlife habitat, increased place making and community cohesion, energy savings, enhanced flood protection, and associated improved climate change resilience and mitigation.

The County of San Mateo developed this GI Plan to comply with the requirements of the Municipal Regional Stormwater Permit (MRP) and to demonstrate its commitment to transform its storm drainage systems with GI in key urban areas within the County's watersheds. The GI Plan presents the County's long-term strategy to incorporate GI in both private and public projects within unincorporated communities through the development of an integrated policy framework across County departments. A new GI policy framework will support and guide the implementation of GI in public projects, ensure consistent regulation of private development projects in the County, and provide the tools and resources needed to implement the County's GI Plan.

The primary focus of the GI Plan is the integration of GI systems into public buildings, parks, parking lots, and rights-of-way (e.g., road or bikeway). The GI Plan also describes opportunities to include GI facilities in the public rights-of-way adjacent to private properties (e.g. frontage improvements) or in conjunction with private development, so that private development can contribute to meeting countywide water quality goals as well as implement GI on a larger watershed scale. The County's GI Plan contains the following key components for successful integration of GI into unincorporated County:

- Demonstration of consistency with and support for GI in County planning documents, regulations, policies and programs;
- Development of guidance and tools for siting, designing, constructing, operating and maintaining GI facilities;
- Evaluation of opportunities and challenges for GI within the County, and identification of focus areas to maximize potential benefits;
- Development of prioritization methodology and metrics for GI to identify a cost-effective mix of potential GI projects;
- Development of a County GI strategy and implementation plan; and

- Collaboration and outreach within County departments, with regional agencies, and with the local community.

Key components of the GI Plan are summarized below.

## CONSISTENCY WITH LOCAL PLANS AND REGULATIONS

As part of the GI Plan development process, the County reviewed its existing planning documents and policies, ordinances, and other legal mechanisms related to the implementation of its stormwater discharge permit requirements. The County found that the GI Plan is consistent with and supported by a number of existing County plans and policies, and found that it has considerable existing legal authority to implement the GI Plan. However, the County plans to strengthen support for the GI Plan by adding a new "Watershed and Stormwater Management" element to its General Plan. The County is also in the process of updating its Municipal Code to create a new Stormwater and Drainage Control Ordinance section to codify the requirements for drainage and water quality review for private projects. The proposed Stormwater and Drainage Control Ordinance establishes the requirements for new development and redevelopment projects related to the design, construction, and operation and maintenance of stormwater drainage and treatment systems. The proposed ordinance section may also include language giving the County authority to require GI improvements in the public right-of-way along the street frontage of a private development on a project-by-project basis. The new General Plan element and Stormwater and Drainage Control Ordinance are expected to be completed by December 2020.

## GI GUIDANCE, DETAILS, AND SPECIFICATIONS

The County participates in the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), a program administered by the City/County Association of Governments (C/CAG) of San Mateo County to assist the County and the 20 incorporated cities and towns within the County with meeting MRP requirements, including GI planning and implementation.

The County will use the first edition of SMCWPPP's San Mateo Countywide Green Infrastructure Design Guide (GI Design Guide) and the Typical GI Details and Specifications included within its appendix to provide support and guidance in implementing GI within the County. The GI Design Guide provides comprehensive guidance on the planning, design, construction, and operations and maintenance of GI for buildings, parking lots, sites, and streets. A companion countywide document, the C.3 Regulated Projects Guide, provides additional technical requirements for the sizing and design of stormwater measures for private and public regulated projects.[1]

The County reviewed the GI Design Guide and the Typical GI Details and Specifications and identified changes and additions that will be needed to customize the countywide guidance materials for the County's applications, as well as new GI details to address County-specific site conditions and new technologies. Additionally, the County reviewed its current Standard Details for public roadway, storm drain, sanitary sewer, lighting, and water systems and identified changes needed to coordinate with the Typical GI Details. Draft utility protection standards for utilities that cross near and/or under GI facilities were also developed. The County intends to complete these identified updates to its details and standards by 2020.

[1] "Regulated projects" are private and public development projects exceeding certain thresholds for amounts of impervious surface created and/or replaced on-site that are required to install stormwater control measures similar to GI, per Provision C.3 of the MRP.

## OPPORTUNITIES AND CHALLENGES FOR GI IMPLEMENTATION

The general focus of the GI Plan is the developed, urban, unincorporated areas of the County; however, urban open space, such as public parks and underutilized or vacant land in developed communities, are also considered to be opportunities for centralized capture and treatment of stormwater from larger drainage areas.

A variety of community characteristics influence the feasibility, desirability and effectiveness of GI, including road standards, available rights-of-way, terrain, soil types, slope stability, utilities, connectivity to the storm drain infrastructure, drainage, and depth to groundwater, as well as opportunities to integrate GI measures with existing efforts such as urban greening or transit improvement. Opportunities for GI were evaluated across all of unincorporated County, and a number of areas of focus for GI implementation were identified where GI is expected to have the greatest success (i.e., areas where potential benefits are high, and constraints are few). The areas of focus for GI based on community characteristics are listed in Table ES-1.

*Table ES- 2. GI Plan Areas of Focus and Characteristics Beneficial for GI Implementation*

| Areas of Focus | Characteristics Beneficial for GI | | | | |
|---|---|---|---|---|---|
| | Commercial Districts | High Impervious Area Percentage | Few Existing Vegetative Drainage Features | GI Support in Community Plans | Opportunities to Integrate with Transit Improvements |
| North Fair Oaks | ● | ● | ● | ● | ● |
| West Menlo Park | ● | ● | ● | | |
| Harbor-Industrial | ● | ● | ● | | |
| Unincorporated Colma | ● | ● | ● | | |
| Midcoast (urban area)* | ● | | | ● | ● |

*Montara, Moss Beach, Princeton, El Granada, and Miramar

## GI PROJECT PRIORITIZATION METHODOLOGY

The GI Plan leverages previous countywide stormwater planning efforts described in the Stormwater Resource Plan for San Mateo County (SRP)[2]. The SRP is a countywide evaluation of opportunities for stormwater capture, treatment, and use, required by the State to allow stormwater capture projects to be eligible for State grant funds. In the SRP, a GIS-based spatial analysis was used to identify publicly-owned parcels and street sections throughout the County and screen them to remove potential project locations that were considered infeasible for public GI projects. The remaining list of locations was categorized into three project types – regional, LID, and green street[3]

[2] SMCWPPP. 2017. Stormwater Resource Plan for San Mateo County. Prepared by Paradigm Environmental and Larry Walker Associates. February 2017.

[3] "Regional projects" are large-scale projects that capture and treat stormwater runoff from both on-site and off-site. Off-site runoff is typically routed to the project site via diversion from storm drains, channels, or streams. "LID projects" are GI facilities that are built on a parcel to treat runoff generated only from impervious surface on that parcel (assumed to be < 0.25 acres). "Green streets" are GI roadway projects located in the public right-of-way that capture and treat runoff from the street and adjacent parcels.

-- and then scored and ranked based on the potential benefit metrics associated with the locations and project types.

As part of the County's GI planning process, a County-specific prioritization was conducted, building upon the SRP prioritization process by modifying metrics used in the SRP and augmenting them with new metrics that capture community-specific characteristics and local planning priorities of the unincorporated communities. The result of the County-specific prioritization analysis was a prioritized list of potential project sites (parcels and street segments) for GI implementation. Project opportunities were scored based on metrics indicating GI effectiveness and benefits, then ranked and bracketed into high, medium, and low priority categories. Within the unincorporated County, a total of 23 regional project opportunities, 21 LID opportunities, and 157 green street opportunities were identified as high priority.

## GI STRATEGY

In addition to the SRP, the County has participated in another countywide GI planning initiative known as the San Mateo County Green Infrastructure Reasonable Assurance Analysis (RAA). The RAA is a tool to help demonstrate that the implementation of GI and other control measures will result in sufficient pollutant reductions over time. The RAA quantifies the storage capacity provided by a combination of different types of GI projects to meet the pollutant reduction requirements of the MRP by 2020, 2030, and 2040.

The County's strategy utilizes the RAA results to specify an optimal mix of private and public project types that would most cost-effectively achieve GI implementation goals, including existing installed GI facilities, future regulated projects, and regional, LID, and green street GI projects.

Another metric used to measure progress toward GI implementation goals is the amount of impervious area "retrofitted" or treated (i.e., redeveloped with GI facilities to treat the runoff from that area) as part of public and private projects during specified timeframes. As required by the MRP, the GI Plan includes estimated targets for impervious area to be treated with GI by 2020, 2030, and 2040.

The target for impervious area treated by 2020 is based on the existing amount of installed GI facilities (public and private), GI projects to be constructed in the near term, and the amount of private development anticipated to occur by 2020. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, an adaptive management process will be key to ensuring that future goals are met. The County's strategy may be updated based on these considerations, as well as future regulatory requirements, and the amount of GI indicated in the RAA for one project type may be met through any other type of GI.

## IMPLEMENTATION PLAN

A workplan for prioritized projects was developed to define the process for implementing the different types of GI projects identified to meet County water quality goals. The workplan describes the steps and schedule to move near-term projects into the design phase, as well as establishing the procedures for integrating prioritized projects into the County's capital planning framework. The process is a collaborative effort between several County departments and may involve coordination with other city, regional, or state agencies as well. A critical aspect of deciding whether a project should move through to the design phase is early evaluation of technical feasibility, stakeholder acceptance, funding potential, and support from partnering agencies.

A key element of the feasibility evaluation is the estimation of project costs and determination of potential funding sources for identified priority projects. The County currently funds its stormwater management program administration, capital improvement projects, and maintenance activities using a combination of General Fund allocations, development and permit fees, and grants. The County is evaluating additional ways to increase funding and leverage private development activities to achieve the goals and objectives of the GI Plan. In addition, a new Flood and Sea Level Rise Resiliency District is being formed which could, in the future, provide funding for GI implementation to the County and other SMCWPPP agencies through the establishment of a countywide stormwater fee, acquisition of Federal and State grants, or other mechanisms.

## COLLABORATION AND OUTREACH

Internal and regional collaboration played a key role in developing the GI Plan, and will continue during implementation of the GI Plan. The GI Plan was developed as an interdepartmental effort led by the Office of Sustainability and involving staff from the Planning and Building Department, the Department of Public Works, Parks Department, and the Project Development Unit of the County Manager's Office. The County's interdepartmental coordination also included the County Flood Resilience Program and the Climate Change Team to encourage incorporation of GI into multi-objective projects that are developed to achieve benefits related to clean water and air, climate change resilience and mitigation, and habitat and energy savings.

Public participation and adoption of the GI Plan was facilitated through presentations at a number of public meetings. Prior to adoption, County staff presented components of the GI Plan at the following public meetings:

- Planning Commission Meeting (March 27, 2019)
- Midcoast Community Council Meeting (May 22, 2019)
- North Fair Oaks Community Council Meeting (June 27, 2019)

The completed GI Plan was adopted by the County's Board of Supervisors on September 17, 2019.

Interdepartmental collaborations, participation in SMCWPPP and public outreach efforts, as well as collaboration with the new County Flood and Sea Level Rise Resiliency District, will continue during implementation of the GI Plan into the future.

# 1 INTRODUCTION

Urban development has resulted in replacement of natural landscapes with impervious pavement and buildings, and the use of storm drain systems to carry increased amounts of stormwater runoff and pollutants directly into local waterways. Green infrastructure (GI), however, uses plants and soils to mimic natural watershed processes, capture stormwater, increase infiltration and create healthier environments. To reduce the impact of urban development on waterways, Bay Area cities and counties are required by state and regional regulatory agencies to shift from traditional (gray) stormwater conveyance systems to GI systems over time in order to meet specified water quality goals. This GI Plan serves as an implementation guide for the County of San Mateo (County) to incorporate GI into storm drain infrastructure on public and private lands where feasible within its unincorporated communities over the next several decades.

## 1.1 BACKGROUND

### 1.1.1 County Description

The County of San Mateo, founded in 1856, covers 455 square miles of the San Francisco Bay peninsula, situated between San Francisco County to the north, and Santa Clara and Santa Cruz Counties to the south. The County is divided by the Santa Cruz Mountains into two geophysical areas draining to either the Pacific Ocean (Ocean) to the west, or the San Francisco Bay (Bay) to the east. The bayside is highly urbanized, with relatively flat topography bordering the Bay, and moderately steep areas where the coastal plain transitions sharply upward to the Santa Cruz Mountains. Major watersheds on the bayside of the County include: Atherton Creek, Belmont Creek, Colma Creek, Cordilleras Creek, San Francisquito Creek, and San Mateo Creek watersheds. Streams within the bayside of the County are largely channelized to prevent flooding of urban areas. The coastside of the County is more mountainous, with mostly rural areas, natural streams, and limited urbanization. Major watersheds on the coastside of the County include: Butano Creek, Gazos Creek, Pescadero Creek, Pilarcitos Creek, San Pedro Creek, and San Gregorio Creek watersheds.

The County has 20 incorporated cities and towns, and approximately 300 square miles of unincorporated area where the County has jurisdiction. Unincorporated census-designated communities are distributed throughout the County and include Broadmoor, Burlingame Hills, El Granada, Devonshire, Emerald Lake Hills, Highlands-Baywood Park, Kings Mountain, Ladera, Los Trancos, La Honda, Loma Mar, Menlo Oaks, Montara, Moss Beach, North Fair Oaks, Pescadero, Princeton-by-the-Sea, San Gregorio, Sequoia Tract, Sky Londa, and West Menlo Park. According to the 2010 Census, the unincorporated communities have a population of 61,222[4] persons.

The unincorporated County can be divided into eight regions based on geographic proximity and shared neighborhood characteristics (Figure 1.1). Ninety-six percent of the unincorporated County geographic area is comprised of non-urban regions (i.e., rural or undeveloped open space). The focus of the GI Plan is on the developed urban portions of the unincorporated County, and does not consider the undeveloped open space, agricultural lands, and forested lands. For this reason, south

[4] All population figures quoted in this chapter are based on the 2010 U.S. Census. The current population of unincorporated San Mateo County, as of January 1, 2019, is 66,027, based on California Department of Finance estimates (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/e-1/).

coast rural communities and other less urban areas were not emphasized. The GI Plan also does not consider unincorporated areas that contain land that is not managed by the County (i.e., San Francisco International Airport and Stanford Lands). The six regions that are under consideration in the GI Plan include: North County, Foothill Communities, Midcoast, Harbor-Industrial, South County, and County Facilities on Incorporated Land (parcels in incorporated areas). Each of these regions are described in more detail below.

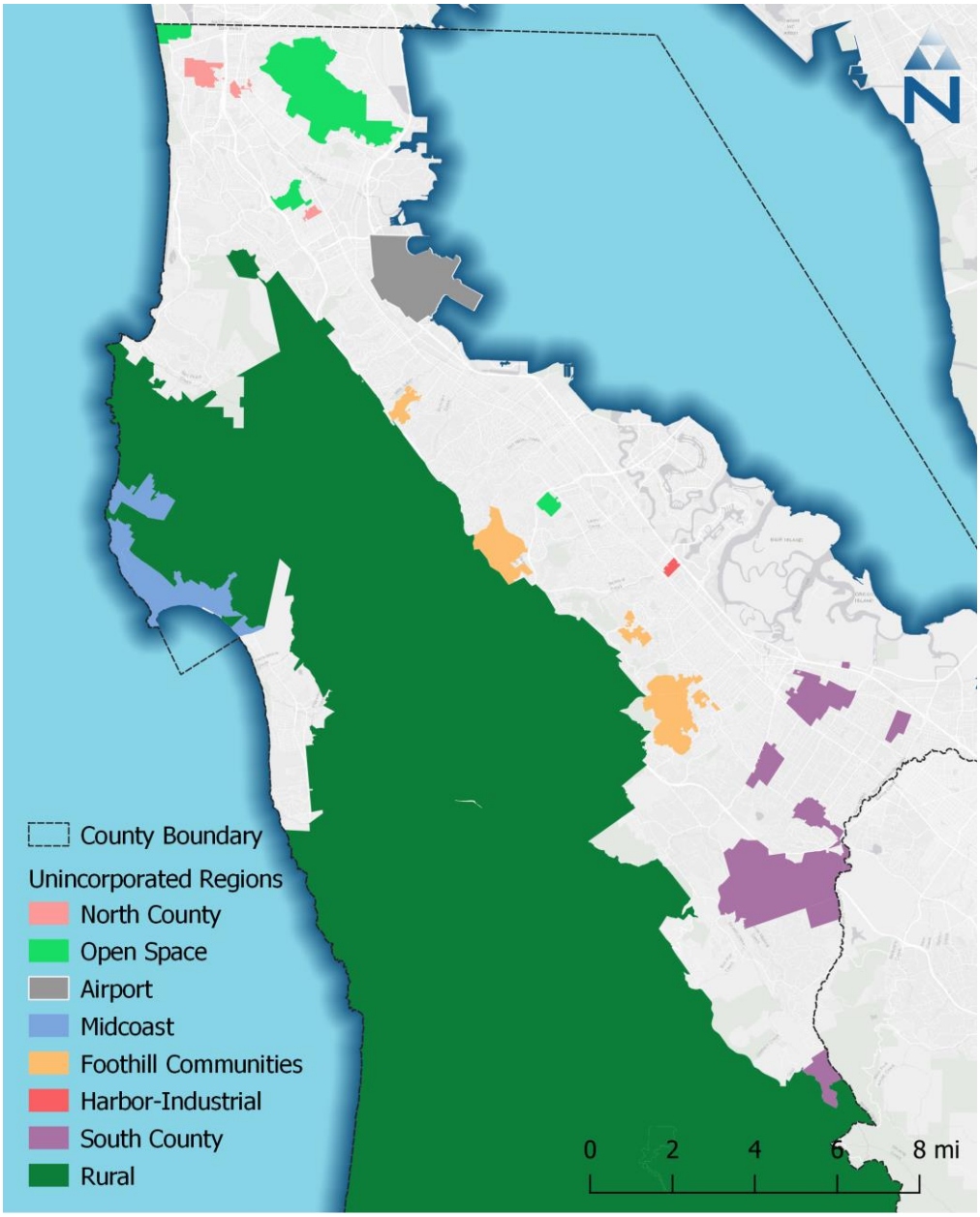



*Figure 1.1. Unincorporated County regions.*

***North County***

The North County region consists of the unincorporated areas of Broadmoor, which drain to the Pacific Ocean, and Unincorporated Colma and the residential neighborhood of Country Club Park, which both drain to the Bay. Figure 1.2 shows the locations and land uses for the North County unincorporated areas.

Broadmoor is a 280-acre unincorporated area within the Vista Grande Watershed, and is completely bordered by Daly City. It is densely populated, having a population of over 4,000 and over 1,300 households. The community is predominately a mix of low- and high-density residential housing with a small commercial district along 87th Avenue to the east.

Unincorporated Colma comprises approximately 66 acres of high-density residential, commercial, and industrial land uses within the Colma Creek watershed. The Colma BART Station occupies approximately 23 acres of the area. El Camino Real turns into Mission Street just south of Unincorporated Colma.

Country Club Park is a small 53-acre residential area south of the California Golf Club of San Francisco within the Colma Creek Watershed. Only two major streets, Alta Vista Drive and Country Club Drive, run through this neighborhood. The area is highly vegetated and has relatively low imperviousness, so is likely to experience little runoff.

***Foothill Communities***

This region consists of unincorporated communities along the foothills of the Santa Cruz Mountains that all drain to the Bay. The region includes Burlingame Hills, San Mateo Highlands, Devonshire, Palomar Park, Oak Knoll, Kensington Square, and Emerald Lake Hills. Emerald Lake Hills and San Mateo Highlands are the two most populated areas in the Foothill Communities region, with approximately 4,300 and 4,000 residents, respectively. The unincorporated community locations and land uses in the Foothill Communities region are shown in Figure 1.3.

Emerald Lake Hills is an 830-acre area on the western edge of the City of Redwood City in the Cordilleras Creek watershed. It has two unique features, Upper and Lower Emerald Lake, located in the south and east portions of the area, respectively. It contains about 45 acres of Edgewood Park and Natural Preserve, a permanent natural preserve rich in biodiversity, and a vital recreation area to Emerald Lake Hills and the surrounding communities. Emerald Lake Hills also contains Handley Rock, a popular recreation area for rock climbing enthusiasts. Emerald Lake Hills consists of primarily mixed residential land uses along with the two waterbodies and two public recreation areas. The remaining Foothill Communities on the bayside, including Burlingame Hills in the Easton Creek watershed, Devonshire in the Pulgas Creek watershed, Palomar Park in the Cordilleras Creek watershed, and San Mateo Highlands in the San Mateo Creek watershed, are all characteristically similar, having low density residential land use and steeper terrain.

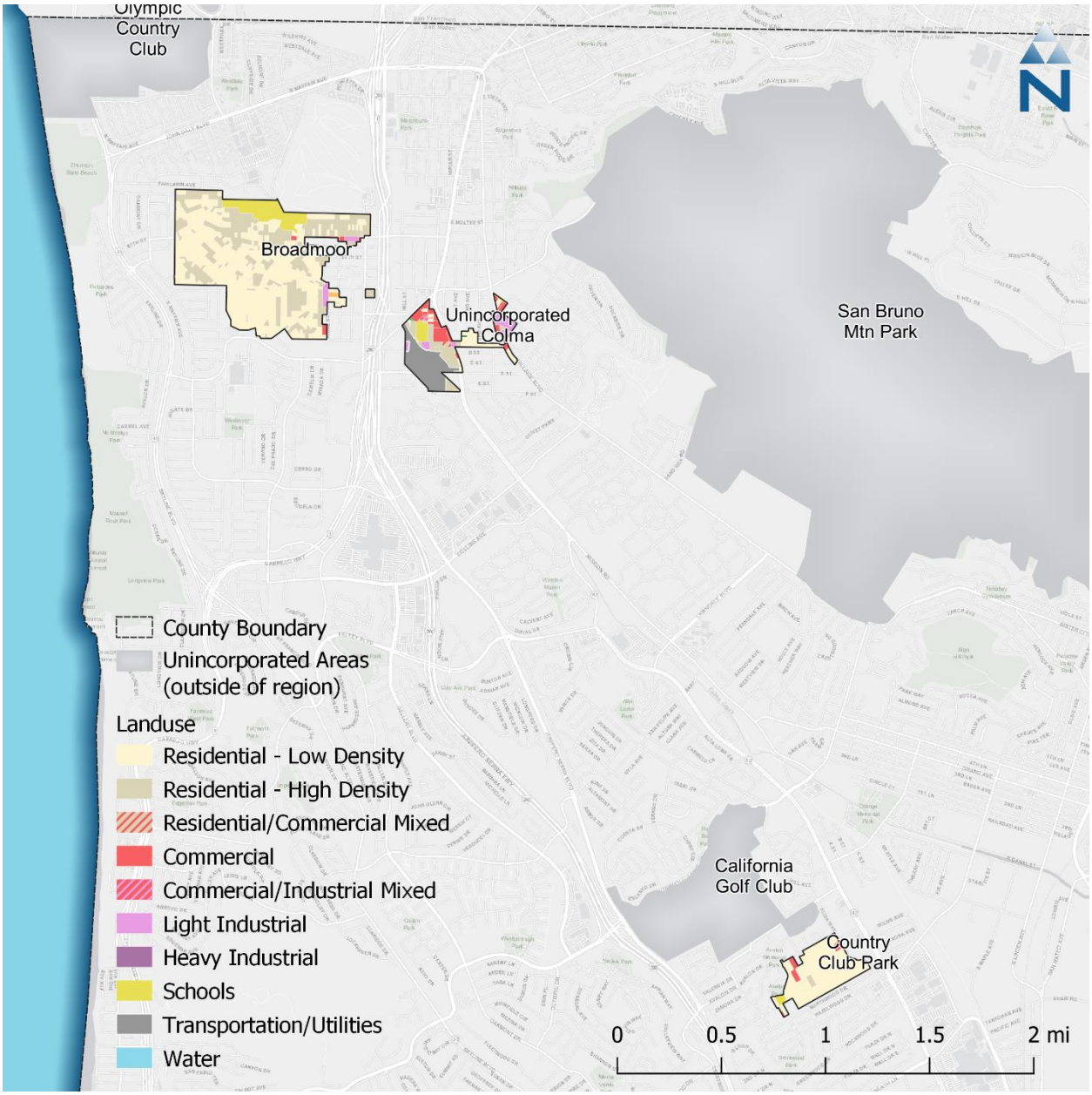



*Figure 1.2. Land use in the North County region (ABAG 2005).*

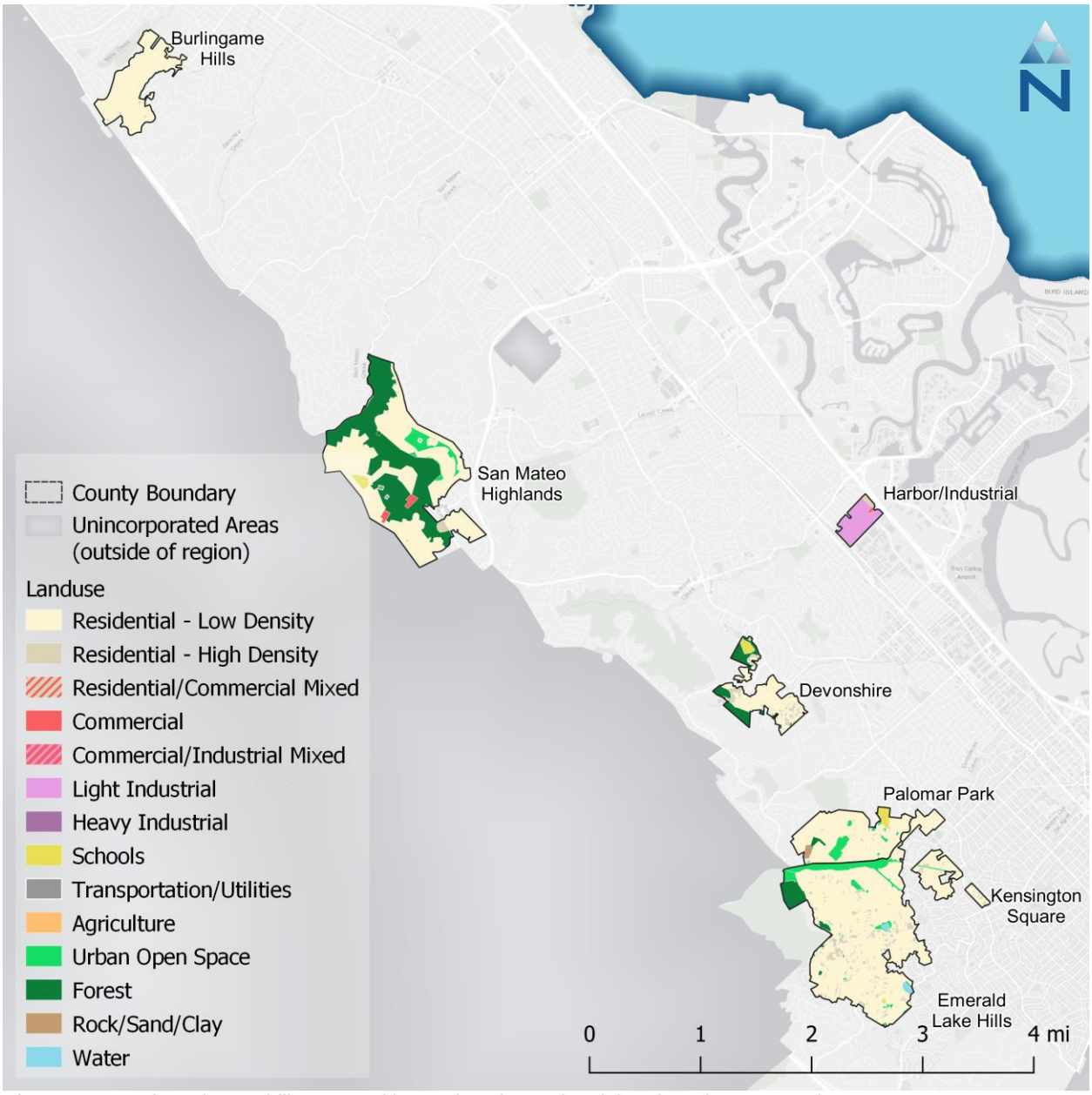



*Figure 1.3. Land use in Foothill Communities and Harbor-Industrial regions (ABAG 2005).*

***Harbor-Industrial***

The Harbor-Industrial region consists of a single industrial district in unincorporated County encompassing approximately 60 acres within the Belmont Creek watershed that drains to the Bay. The defining features of this area are the two major arterial streets, Harbor Boulevard and Industrial Road. The streets are wide with multiple travel lanes. The unincorporated area location and land use in the Harbor-Industrial region are shown in Figure 1.3.

***Midcoast***

Unincorporated Midcoast communities in San Mateo County include Montara in the Montara Creek watershed, Moss Beach in both the Dean Creek and San Vicente Creek watersheds, Princeton in the Denniston Creek watershed, El Granada in the El Granada Creek watershed, and Miramar in the Arroyo de en Medio Creek watershed. The combined population of these Midcoast communities is approximately 12,000 (U.S. Census 2010). These small communities are characterized by beaches, nature preserves and mountains, residential areas, and some agriculture near the community limits. All unincorporated areas in the Midcoast region drain to the Ocean. Figure 1.4 shows the locations and land uses of unincorporated communities in the Midcoast region.

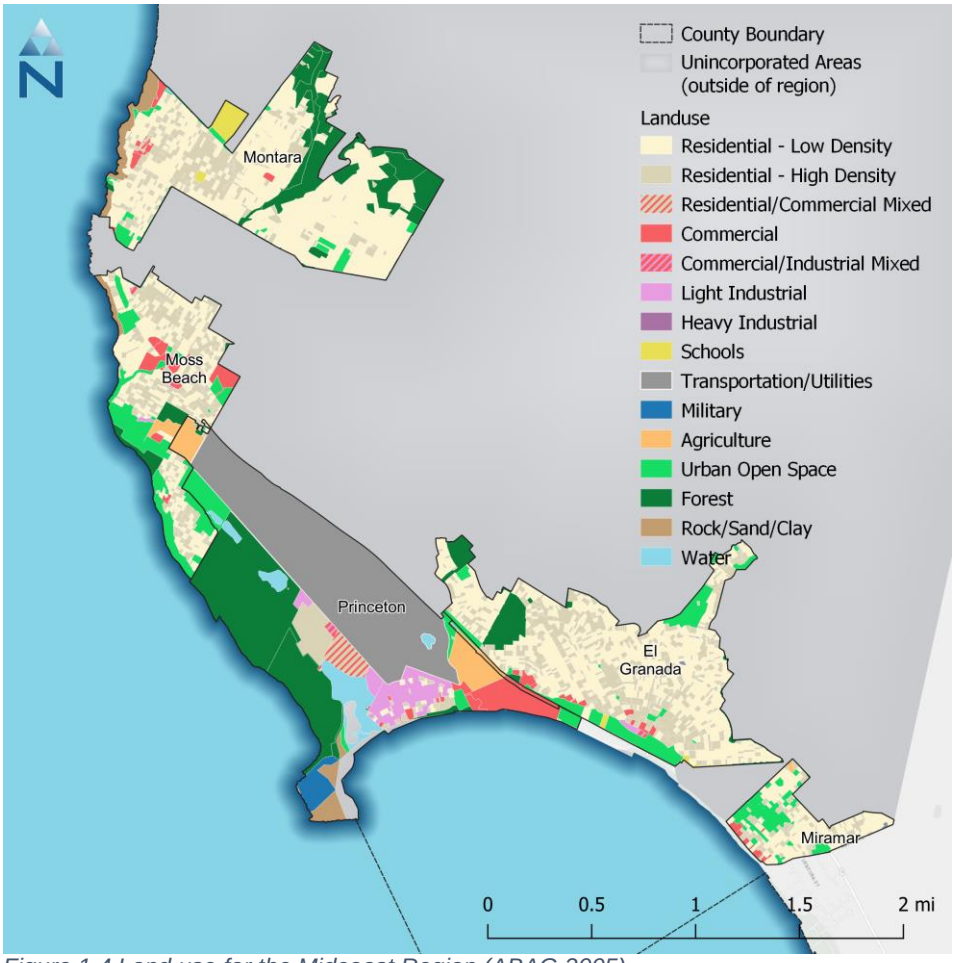



*Figure 1.4 Land use for the Midcoast Region (ABAG 2005)*

***South County***

The South County region consists of several unincorporated communities, with North Fair Oaks being the most populous. The remaining communities include a small mobile home park north of North Fair Oaks, Menlo Oaks, Sequoia Tract, West Menlo Park, Stanford Weekend Acres (not under the County's jurisdiction), Stanford Lands housing the Linear Accelerator (not under the County's jurisdiction), Ladera, and Los Trancos Woods. Land use for the South County region is shown in Figure 1.5.

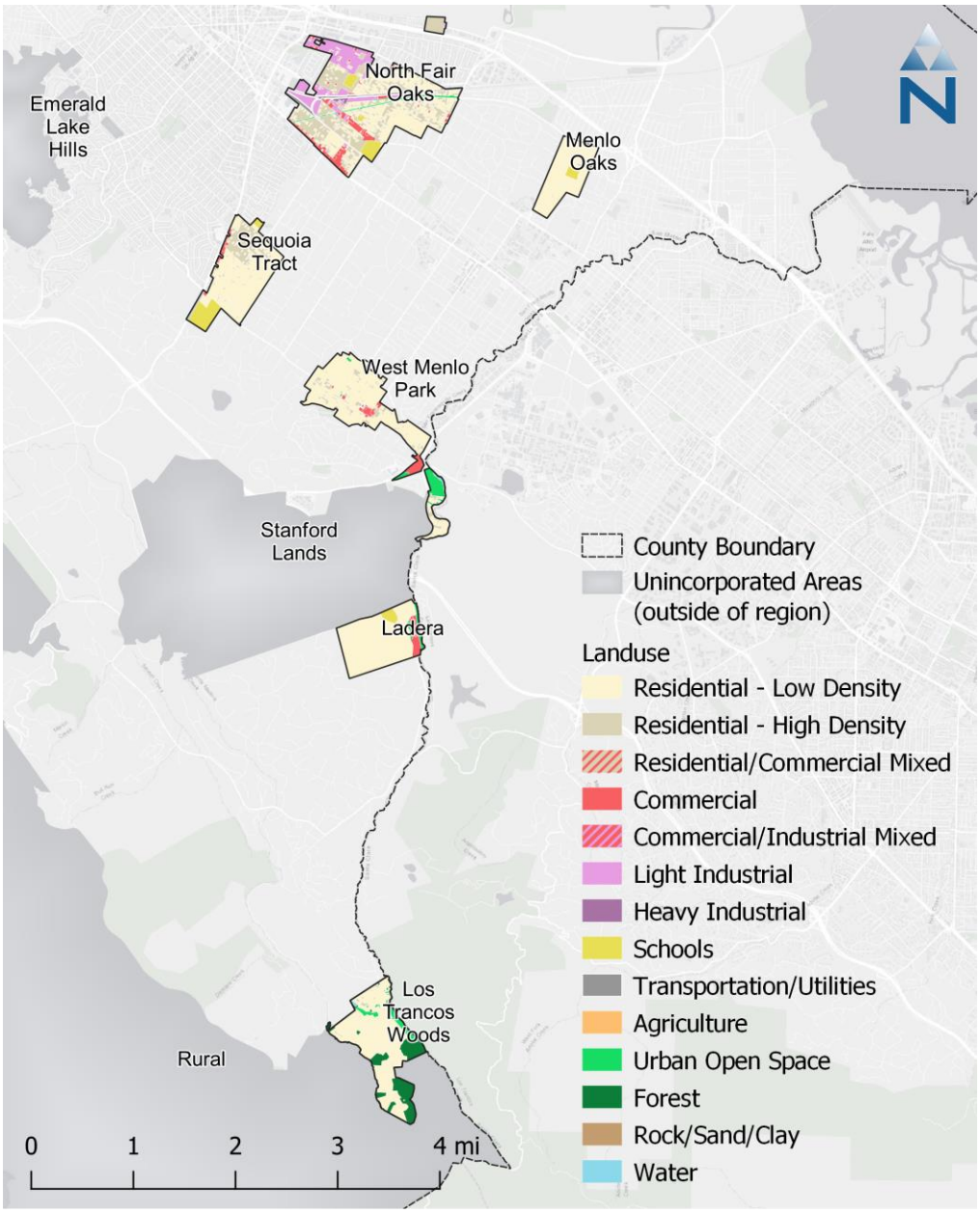



*Figure 1.5. Land use for the South County region (ABAG 2005).*

North Fair Oaks is a census-designated community in unincorporated San Mateo County within the Bayfront Canal/Atherton Channel watershed. The community is bordered by Redwood City to the north, west, and southwest; the Town of Atherton to the east; and a small portion of Menlo Park to the northeast. The boundary of North Fair Oaks encompasses approximately 800 acres and is home to around 15,000 residents in 4,000 housing units, as of 2010. The community contains multiple land uses, dominated by low- to high-density residential areas. There is a commercial and industrial district in the northwest corner of the community, bounded by Fair Oaks Avenue and Second Avenue. The community is bisected by two rail lines, with industrial areas located along the rail line along Edison Way and centered around Spring Street. Two commercial corridors exist along El Camino Real and Middlefield Road.

Menlo Oaks is a 160-acre unincorporated area located along the western border of the City of Menlo Park that drains to the Ravenswood Slough. The neighborhood has around 285 homes and a private K-8 school. The area consists of just five major residential streets with predominantly single-family homes and one educational building, the Peninsula School. Menlo Oaks is almost entirely residential and accessed by vehicular travel on narrow roads lacking sidewalks, curbs, and gutters. Menlo Oaks is shaded by a thick canopy of mature oaks, redwoods, eucalyptus, and evergreen trees (Menlo Oaks Tree Advocacy).

Sequoia Tract is an unincorporated area within the Redwood Creek watershed, bordered by Atherton to the east, Woodside to the west, and Redwood City to the north. The area contains approximately 330 acres. A combined 30 acres are occupied by Woodside High School and Selby Lane Middle School. The other 300 acres are dominated by low- to medium-density residential land uses. Sequoia Tract is bordered by Selby Lane and Nimitz Avenue to the north, Stockbridge Avenue to the east, Alameda de las Pulgas and Churchill Avenue to the south, and Woodside Road to the west. The middle school resides along the northern border and the high school along the southern border. Sequoia Tract has a moderately dense tree canopy throughout its residential neighborhoods.

West Menlo Park is an unincorporated area located between the City of Menlo Park and the Town of Atherton. The area encompasses approximately 320 acres in both the Atherton Channel and San Francisquito Creek watersheds. The population is around 3,700 as of 2010 and primary land uses consist of suburban housing and a small commercial district along Alameda de las Pulgas (U.S. Census 2010). West Menlo Park is predominantly low-density residential housing.

Ladera is a small residential community within the San Francisquito Creek watershed, on the eastern border of San Mateo County with Santa Clara County. The community has a population of 1,400 people. There is a small commercial district along Alpine Road. The community is characterized by plentiful vegetation, relatively low impervious area, and steep slopes.

Los Trancos Woods is a small residential community within the San Francisquito Creek watershed, located in the foothills of the Santa Cruz Mountains near the border with Santa Clara County. The predominantly forested area drains to Los Trancos Creek, a major tributary of the San Francisquito Creek. The community contains relatively low impervious area, steep slopes, and narrow streets.

***County Facilities on Incorporated Land***

The County owns a total of 83 parcels in incorporated cities, which include County buildings, parks, libraries, parking lots, a medical center, an event center, and vacant land. County parcels located in incorporated cities are shown in Figure 1.6.

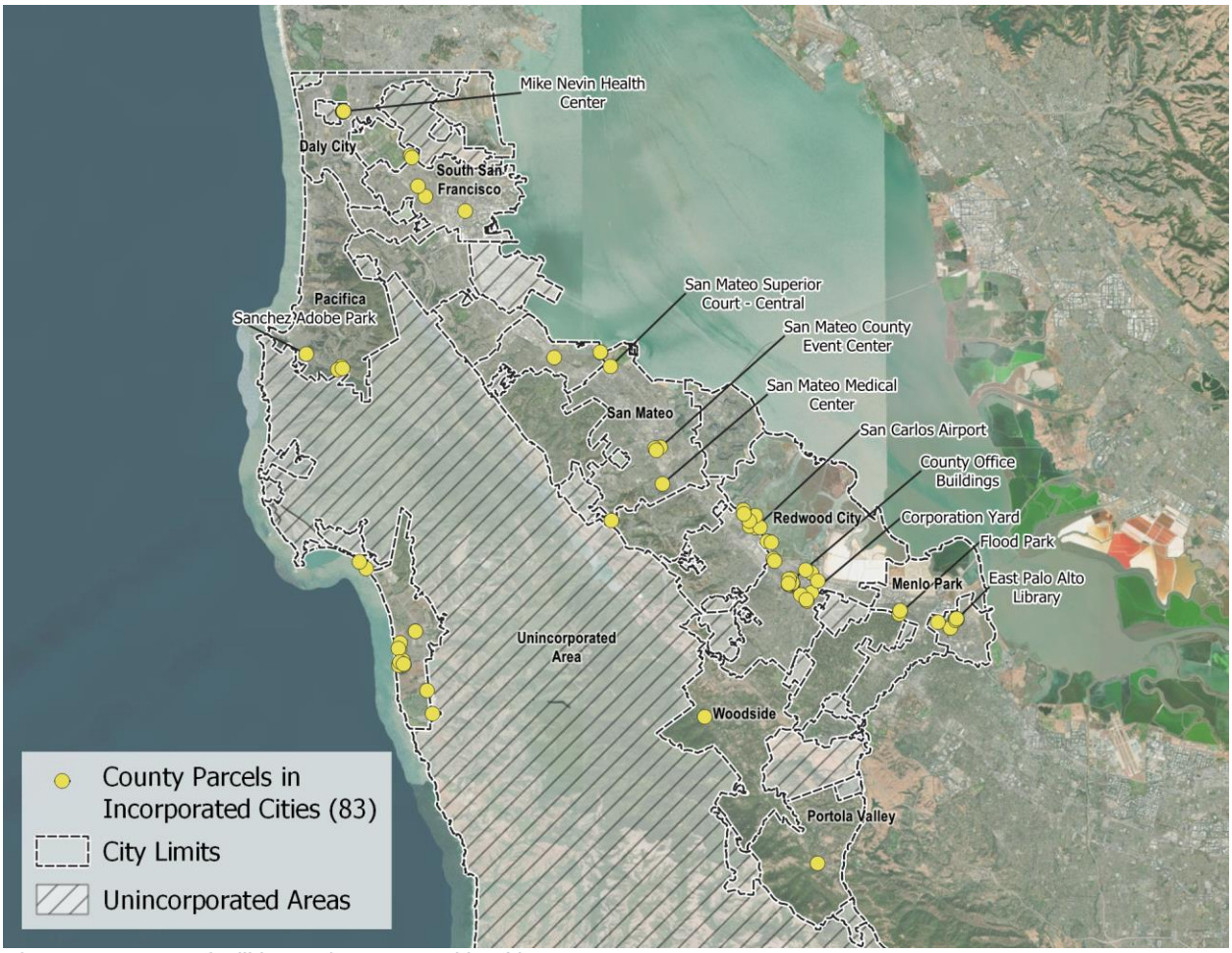



*Figure 1.6. County facilities on incorporated land in San Mateo County.*

### 1.1.2 Regulatory Context

***Federal and State Regulations and Initiatives***

The U.S. Environmental Protection Agency (EPA) has authority under the Clean Water Act to promulgate and enforce stormwater-related regulations. For the State of California, EPA has delegated the regulatory authority to the State Water Resources Control Board (State Water Board), which in turn, has delegated authority to the Regional Water Board to issue National Pollutant Discharge Elimination System (NPDES) permits in the San Francisco Bay Region. Stormwater NPDES permits allow stormwater discharges from municipal separate storm sewer systems (MS4s) to local creeks, San Francisco Bay, and other water bodies as long as they do not adversely affect the beneficial uses of or exceed any applicable water quality standards for those waters. Since the early 2000s, EPA has recognized and promoted the benefits of using GI in protecting drinking water supplies and public health, mitigating overflows from combined and separate storm sewers, and reducing stormwater pollution, and has encouraged the use of GI by municipal agencies as a prominent component of their MS4 programs[5].

The State Water Board and its Regional Water Boards have followed suit in recognizing not only the water quality benefits of GI, but also the opportunity to augment local water supplies in response to the impacts of drought and climate change. The 2014 California Water Action Plan called for multiple

[5] See: https://www.epa.gov/green-infrastructure

benefit stormwater management solutions and more efficient permitting programs. This directive created the State Water Board's "Strategy to Optimize Resource Management of Stormwater" (STORMS). STORMS's stated mission is to "lead the evolution of stormwater management in California by advancing the perspective that stormwater is a valuable resource, supporting policies for collaborative watershed-level stormwater management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests."[6] These Federal and State initiatives have influenced approaches in Bay Area municipal stormwater permits, as described in the next section.

***Municipal Regional Stormwater Permit***

The County of San Mateo is subject to the requirements of the reissued Municipal Regional Stormwater NPDES Permit for Phase I municipalities and agencies in the San Francisco Bay area (Order R2-2015-0049), also known as the Municipal Regional Permit (MRP), which became effective on January 1, 2016. The MRP applies to 76 large, medium, and small municipalities (cities, towns, and counties) and flood control agencies that discharge stormwater to San Francisco Bay, collectively referred to as Permittees.

Over the last 15 years, under Provision C.3 of the MRP and previous permits, new development and redevelopment projects on private and public property that exceed certain size thresholds ("Regulated Projects") have been required to mitigate impacts on water quality by incorporating site design, pollutant source control, stormwater treatment, and flow control measures as appropriate. Regulated Projects include new development and redevelopment projects that create and/or replace at least 10,000 square feet of impervious surface, and certain projects (e.g. auto service facilities, gas stations, restaurants, and uncovered parking lots) that create and/or replace at least 5,000 square feet of impervious surface. Low Impact Development (LID) treatment measures, such as rainwater harvesting and use, infiltration, and biotreatment, have been required on most Regulated Projects since December 2011. Construction of new roads is covered by these requirements, but projects related to existing roads and adjoining sidewalks and bike lanes are not regulated unless they include creation of an additional travel lane.

Provision C.3.j of the MRP requires each Permittee, including the County of San Mateo, to develop a Green Infrastructure (GI) Plan that demonstrates how jurisdictions will gradually shift from traditional "gray" storm drain infrastructure—which channels polluted runoff directly into receiving waters without treatment—to a more resilient and sustainable storm drain system comprised of "green" infrastructure, which captures, stores, and treats stormwater using specially-designed landscape systems. The GI Plan must demonstrate how the County plans to facilitate incorporation of GI measures in storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs, and other elements. The GI Plan, including a description of regulation updates, is required to be completed by September 30, 2019.

Other sections of the MRP include requirements for municipalities to control pollutants of concern to water quality in stormwater discharges, including polychlorinated biphenyls (PCBs), mercury, trash, and pesticides. GI measures can help remove these pollutants from stormwater runoff. For this reason, the MRP establishes a new linkage between public infrastructure retrofits and required reductions in discharges of certain pollutants, specifically PCBs and mercury, which are regulated by

[6] See: https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/

TMDLs for San Francisco Bay[7]. Over the next few decades, Permittees must reduce the loads of PCBs and mercury in stormwater discharges through various means, with a portion of these load reductions achieved through the installation of GI systems. Permittees in San Mateo County must collectively implement GI on public and private property to reduce mercury loading by 6 grams per year and PCBs loading by 15 grams per year by 2020. The load reductions will continue in future permits. These efforts will be integrated and coordinated countywide and regionwide for the most cost-effective results. Reduction of other pollutants, including trash and pesticides, should also be coordinated with GI implementation since, when properly designed, constructed and maintained, some GI systems may also be credited towards trash and pesticide reduction goals.

## 1.2 PURPOSE OF THE GI PLAN

The purpose of the GI Plan is to demonstrate the County's commitment to transform its urban landscape and storm drainage systems from exclusively "gray" to a mix of gray and "green," as required by the MRP to achieve water quality goals. This transformation will help produce a more resilient, sustainable system that reduces and slows runoff by dispersing it to vegetated areas, allows for infiltration and/or evapotranspiration of runoff, collects runoff for non-potable uses, and treats runoff using biotreatment and other green infrastructure practices.

The GI Plan presents the County's long-term strategy to incorporate GI in both private and public projects within unincorporated communities through development of an integrated policy framework across County departments that: 1) supports and encourages implementation of GI in public projects and regional collaboration; 2) ensures consistent regulation of private development projects in the County; and 3) provides the tools and resources needed to implement the County's GI Plan. As part of the overall strategy, the GI Plan has been developed to align with other County plans, such as the General Plan, Area Plans, County ordinances, Parks plans and policies, the Sea Level Rise Vulnerability Assessment, and County Flood Resilience Program plans.

The County's GI Plan contains the following key components for successful integration of GI into unincorporated County:

- Demonstration of consistency with and support of other local planning documents, regulations, policies and programs;
- Development of guidance and tools for siting, design, construction, and operations and maintenance of GI facilities;
- Evaluation of opportunities and challenges for GI within the County, and identification of focus areas to maximize potential benefits;
- Development of prioritization methodology and metrics for GI to identify a cost-effective mix of potential GI projects;
- Development of a County GI strategy and implementation plan; and
- Collaboration and outreach within County departments, with regional agencies, and with the local community.

[7]Total Maximum Daily Loads (TMDLs) are developed as required under the Clean Water Act to establish the maximum daily amount of a pollutant that can be discharged to a waterbody from all sources and still maintain water quality standards for that waterbody.

A key component of the GI definition in the MRP is the inclusion of both private and public property locations for GI systems. This has been done in order to plan, analyze, implement and credit GI systems for pollutant load reductions on a watershed scale, as well as recognize all GI accomplishments within a municipality. However, the primary focus of the GI Plan is the integration of GI systems into public buildings, parks, parking lots, and rights-of-way (e.g. road or bike path).

The GI Plan is not intended to impose retrofit requirements on private property, outside the standard development application review process for projects already regulated by the MRP, but may provide incentives or opportunities for private property owners to add or contribute towards GI elements if desired. The GI Plan may also establish opportunities to include GI facilities in the public right-of-way adjacent to private properties or in conjunction with private development, so they can contribute to meeting the target load reductions on a countywide level as well as implement GI on a larger scale.

## 1.3 WHAT IS GREEN INFRASTRUCTURE?

### 1.3.1 Basic Definition and Purpose

"Green Infrastructure" (GI) is infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. GI can treat stormwater to remove pollutants and protect water quality, store stormwater (direct water to stable storage areas away from roads and other development), and infiltrate treated water back into the groundwater table (replenishing the groundwater table). GI measures provide multiple benefits, including flooding and erosion prevention, reduction of heat island effect, aesthetic enhancements, traffic calming, and improvements to water quality and groundwater recharge.

At the scale of a city or county, GI refers to the patchwork of these landscape features. At the scale of a neighborhood or project site, GI refers to stormwater management systems and features that mimic nature by absorbing and storing water. There are three categories of GI measures based on their location:

1. Along or within a street or public right-of-way, these measures are referred to as Green Street measures;
2. On a private parcel, these measures are referred to as Low Impact Development (LID), or LID measures; and
3. When parcel-based GI measures capture runoff from off-site areas, they are referred to as Regional Projects. Generally located on publicly-owned lands, Regional Projects may involve collaboration among multiple municipalities and/or public agencies to construct large GI projects that capture and treat stormwater from large drainage areas. Collaboration with other jurisdictions may allow for larger GI projects with greater economies of scale, specifically cost-sharing opportunities and greater flood control and pollutant reduction capacity.

### 1.3.2 Impacts of Urbanization

A healthy, undisturbed landscape acts like a sponge by capturing, absorbing, and slowing the flow of water from the moment a raindrop lands on the ground. Urban development, though, has dramatically impacted natural hydrologic systems by reducing the landscape's absorptive capacity and introducing pollutants. In developed areas, impervious surfaces – such as roads, parking lots and rooftops – prevent water from infiltrating into the soil. Most of the rainfall runoff flows across the surface, where it washes debris, dirt, vehicle fluids, chemicals, and other pollutants into the local

storm drain systems. Once in the storm drain, polluted runoff flows directly into creeks and other natural bodies of water.

Not only does urban stormwater runoff wash pollutants into local waterways, but it can also contribute to flooding and erosion, and impact natural habitats. When impervious surfaces are built, rainwater runs off at faster rates and in larger volumes than in the natural condition. Stormwater runoff increases as more and more impervious surface is created. Natural creek channels must suddenly handle much greater volumes of water traveling at much faster rates, greatly increasing the duration of erosive forces on their bed and banks. In response to these changes, creek channels enlarge by downcutting and widening. This effect is called hydrograph modification or hydromodification.

### 1.3.3 Green Infrastructure Approach and Benefits

In contrast to traditional urban development, the green infrastructure approach is designed to minimize the impact of urban development on natural drainage systems by using vegetation, soils, and other elements and practices to capture, treat, infiltrate, and slow urban runoff and reduce heat that urban development introduces. The GI approach uses the buildings, streets, and parking lots of our built human environment to help maintain the balance of natural drainage systems. Green streets, green parking lots, and green roofs help increase the time it takes stormwater runoff to flow downstream and distributes the volume of water entering into creeks over a longer period of time, thereby decreasing flooding and reducing the erosive forces of the water. LID on public or private parcels reduces water quality impacts by preserving and re-creating natural landscape features, minimizing imperviousness, and then infiltrating, storing, detaining, evapotranspiring (evaporating stormwater into the air directly or through plant transpiration), and/or biotreating stormwater runoff close to its source, or onsite.

GI provides amenities with many benefits beyond water quality improvement and groundwater replenishment, including creation of attractive streetscapes, reduction of heat island effect, bicycle and pedestrian accessibility, clean air, climate change resilience and mitigation, place making and community cohesion, energy savings, and enhanced flood protection.

The County's GI Plan can serve as a catalyst for advancing health equity, fostering community-led projects, and building social, physical, and economic resilience to climate change throughout unincorporated San Mateo County. Climate change is exacerbating health inequities, and the public health impacts of climate change negatively impact already vulnerable populations such as lower-income communities, people with respiratory diseases and disabilities, children, and the elderly. Protecting water resources is also important to the ecosystem and human health. A significant portion of the County is prone to flooding from sea level rise, which may result in increased health risks from vector-borne diseases, drinking water contamination, and food-borne diseases. The environmental, health, and economic benefits that GI projects will bring to unincorporated County are valuable assets to advance.

### 1.3.4 Types of GI Facilities

Integrating GI into public spaces typically involves construction of stormwater capture and treatment measures in public streets, parks, and parking lots or as part of public buildings. The most common types of GI measures that can be constructed in public spaces include: (1) bioretention, (2) stormwater tree well filters, (3) pervious pavement, (4) infiltration facilities, (5) green roofs, and 6) rainwater harvesting and use facilities. A description of these facility types is provided below.

***Biotreatment/Bioretention***

Bioretention areas are depressed landscaped areas that consist of a ponding area, mulch layer, plants, and a special biotreatment soil media composed of sand and compost, underlain by drain rock and an underdrain, if required. Bioretention is designed to retain stormwater runoff, filter stormwater runoff through biotreatment soil media and plant roots, and either infiltrate stormwater runoff to underlying soils as allowed by site conditions, or release treated stormwater runoff to the storm drain system, or both. They can be of any shape and are adaptable for use on a building or parking lot site or in the street right-of-way.

*Figure 1.7. Stormwater curb extension, Carolan Ave, Burlingame.*
*(Source: SMCWPPP)*

Bioretention systems in the streetscape have specific names: stormwater planters, stormwater curb extensions (or bulb-out), and stormwater tree well filters (described in the next section).

A stormwater curb extension (Figure 1.7) is a bioretention system that extends into the roadway and involves modification of the curb line and gutter. Stormwater curb extensions may be installed midblock or at an intersection. Curb bulb-outs and curb extensions installed for pedestrian safety, traffic calming, and other transportation benefits can also provide opportunities for siting bioretention facilities. Parking lots can accommodate bioretention areas of any shape in medians, corners, and pockets of space unavailable for parking.

*Figure 1.8. Stormwater planter, Hotel Nia, Menlo Park.*
*(Source: City of Menlo Park)*

A stormwater planter (Figure 1.8) is a linear bioretention facility in the public right-of-way along the edge of the street, often in the planter strip between the street and sidewalk. They are typically designed with vertical (concrete) sides. However, they can also have sloped sides depending on the amount of space available.

***Stormwater Tree Well Filters and Suspended Pavement Systems***

A stormwater tree well filter (Figure 1.9) is a type of bioretention system consisting of an excavated pit or vault that is filled with biotreatment soil media, planted with a tree and other vegetation, and underlain with drain rock and an underdrain, if needed. Stormwater tree well filters can be constructed in series and linked via a subsurface trench or underdrain. A stormwater tree well filter can require less dedicated space than other types of bioretention areas.

Suspended pavement systems may be used to provide increased underground treatment area and soil volume for tree well filters. These are structural systems designed to provide support for pavement while preserving large volumes of uncompacted soil for tree roots. Suspended pavement systems may be any engineered system of structural supports or commercially available proprietary structural systems.

Stormwater tree well filters and suspended pavement systems are especially useful in settings between existing sidewalk elements where available space is at a premium. They can also be used in curb extensions or bulb-outs, medians, or parking lots if surrounding grades allow for drainage to those areas. The systems can be designed to receive runoff through curb cuts or catch basins or allow runoff to enter through pervious pavers on top of the structural support.

*Figure 1.9. Stormwater tree well filter conceptual examples: modular suspended pavement system (left), column suspended pavement system (right).*
*(Courtesy of Philadelphia Water Department)*

***Pervious Pavement***

Pervious pavement (Figure 1.10) is hardscape that allows water to pass through its surface into a storage area filled with gravel prior to infiltrating into underlying soils. Types of pervious pavement include permeable interlocking concrete pavers, pervious concrete, porous asphalt, and grid pavement. Pervious pavement is often used in parking areas or on streets where bioretention is not feasible due to space constraints or if there is a need to maintain parking. Pervious pavement does not require a dedicated surface area for treatment and allows a site to maintain its existing hardscape.

There are two types of pervious pavers: Permeable Interlocking Concrete Pavers (PICP) and Permeable Pavers (PP). PICP allow water to pass through the joint spacing between solid pavers, and PP allow water to pass through the paver itself and therefore can have tighter joints. Porous asphalt and pervious concrete are similar to traditional asphalt and concrete, but do not include fine aggregates in the mixture, allowing water to pass through the surface. Reinforced grass and gravel grid systems also allow rainwater to soak into open pore spaces in the soil medium. All types are supported by several layers of different sizes of gravel to provide structural support and water storage.

*Figure 1.10. Permeable Interlocking Concrete Pavers, Mayfield Playing Fields, Palo Alto.*
*(Source: City of Palo Alto)*

### *Infiltration Facilities*

Where soil conditions permit, infiltration facilities can be used to capture stormwater and infiltrate it into native soils. The two primary types are infiltration trenches and subsurface infiltration systems.

*Figure 1.11. Infiltration trench, San Jose.*
*(Source: City of San Jose)*

An infiltration trench is an excavated trench backfilled with a stone aggregate and lined with a filter fabric. Infiltration trenches collect and detain runoff, store it in the void spaces of the aggregate, and allow it to infiltrate into the underlying soil. Infiltration trenches can be used along roadways, alleyways, and the edges or medians of parking lots. An example of an infiltration trench is shown in Figure 1.11. Infiltration trenches can have exposed gravel, landscaped surface or pervious pavement surface (as shown in Figure 1.11).

*Figure 1.12. Subsurface infiltration system (under construction), Sun Valley Park, Los Angeles.*
*(Source: Conteches.com)*

Subsurface infiltration systems are another type of GI measure that may be used beneath parking lots or parks to infiltrate larger quantities of runoff. These systems, also known as infiltration galleries, are underground vaults or pipes that store and infiltrate stormwater while preserving the uses of the land surface above parking lots, parks and playing fields. An example of a subsurface infiltration system is shown in Figure 1.12. Storage can take the form of large-diameter perforated metal or plastic pipe, or concrete arches, concrete vaults, plastic chambers or crates with open bottoms. Prefabricated, modular infiltration galleries are available in a variety of shapes, sizes, and material types that are strong enough for heavy vehicle loads.

### *Green Roofs*

Green roofs (Figure 1.13) are vegetated roof systems that filter, absorb, and retain or detain the rain that falls upon them. Green roof systems are comprised of a layer of planting media planted with vegetation, underlain by other structural components including waterproof membranes, synthetic insulation, geofabrics, and underdrains. A green roof can be either “extensive”, with 3 to 7 inches of lightweight planting media and low-profile, low-maintenance plants, or “intensive”, with a thicker layer (8 to 48 inches) of media, more varied plantings, and a more garden-like appearance. Green roofs can provide high rates of rainfall retention via plant uptake and evapotranspiration and can decrease peak flow rates in storm drain systems because of the storage that occurs in the planting media during rain events.

*Figure 1.13. Green Roof, Casa Feliz Housing Project, San Jose.*
*(Source: First Community Housing)*

*Figure 1.14. Rainwater harvesting cistern, Environmental Innovation Center, San José. (Source: City of San Jose)*

***Rainwater Harvesting and Use***

Rainwater harvesting is the process of collecting rainwater from impervious surfaces and storing it for later use. Storage facilities that can be used to capture stormwater include rain barrels, above-ground or below-ground cisterns, open storage reservoirs (e.g., ponds), and various underground storage devices (tanks, vaults, pipes, and proprietary storage systems). Examples of an above-ground cistern and a subsurface vault are shown in Figures 1.14 and 1.15. The captured water is then fed into irrigation systems or non-potable water plumbing systems, either by pumping or by gravity flow. Uses of captured water may include irrigation, vehicle washing, and indoor non-potable use such as toilet flushing, heating and cooling, or industrial processing.

The two most common applications of rainwater harvesting are: 1) collection of roof runoff from buildings; and 2) collection of runoff from at-grade surfaces or diversion of water from storm drains into large underground storage facilities below parking lots or parks. Rooftop runoff usually contains lower quantities of pollutants than at-grade surface runoff and can be collected via gravity flow. Underground storage systems typically include pre-treatment facilities to remove pollutants from stormwater prior to storage and use.

*Figure 1.15. Subsurface storage system, generic example. (http://stormtrap.com/products/singletrap/)*

## 1.4 OVERVIEW OF THE GREEN INFRASTRUCTURE PLAN

### 1.4.1 GI Plan Development Process

The process to develop the County's GI Plan began with the development and adoption of the San Mateo County Green Infrastructure Workplan (Workplan) by June 30, 2017, as required by MRP Provision C.3.j.i.(1). The Workplan provided the framework for completing the GI Plan, including a statement of purpose, tasks, and timeframes for completing the required elements of the GI Plan. The Workplan was adopted by the County Board of Supervisors on April 25, 2017 (Resolution No. 075143), and submitted to the Water Board by September 30, 2017, in compliance with the MRP.

The County's overall approach to developing and implementing the GI Plan includes the following 3 components:

1. Integration of GI into the County's Policy Framework.
   The County is developing an integrated policy framework to support implementation of GI in the County through adoption and modification of policies, ordinances, and regulation updates to address GI requirements. This will support implementation of GI and provide consistent regulation for both public and private development projects. The GI Plan includes a workplan that identifies additional measures the County will take to ensure GI and LID measures are appropriately included in future policy and regulation updates.

2. Identification and Prioritization of GI Projects.
   The County identified, prioritized, and mapped opportunities for public GI projects in the County, and developed a workplan for completion of prioritized projects. From this information, the County developed a prioritized list of projects and estimated targets for the amount of impervious surface within the County that will be converted to drain to a GI feature by 2020, 2030, and 2040.

3. Technical Guidance and Information.
   The County is providing technical guidance and other information or tools needed to support development, implementation, and tracking of GI projects in the County. The GI Plan provides information on funding sources, updated guidelines and specifications, maintenance, and project tracking tools.

Internal and regional collaboration played a key role in developing the GI Plan, and will continue during implementation of the GI Plan. Both the Workplan and the GI Plan were developed as an interdepartmental effort led by the Office of Sustainability and involving staff from the Planning and Building Department, the Department of Public Works, Parks Department, and the Project Development Unit of the County Manager's Office. The County's interdepartmental coordination also included the County Flood Resilience Program and the Climate Change team to encourage incorporation of GI into multi-objective projects that are developed to achieve benefits related to clean water and air, flood and climate change resilience and mitigation, habitat protection/enhancement, and energy efficiency.

Because the County and its 20 cities need a coordinated approach to effectively address flooding, sea level rise and coastal erosion across the County as a whole, the County plans to modify the San Mateo County Flood Control District (FCD) by legislation to expand its scope, restructure its governance, and rename it the Flood and Sea Level Rise Resiliency District[8]. The new District will consolidate the work of both the FCD and the Flood Resiliency Program. The interdepartmental collaborations described above, as well as collaboration with the new County Flood and Sea Level Rise Resiliency District, will continue during implementation of the GI Plan into the future.

Regional collaboration is primarily facilitated though the County's participation in the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP). The program is administered by the City/County Association of Governments of San Mateo County (C/CAG), a joint powers agency whose members are the County of San Mateo and the 20 incorporated cities and towns in the County. SMCWPPP works with other MRP Permittees to comply with MRP requirements. In addition to assisting individual municipalities with MRP compliance, SMCWPPP provides guidance and products at the countywide and regional levels, and facilitates and encourages coordination and collaboration on Regional GI Projects. For example, SMCWPPP developed the Stormwater Resource Plan for San Mateo County (SRP) that identified and prioritized potential multi-benefit GI opportunities on public parcels and streets within the County. The County's GI Plan builds upon the SRP output to incorporate the local priorities of the unincorporated communities within the County and further identify, evaluate, and prioritize potential GI project opportunities. SMCWPPP coordinated the Green Infrastructure Technical Advisory Committee (GI TAC) and technical consultants that have helped the County and cities develop and implement their GI Plans. SMCWPPP also created the San Mateo Countywide Green Infrastructure Design Guide (GI Design

[8]More information on the new Flood and Sea Level Rise Resiliency District can be found here: https://resilientsanmateo.org/.

Guide) which provides design guidance, standards and typical details for GI implementation in public and private projects (SMCWPPP 2019).

Through SMCWPPP, the County also coordinates with the Bay Area Stormwater Management Agencies Association (BASMAA), which has provided regional GI guidance and feedback from MRP regulators on GI expectations and approaches. BASMAA members include other countywide stormwater programs in Alameda, Contra Costa, and Santa Clara Counties, and area-wide programs in the Vallejo and Fairfield-Suisun portions of Solano County, whose participating municipalities are permittees under the MRP. Through these regional programs, the County is pursuing opportunities for watershed-scale partnerships and collaborative multi-benefit efforts to implement regional projects in coordination with neighboring cities, special districts, and transportation agencies.

***Adoption and Public Participation***

Public participation and adoption of the GI Plan was facilitated through presentations at a number of public meetings. Prior to adoption, County staff presented components of the GI Plan at the following public meetings:

- Midcoast Community Council Meeting
  Granada Community Services District, 504 Alhambra Avenue, El Granada CA 94019
  May 22, 2019

- North Fair Oaks Community Council Meeting
  North Fair Oaks Community Center, 2600 Middlefield Road, Redwood City CA 94063
  June 27, 2019

- County of San Mateo Planning Commission Meeting
  March 27, 2019

The completed GI Plan was adopted by the County's Board of Supervisors on September 17, 2019.

### 1.4.2 GI Plan Sections and Appendices

The remainder of the GI Plan is organized into the following chapters:

Chapter 2: Coordination with Other Planning Documents. This chapter describes the relationship of the GI Plan to other planning documents and the efforts completed within the County to date to update or modify those planning documents, as needed, to support and incorporate GI requirements. This section also presents a workplan and schedule for future updates or modifications to planning documents and regulations that were not completed with the GI Plan.

Chapter 3: GI Design Guidelines, Details, and Specifications. This chapter identifies materials developed by SMCWPPP, BASMAA, or others on GI design guidelines, typical details, specifications and standards that are available to County staff and others to support the design, construction and operation and maintenance of GI facilities. It also describes efforts to date by the County to customize typical details and update existing road standards.

Chapter 4: Opportunities and Challenges for GI in Unincorporated County. This chapter provides an overview of the characteristics relevant to GI implementation, summarizes the various

unincorporated communities in San Mateo County, and recommends suggested areas of focus based on community characteristics.

Chapter 5: GI Project Prioritization Methodology. This chapter presents the methodology used to identify and prioritize opportunities for GI projects within unincorporated County, starting first with the priorities identified at the countywide scale, as described in the San Mateo County SRP, and then further refined based on the specific priorities of unincorporated County.

Chapter 6: County GI Strategy. This chapter outlines the County's strategy for implementing prioritized potential GI projects within the next 10 years and through 2040.

Chapter 7: Implementation Plan. This chapter discusses the variety of mechanisms the County will employ to implement the GI Plan, including future planning, tracking, and funding. This chapter also includes a workplan to complete prioritized GI projects.

Chapter 8: References. This chapter provides references contained within the GI Plan.

Appendices:

- Appendix A: Reasonable Assurance Analysis. A discussion of the RAA modeling process and a detailed explanation of the results is provided in this appendix.
- Appendix B: Project Concepts. This appendix contains project concepts for four potential regional projects.
- Appendix C: County GI Design Resources. Recommended modifications to the Typical GI Details and Specifications included within the SMCWPPP GI Design Guide and County-specific guidance for GI street design are provided in this appendix.
- Appendix D: Supporting Information for Evaluation of Future Funding Options. This appendix provides information on various options being evaluated by the County as future funding sources for GI implementation.

The GI Plan elements required by Provision C.3.j.i.(2) of the MRP and the section of the document in which each component can be found are summarized in Table 1-1 below.

*Table 1-1. Summary of GI Plan elements required by Provision C.3.j.i of the MRP.*

| MRP Provision | GI Plan Elements | GI Plan Section |
|---|---|---|
| **C.3.j.i.(2)(a)** | Project Identification and Prioritization Mechanism | Chapter 5 |
| **C.3.j.i.(2)(b)** | Prioritized Project Locations | Section 5.4.3 |
| **C.3.j.i.(2)(c)** | Impervious Surface Targets | Section 6.7 |
| **C.3.j.i.(2)(d)** | Completed Project Tracking System | Section 7.4 |
| **C.3.j.i.(2)(e,f)** | Guidelines and Specifications | Chapter 3 |
| **C.3.j.i.(2)(g)** | Alternative Sizing Requirements for Green Street Projects | Section 3.2.2 |
| **C.3.j.i.(2)(h)** | Integration with Other Municipal Plans | Chapter 2 |
| **C.3.j.i.(2)(i)** | Work Plan for Integration of GI Language in Plan Updates and Future Plans | Section 2.4 |
| **C.3.j.i.(2)(j)** | Workplan to Complete Prioritized Projects | Section 7.1 |
| **C.3.j.i.(2)(k)** | Evaluation of Funding Options | Section 7.2.2 |
| **C.3.j.i.(3)** | Legal and Implementation Mechanisms | Section 7.2.1 |

# 2 CONSISTENCY WITH OTHER PLANNING DOCUMENTS

To ensure the success of the GI Plan and its implementation, its goals, policies and implementation strategies should align with the County's General Plan and other related planning documents. The MRP requires that municipal agencies review such documents and include in their GI Plans a summary of any planning documents aligned with the GI Plan or updated or modified to appropriately incorporate GI requirements. The GI Plan must also include a workplan identifying how GI measures will be included in future plans.

## 2.1 EXISTING COUNTY PLANS AND POLICIES

The County completed a review of its existing planning documents to determine the extent to which GI-related language, concepts and policies have been incorporated. The significant plans, standards and policies that were reviewed are listed below:

- General Plan
- Energy Efficiency Climate Action Plan
- Hazard Mitigation Plan
- Local Coastal Program Policies
- Complete Streets Policy
- North Fair Oaks Community Plan

The following sections provide a brief discussion of the significant documents reviewed and examples of current language related to GI. A prioritized workplan for the integration of GI language into existing and future County planning documents is provided in Section 2.3.

### 2.1.1 General Plan

The General Plan is a State-required document that guides long-term land use, development and resources within the County. The initial plan was developed in 1986 and includes goals, policies, and programs to address land use, circulation, housing, conservation, open space, noise, and safety. The Energy and Climate Change Element was the most recent addition to the General Plan approved in 2013. Two examples of GI-related language in the current General Plan are cited below:

Chapter 7 – General Land Use, General Land Use Issues Section II.C.3 "Water Quality"

> "Water pollution is also influenced by development and land use patterns. As identified in the County's Surface Water Runoff Management Program, development in several bayside watersheds caused significant pollution in streams and the Bay. In general, denser development patterns generally require fewer miles of roadway and cover smaller amounts of open space, because dwelling units are clustered or stacked. Consequently, fewer acres are paved and fewer pollutants are carried by water runoff into storm drainage systems or sediment basins. Also, potential problems of downstream flooding can be avoided if the size of upstream areas covered by pavement is reduced."

Chapter 17 - Energy and Climate Change Element, General Greenhouse Gas Reduction Policies and Programs, Implementing Strategy 2.3A:

> "Revise design guidelines and other regulations to incorporate requirements for tree planting where site conditions allow, shading design, and the use of high albedo, pervious, or open-grid materials to reduce heat absorption in development."

### 2.1.2 Energy Efficiency Climate Action Plan

The Energy Efficiency Climate Action Plan serves as the primary guide for the County related to policies and actions to reduce the emissions of greenhouse gases and efforts to combat climate change. It was developed in 2013 to demonstrate the County's continuing commitment to mitigate and adapt to the impacts of climate disruption and reverse the trends of increasing emissions by reducing emissions by 17% by 2020 over 2005 levels. The plan is currently being updated to set the next emissions reduction goal and time frame. An example of GI language is excerpted here:

Chapter 5 – Adaptation, County Adaptation Strategy, Priority Adaptive Capacity Actions:
"Built Environment"

> "Install low-impact development, natural filtration, and urban runoff catchments to address changes in the precipitation pattern, flooding, and other extreme events as well as increase groundwater recharge."

### 2.1.3 Hazard Mitigation Plan

The San Mateo County Office of Emergency Services (OES) and San Mateo County jurisdictions created the Hazard Mitigation Plan in 2016 to further customize a regional hazard plan created by the regional planning organization, ABAG. Volume 1 contains the County plan and Volume 2 (Annex) contains information on the other agencies in the County that participated in the planning process. An example of GI-related language is shown below:

Environment Mitigation Strategies: "Environmental Sustainability and Pollution Reduction"

> "Comply with applicable performance standards of any National Pollutant Discharge Elimination System municipal stormwater permit that seeks to manage increases in stormwater run-off flows from new development and redevelopment construction projects."

### 2.1.4 Local Coastal Program Policies

The Local Coastal Program Policies is the set of policies and mechanisms related to development and land use in the coastal area of San Mateo County. The document was updated in 2013 and includes requirements related to Coastal Development Permits that are issued to all development projects in the area. An example of stormwater related language is shown here:

Minimum Stormwater Pollution Prevention Requirements: "New development that alters the land"

> "Use landscaping to collect, detain and filter surface runoff, and design landscaping to minimize the use of irrigation, fertilizers and pesticides. All landscaping plants shall be drought tolerant and consist of either native or non-invasive species."

### 2.1.5 Complete Streets Policy

The County's Complete Streets Policy was approved by the Board of Supervisors on January 8, 2013 in response to State legislation and Metropolitan Transportation Agency (MTC) requirements for maintaining eligibility for One Bay Area Grant program funding. The policy affirms the County's commitment to creating and maintaining Complete Streets that provide safe, comfortable, and convenient modes of travel through a comprehensive, integrated transportation network that serves the needs of users of all ages and abilities. The policy describes the need for transportation improvements such as traffic calming devices and landscaping but does not discuss the opportunities for integration of GI into these facilities or the benefits of GI as part of Complete Street projects. Complete Streets approaches have been incorporated into Chapter 4, Greenhouse Gas Reduction Strategies, of the Energy Efficiency Climate Action Plan, as well as the Energy and Climate Change Element of the General Plan.

### 2.1.6 North Fair Oaks Community Plan

The North Fair Oaks Community Plan was developed in 2011 to guide development and land use decisions in the North Fair Oaks area of the County. It provides a vision for the community with goals, policies and related actions. The plan already contains several instances of model GI-related language and one example is shown below:

Infrastructure: "Reduce the impact of flooding in North Fair Oaks"

> "Create a new program for existing public streets to be redesigned with integrated stormwater treatment areas such as bioretention areas, vegetated swales, rain gardens, and other features to reduce the peak storm flows. The new stormwater treatment areas should also be designed to provide stormwater retention, which will hold back stormwater runoff for a period of time so that downstream flooding is reduced."

## 2.2 COUNTY GUIDELINES AND MANUALS

### 2.2.1 Guidelines for Drainage Review

The County's existing guidelines for drainage review are contained within a Department of Public Works document titled San Mateo County Guidelines for Drainage Review. The document briefly describes the design requirements for drainage facilities and the guidelines for preparing documentation of drainage design.

As part of the GI Plan efforts, the County is expanding upon this existing document by updating its existing stormwater ordinance to create a new Stormwater and Drainage Control Ordinance section to codify the requirements for drainage review. A new Drainage Manual is being developed to provide guidance for meeting the requirements of the Ordinance. The Drainage Manual will also serve to unify by reference the various stormwater and drainage policy and guidance documents within the County into one document. The contents of the two documents are described briefly as follows.

***Stormwater and Drainage Control Ordinance***

The new Stormwater and Drainage Control Ordinance (proposed amendments to Chapter 4.100 of the County Municipal Code) will establish the requirements for new development and redevelopment projects related to the design, construction, and post-construction operations and maintenance of project drainage and stormwater treatment systems. The Ordinance contains requirements related to three measures of system performance: conveyance, flow and volume control, and water quality

treatment. All projects must have the capacity to convey peak flows from the specified design storm, and must also provide adequate flow and volume controls such that neither the runoff flow rate nor total volume is increased from pre-development conditions. Depending on the scale and setting of the project, water quality requirements vary from minimal site design and source control measures up to formal stormwater treatment facilities. The ordinance is also being updated to address all current County stormwater program requirements, as needed.

***Drainage Manual***

The County of San Mateo Drainage Manual (Manual) will provide guidance to landowners, developers, engineers, landscape architects, and the general public on the County's drainage policies and compliance with the new Stormwater and Drainage Ordinance for all stages of the development process, from design through permitting, construction, and post-construction. The Manual will describe in detail the three different drainage review processes in the County -- Basic Drainage Review, Prescriptive Drainage Review, and Standard Drainage Review -- and guide applicants in determining the appropriate drainage review process for their projects. Basic and Prescriptive Drainage Review are intended to streamline the permitting process for smaller projects that do not require new drainage facilities or only install previously approved drainage facilities. Basic and Prescriptive Drainage Review can be completed without the services of a registered professional civil engineer. Larger, more complex projects are required to complete Standard Drainage Review, which requires an application prepared by a registered professional civil engineer.

The Manual will promote the use of GI facilities as multi-benefit systems that can help projects meet flow and volume control requirements as well as water quality requirements. The Manual will also incorporate by reference several other guidance documents on green infrastructure facilities, such as the SMCWPPP C.3 Regulated Projects Guide and SMCWPPP Green Infrastructure Design Guide.

### 2.2.2 Routine Maintenance Program Manual

The County Department of Public Works (DPW) and Parks Department (Parks) are required to conduct routine maintenance activities to ensure that County facilities are properly functioning and operational. In the past, the County has developed, permitted, and conducted maintenance activities as individual discrete actions. The purpose of developing the San Mateo County Routine Maintenance Program was to provide a more comprehensive and consistent approach to conducting routine maintenance activities, following a consistent set of maintenance methods, BMPs, and impact avoidance approaches. The Routine Maintenance Program Manual, completed in 2018, describes routine maintenance activities and practices to avoid and minimize potential environmental impacts during maintenance.

Section 5.2.3 of the Manual describes maintenance of LID and GI facilities, and references the County's GI Plan. Once GI and other future LID facilities are installed, the County intends that this Maintenance Program will cover maintenance of such infrastructure on County-owned or County-maintained lands.

## 2.3 REGIONAL PLANS

The County of San Mateo has partnered with other agencies on several other GI-related planning efforts across the region. Having worked closely on these regional plans, the County's GI Plan builds upon previous planning efforts and incorporates lessons learned with an awareness of other regional priorities. The County recognizes that meeting its own GI implementation goals is related to its coordinated planning efforts. Regional planning efforts that the County participated in include the

San Mateo County Stormwater Resource Plan (SRP), the C/CAG Sustainable Streets Master Plan, and the Bay Area Integrated Regional Water Management Plan (IRWMP).

### 2.3.1 San Mateo County Stormwater Resource Plan

The San Mateo County SRP is a countywide evaluation of opportunities for stormwater capture, treatment and use, required by the State to allow stormwater capture projects to be eligible for State grant funds. Development of the SRP was led by C/CAG and SMCWPPP, representing twenty cities and towns, the County of San Mateo, and the San Mateo County Flood Control District. 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 opportunities for 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 GI prioritization analysis in the SRP forms the building blocks for the County-specific prioritization in the GI Plan. The regional priorities addressed by the SRP were incorporated into the GI Plan augmented with the local planning priorities of the County in unincorporated areas (see Chapter 5 for more details).

### 2.3.2 C/CAG Sustainable Streets Master Plan

The Sustainable Streets Master Plan (SSMP) is a collaborative effort between Caltrans and C/CAG to further prioritize locations for integrating GI into roadway rights-of-way to capture and treat stormwater runoff. As an additional objective, the SSMP aims to build upon current climate change planning efforts within the County to add resilience to vulnerable communities that may be disproportionately burdened by the effects of climate change. In addition to prioritizing sites and developing concepts for sustainable street projects, the SSMP effort will also result in the development of a Countywide GI Tracking Tool. The tool will provide a platform for all C/CAG member agencies, including the County, to track completed GI projects, quantify key project benefits, and report progress towards GI implementation for multiple objectives, including meeting requirements of the MRP provisions. Plans for integrating the County's current GI tracking methods with the tool to meet reporting requirements of the MRP are described in Section 7.3.

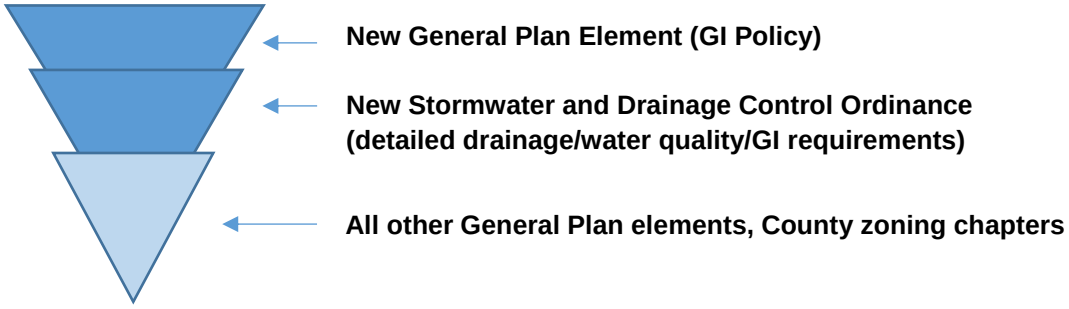
### 2.3.3 Bay Area Integrated Regional Water Management Plan

The San Francisco Bay Area 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 in four functional areas: 1) water supply and water quality; 2) wastewater and recycled water; 3) flood protection and stormwater management; and 4) watershed management and habitat protection and restoration. The IRWMP provides a collaborative and integrative framework to take action and address the major water-related challenges in the region through goals, objectives, selected resource management strategies, and prioritized projects. The IRWMP includes a list of over 300 project proposals, and a methodology for ranking those projects for the purpose of submitting a compilation of high priority projects for grant funding. The Bay Area IRWMP Coordinating Committee approved the inclusion of the San Mateo County SRP into the 2013 IRWMP on February 27, 2017. As SRP projects are proposed for grant funding, they will be added to the IRWMP list using established procedures.

## 2.4 WORK PLAN FOR INTEGRATION OF GI LANGUAGE IN COUNTY PLAN UPDATES AND FUTURE PLANS

### 2.4.1 Recommended Updates to Existing County Plans and Policies

The review of the General Plan has led to the conclusion that a new element focusing on watershed and stormwater management is needed for the County's General Plan. The County intends that the new element be the policy anchor for GI in conjunction with revisions to the existing stormwater ordinance (the new Stormwater and Drainage Control Ordinance) and updates to other policy documents as needed in the future. The following graphic depicts the County's priorities for policy changes:




The new General Plan element will frame the purpose and benefits of green infrastructure and establish policies that support changes in the subordinate County policies and regulations. The policy approach will also address MRP requirements and describe how the County relies on a collaborative and integrated management approach, because of the many disparate urban jurisdictional areas within the County. The new Stormwater and Drainage Control Ordinance will be an efficient and effective way of promulgating the more detailed regulations needed for new and redevelopment projects.

The tentative schedule for the new General Plan element and update to the County Municipal Code is summarized in Table 2-1:

*Table 2-1. Tentative schedule for new General Plan element and update to County municipal code.*

| Name of Item | Last Update | Proposed Update[a] |
|---|---|---|
| General Plan – Add new Watershed and Stormwater Element | 2017 | 2020 |
| County Municipal Code – Amend Chapter 4.100 (Stormwater and Drainage Control) | 2008 | 2020 |

[a]All dates are tentative and subject to change pending schedules set forth by the County Board of Supervisors.

The other County plans described in Sections 2.1.2 through 2.1.6 are generally aligned with and support the GI Plan and will be updated with GI-related language as needed and as they are updated in the future.

### 2.4.2 GI Language Inclusion in Future Plans

The County will review GI Plan requirements when revising or updating existing planning documents or when developing new planning documents to ensure that GI requirements and policies are incorporated. Examples of GI related language can be found in existing County plans, as described in Section 2.1 above, and in references such as SMCWPPP's Planning Document Update – Model Language (December 2016).

# 3 GI DESIGN GUIDELINES, DETAILS, AND SPECIFICATIONS

The MRP requires that the GI Plan include general design and construction guidelines, standard specifications and details (or references to those documents) for incorporating GI components into projects within the County of San Mateo's jurisdiction. These guidelines, details, and specifications should address the different street and project types within the County, as defined by its land use and transportation characteristics, and allow projects to provide a range of functions and benefits, such as stormwater management, bicycle and pedestrian mobility and safety, public green space, and urban forestry.

This chapter discusses the San Mateo Countywide Green Infrastructure Design Guide (GI Design Guide) developed by SMCWPPP to assist its member agencies with implementing green infrastructure within their jurisdictions; alignment of the GI Design Guide and Typical GI Details with the County's specific requirements, standard details, site conditions, and/or its new Drainage Manual; and identified modifications to current County of San Mateo Public Works Standard Drawings for Public Improvement (County Standard Details) to align with the Typical GI Details.

## 3.1 DESIGN GUIDELINES

### 3.1.1 SMCWPPP "Green Suite" Resources

The County of San Mateo worked with SMCWPPP, its consultants, and other SMCWPPP member agencies to develop the GI Design Guide. The GI Design Guide provides comprehensive guidance for the design, construction, and maintenance of a broad range of GI project types within the public right-of-way and private parcels. The document provides descriptions for 13 GI measures, opportunities for integration of GI applicable to San Mateo County, key design and construction considerations, key implementation strategies, operations and maintenance guidance, and Typical GI Details and Specifications. More technical and specific requirements for the sizing and design of stormwater control measures mandated by the MRP are included in a companion document, the C.3 Regulated Projects Guide (formerly the C.3 Stormwater Technical Guidance). The two documents, the GI Design Guide and the C.3 Regulated Projects Guide, are commonly referred to as the "Green Suite."

The Typical GI Details and Specifications included within the Appendix of the GI Design Guide are the San Francisco Public Utilities Commission (SFPUC) Typical GI Details and Specifications (SFPUC GI Details). These details show typical configurations, rather than required standard configurations, to address the need for GI to meet unique site-specific conditions. The detail set focuses on the most common types of GI within public streets, permeable pavement and bioretention systems, but also includes details for subsurface infiltration systems and general components that apply to various types of GI systems. With the exception of a few updated versions of single detail sheets and four new details provided in the GI Design Guide, the original SFPUC GI Details have not been modified to be applicable to SMCWPPP agencies. The GI Design Guide recommends that member agencies review the provided details carefully and make modifications to coordinate with their agency-specific requirements and conditions.

The County reviewed the entire set of Typical GI Details and identified where updates are needed in order for the details to be more directly applicable to projects within the County of San Mateo. Recommended updates were then developed in the form of redlines on the details. Redlines of the SFPUC GI Specifications for permeable pavers, pervious concrete, and porous asphalt were also developed. The redlines were updated to refer to the biotreatment soil specification currently referenced by SMCWPPP, the BASMAA Specification for Biotreatment or Bioretention Facilities[9].

The County plans to address the detail redlines and provide a clean updated set of details, in PDF and AutoCAD formats, at a later date. Recommended modifications to the Typical GI Details and Specifications are provided in Table C-1 in Appendix C.

In addition to updating the Typical GI Details to align with County requirements and the Countywide Green Suite, the County is planning to develop new GI Details that address GI technologies and/or County-specific site conditions that are not covered by the current set of details. New details may include tree wells, bioretention planter layouts for streets with valley gutters, bioretention facilities within chicanes, and pedestrian bridges that cross over bioretention planters. The County plans to complete this effort in 2020. New details and specifications may be added to the set as new GI technologies emerge and/or new project conditions are encountered.

### 3.1.2 Incorporation of SMCWPPP Details & Specifications into County Standards

The comparison of the County Standard Details to the Typical GI Details revealed some instances where it may be advantageous to the County to add new standard design details (in lieu of typical design details) to the County Standard Details that address GI facilities within the public right-of-way to ensure more consistency among streetscape projects. Details that are termed “standard” and integrated within the County’s set of standard details will be easier to implement and replicate along public streets. Because varying site conditions impact the overall layout, form, and design of GI facilities, it is more practical to make the design of certain key GI components into standard designs. Some examples of Typical GI Details that the County may consider converting into County Standard Details in the future include the following:

- Permeable pavement sections, edge restraints and specifications for public streets and parking lot applications;
- Bioretention outlet structure;
- Bioretention planter curb cut inlet and outlet;
- Bioretention planter trench drain inlet/outlet;
- Underdrain pipe; and
- Utility crossings and protection.

### 3.1.3 Utility Protection Guidance

In addition to the proposed modifications to the Typical GI Details, the County also identified a need for more specific utility setback and protection guidance related to GI than the high-level guidance provided in the GI Design Guide. The County of San Mateo reviewed the SFPUC Asset Protection Standards[10] that provide specific requirements for the avoidance or protection of water and

[9] The BASMAA Biotreatment Soil Specification can be downloaded here: https://www.flowstobay.org/sites/default/files/BASMAA%20Regional%20Biotreatment%20Soil%20Specification%202016.pdf

[10] The SFPUC Asset Protection Standards can be viewed here: https://sfwater.org/modules/showdocument.aspx?documentid=10873

combined sewer facilities for various streetscape improvements. This document includes requirements for the protection of utilities that cross under, through, and/or near bioretention planters, permeable pavement systems, and sidewalk extensions/bulbouts. These specific conditions are not addressed directly in any of the County's existing codes or standards. To address this need, the County developed new guidance regarding the protection of public utility assets near and/or under GI facilities. The finalization and ultimate adoption of this document will require additional coordination with and approval from other utility providers that have assets within the unincorporated districts of the County, e.g., Pacific Gas and Electric and California Water Service. This document may be expanded to include any other utility crossings and/or conflicts not currently included. In parallel with the completion of the utility protection standards, the utility protection and crossing details included within the Typical GI Details will be modified to align with all of the approved standards.

### 3.1.4 Approach to GI Design

The County of San Mateo will refer to the general design, construction and maintenance guidance provided within the GI Design Guide. The County will share the GI Design Guide with designers, contractors, and maintenance personnel that are working on GI projects within the County, as well as use the GI Design Guide as a helpful resource for the design and implementation of capital projects. As more GI projects are constructed within the County, best practices may evolve and new technologies will emerge that will require supplemental and/or updated guidelines to make GI projects more effective, resilient, and valuable to the community.

### 3.1.5 GI Design Considerations for Various County Locations and Street Types

The unincorporated areas within the County present different opportunities and constraints for GI implementation compared to the urban incorporated cities and towns within the County of San Mateo. The unincorporated County consists primarily of dispersed communities, rural lands, and undeveloped open space. Chapter 3.3 of the GI Design Guide provides GI design strategies and examples for various types of building sites and parking lots, including low-density residential housing, parks and commercial/industrial sites that exist within the unincorporated County. A suitability matrix within this chapter provides a general guide to acceptable design strategies based on land-use type.

Chapter 3.4 of the GI Design Guide covers sustainable street design process and strategies, and similar to Chapter 3.3, addresses various types of street conditions. Eight communities within the unincorporated County area have specific road standards that were developed through comprehensive community input processes. In some instances, these standards do not align with the standard street types covered in the GI Design Guide. Many of the County road standards are too narrow to support parking and sidewalks or to accommodate GI facilities. To address the unique County road types, the County has developed its own version of the Table 3.4e – Green Infrastructure Measure Applicability by Street Type (in Chapter 3.4 of the GI Design Guide) to provide guidance on potential GI opportunities for each County road type. This guidance is provided in Table C-2 in Appendix C.

### 3.1.6 Sizing Guidelines

MRP Provision C.3.d specifies minimum hydraulic sizing requirements for stormwater treatment measures at Regulated Projects. Regulated Projects must treat the water quality design flow or volume (the "C.3.d" amount) of stormwater runoff through infiltration or biotreatment. Certain Regulated Projects must also meet the sizing requirements for Hydromodification Management (HM)

in Provision C.3.g, depending on the location and amount of impervious surface created and/or replaced on the site. These standard sizing criteria are further described in the GI Design Guide.

GI measures in public rights-of-way must be designed to meet the same treatment and HM sizing requirements as Regulated Projects wherever feasible. However, if GI measures cannot be designed to meet the standard sizing criteria due to constraints in the public right-of-way such as lack of space, utility conflicts, or other factors, the County may still wish to construct the measure to achieve other benefits (e.g., traffic calming, pedestrian safety, etc.).

To address this situation, MRP Provision C.3.j.i.(2)(g) states that, for non-regulated Green Street projects, "Permittees may collectively propose a single approach with their Green Infrastructure Plans for how to proceed should project constraints preclude fully meeting the C.3.d requirements." Such a regional approach has been developed by BASMAA[11] for use by the County of San Mateo and other Permittees in their GI Plans. This "alternative sizing methodology" is described in the GI Design Guide.

## 3.2 COUNTY STANDARD DETAILS AND SPECIFICATIONS

### 3.2.1 Description & Edits to Incorporate GI

The County reviewed its Standard Details for public roadway, storm drain, sanitary sewer, lighting, and water systems to identify any items that will need to be updated to coordinate with the GI Typical Details. The review of the details yielded several items that need to be updated and/or warrant further coordination with County staff. The majority of the updates are related to the County Road Standard Section Drawings and raise policy questions regarding the construction and maintenance of GI measures within different zones of the street. Many of these policy questions will be answered in parallel with future updates to the County Stormwater and Drainage Ordinance. The County plans to complete the detail updates by the end of 2020.

[11] BASMAA, 2018. Guidance for Sizing Green Infrastructure Facilities in Street Projects.

# 4 OPPORTUNITIES AND CHALLENGES FOR GI IN UNINCORPORATED COUNTY

As part of the GI Plan, the prioritization process from the SRP was updated to consider site characteristics that either present opportunities or constraints for implementing GI. Characteristics that may affect GI feasibility include road standards, available rights-of-way, terrain, soil types, slope stability, utilities, connectivity to the storm drain infrastructure, drainage, or depth to groundwater, among others. This chapter provides an overview of the characteristics relevant to GI implementation, summarizes the various unincorporated communities in San Mateo County, and recommends suggested areas of focus based on community characteristics.

## 4.1 SITE CHARACTERISTICS THAT INFLUENCE GI FEASIBILITY

This section describes several of the community characteristics that are used to identify areas of focus for GI implementation across the County.

### 4.1.1 Transportation

A neighborhood's transportation traits are important considerations for GI implementation, especially when considering GI in the right-of-way. Many transportation improvements associated with traffic calming and pedestrian/bicycle safety, such as sidewalk and landscape barriers, are prime opportunities for incorporating GI. Additionally, existing median islands may be retrofitted to include GI if street grades allow, minimizing disruption in the right-of-way. Bioretention can be integrated into curb extensions that can be strategically placed to provide traffic calming, improve line of sight between pedestrians and vehicles, and narrow the crossing distance at crosswalks. Expansion of and improvements to multi-modal transit, especially when pedestrian and bicycle routes are involved, are likely to increase the number of opportunities for GI implementation. However, care must be given to design transit-supportive GI elements that do not interfere with bus and bicycle routes. GI elements should be designed to be consistent with guidance in the Bicycle and Pedestrian Plan for Unincorporated County.

### 4.1.2 Parking

Parking is a major concern for implementation of GI features in the right-of-way, especially in the densely-populated Bay Area. GI measures commonly used in the right-of-way tend to be implemented in parallel with road diets and curb extensions. Narrowing of the road and removal of existing parking due to GI measures extending into the parking lanes may provide added stress to the existing parking limitations. GI opportunities should be prioritized in areas where parking is not limited, where parking is already prohibited (e.g., along red curbs), or where construction would not contribute to the existing parking challenges.

### 4.1.3 Streets

Street characteristics influence the opportunities for GI in the right-of-way. Implementation is typically more cost effective when paired with other planned street improvements. Pavement condition may be an indicator of how likely a street will be improved in the near future. Focusing on

street segments with poor pavement condition will ensure GI projects will be prioritized in areas that may benefit from street resurfacing or curb and sidewalk improvements. Streets that have recently been improved should be avoided to minimize disruption in a neighborhood and impacts on recently constructed facilities. Certain communities, like North Fair Oaks and West Menlo Park, have priority lists that include a handful of streets scheduled for construction of formalized surface drainage improvements (such as concrete gutters). The lists include only unimproved streets – without formalized surface drainage facilities – that may support integration with GI.

In addition to pavement condition, street functional class (e.g., arterial, collector, local) may be an important consideration for GI as well. GI constructed on streets along commercial corridors typically associated with arterial and collector roads may pose less disruption to residents than on local residential roads. Additionally, the presence of differing road standards across unincorporated communities may influence where GI is feasible. Ten communities in unincorporated County have specific road standards that were developed through lengthy comprehensive community engagement processes. These communities are Montara, El Granada, Clipper Ridge, Sequoia Tract, West Menlo Park, Menlo Oaks, Devonshire, Emerald Lake Hills, Country Club Park, and North Fair Oaks. GI implementation in the roadways of these communities may require gaining community support to modify specific road standards. Changes to road standards should be consistent with the Bicycle and Pedestrian Plan for Unincorporated County.

### 4.1.4 Infrastructure

The presence of infrastructure, such as storm drains and other utilities, significantly impacts where GI can be implemented. Major utility lines, such as storm, sewer, and gas mains, may be logistically and economically infeasible to relocate. Smaller distribution lines, while easier to relocate, may drive up construction costs, reducing cost effectiveness. Implementation in areas with major utility conflicts should be avoided. In addition to existing utility conflicts, implementation of GI may create challenges with future property access and connection to utilities in some instances. While most utilities are impediments to GI, nearby storm drains can be beneficial for certain GI projects in zones of lower soil infiltration capacity, and the lack of storm drains can pose challenges. Underdrains that tie into the existing storm drain system allow GI to be implemented at infiltration-limited sites and accommodate runoff from larger storms without overloading the GI structure. GI measures that rely on infiltration as the primary treatment mechanism are not effective on sites that have low infiltrating soils and lack a nearby storm drain for an underdrain connection.

### 4.1.5 Urban Greenery

A benefit typically associated with GI is urban greening. Bioretention, tree wells, vegetated buffer strips, and swales all provide increased vegetation and associated benefits. Some of the benefits received from increasing urban greenery include mitigating the urban heat island effect through additional shading, reducing air pollution, improving water quality through pollutant uptake, and beautifying neighborhoods. Additionally, trees provide canopy interception and vegetation provides friction in the watershed that together reduce runoff and slow storm flows. GI should be prioritized in communities with lower density of urban greenery. Residential urban areas, especially in the foothills, have a higher concentration of vegetation and tree cover. The higher density developments nearer to the Bay tend to have less vegetation and may benefit from GI. Vulnerable communities are more likely to have lower urban green coverage density, high pollution, and more polluting industries, and access to urban green spaces is a strong promoter of mental and physical health. Access to urban green space is correlated with increased life expectancy due to reduced stress, improved immune systems, increased physical activity, and improved social cohesion.

The design guidelines for redevelopment areas in North Fair Oaks require street trees and include planting requirements for a cellular or structural soil area that is at least 8 feet square and 2 feet deep. These requirements provide opportunities for integration of GI facilities with street trees.

### 4.1.6 Pollutants of Concern

The MRP includes provisions for implementation of several TMDLs, including pesticides (diazinon and other pesticide-related toxicity), bacteria, mercury, and PCBs. While the pesticide and bacteria TMDLs are focused on managing pollution through non-structural source control, the mercury and PCBs TMDLs are intended to address pollution through a combination of non-structural and structural control measures, including GI. For that reason, mercury and PCBs are specifically considered in the GI Plan. GI projects prioritized in old industrial land use areas, near potential mercury and PCB sources, may reduce the presence of these pollutants in stormwater runoff to downstream waterbodies. Previous work in the County identified potential source areas of mercury and PCBs. An analysis of pre-1980 and current land use, as well as other site characteristics (e.g., industrial permitted facility, previous permit violations, site included in environmental tracking databases like Geotracker), were used to determine "interest areas" that are potential sources of PCBs or mercury and would benefit from the presence of GI facilities to capture and treat runoff.

### 4.1.7 Soils

Because GI typically contains an infiltration component, soils are an important consideration for locating potential sites for GI projects. Soils with low infiltration rates may limit the effectiveness of infiltration GI measures if those measures are not designed with an underdrain. GI in low-infiltrating soils must utilize an underdrain to avoid overloading the system during larger storm events and to avoid stagnant water that may cause vector control issues. For GI near roadways, infiltration in soils with low-infiltration rates may cause damage to the roadway base unless effective water barriers are installed, contributing to the propagation of potholes and other roadway structure failure. In areas where there are low-infiltrating soils, cisterns, flow-through planters, or other non-infiltration GI measures should be considered. A common classification to describe generally the hydrologic properties of soil is the Hydrologic Soil Group (HSG). HSG ranges from letters "A" to "D", with "A" representing well-drained (high infiltration) soils and "D" representing poorly-drained (low infiltration) soils.

### 4.1.8 Groundwater

Another constraint for infiltration GI measures is (historically) high groundwater, long term trends in groundwater levels due to climate change and sea level rise, non-static conditions caused by long- and short-term pumping, temporarily perched groundwater, and annual changes from extremely wet (El Niño) or dry (drought) conditions. To allow for effective infiltration, a minimum distance of separation between the groundwater table and the bottom of the infiltrating structure is usually specified by local design guidance. In San Mateo County, this separation is 5 feet for infiltration measures (GI measures that provide indirect infiltration through surface soils, such as bioretention and permeable pavements), and 10 feet or more for infiltration "devices" (GI measures designed to bypass surface soils and provide direct infiltration to subsurface soils and/or groundwater, such as infiltration galleries, trenches, and dry wells) (SMCWPPP 2016).

## 4.2 SUMMARY OF GI OPPORTUNITIES AND CONSTRAINTS IN UNINCORPORATED COMMUNITIES

As described in Section 1.1.1, the focus of the GI Plan is on the developed urban portions of unincorporated County and not undeveloped open space, agricultural lands, or forested lands. The stormwater conveyance infrastructure in rural coastal areas consists mostly of vegetated ditches, which already provide a similar function to GI. However, urban open space, such as public parks and underutilized or vacant land in developed communities, are considered in the GI Plan. These areas are great opportunities for centralized treatment of stormwater runoff (i.e., regional GI projects) because they often contain sufficient open space to support the required footprints typical of large stormwater capture facilities (see Section 1.3.2 for descriptions of GI types). This section summarizes the characteristics described in Section 4.1 for each of the primary regions established in Section 1.1.1.

### 4.2.1 North County

***Broadmoor***

The Broadmoor community in the North County region is primarily residential with narrow (20 to 25-feet wide) roads that widen up to as much as 35 to 50-feet wide as they move northeast downslope. Roads on the flatter, east side of the area possess greater pedestrian access and milder slopes. The steeper and narrower roads on the southwest side pose challenges for GI. While street parking is available along the residential streets, parking may be heavily utilized and the narrow roads will make GI challenging to implement. Broadmoor has very dense tree canopy to the southwest, where areas in between suburban parcels are almost entirely vegetated. The northeastern part of Broadmoor is less vegetated and may be considered an opportunity for increasing urban greenery. In Broadmoor, there is only one PCBs and mercury interest area at a commercial building on the corner of 87$^{th}$ Street and Washington Street. Due to predominantly residential land use, the presence of pollutants associated with old industrial land uses will be minimal. Monitoring wells at 151 Southgate Avenue, Daly City report groundwater depths around 130 feet below the surface (SWRCB 2019). High groundwater should not be a limiting factor for GI in this area.

***Unincorporated Colma***

In Unincorporated Colma, the major thoroughfare, Mission Street, is a wide (100 feet) Caltrans maintained and operated multi-lane street separated by vegetated medians. Due to the high-density development, parking may be limited and may present GI siting challenges. Interstate 280 is nearby, and investigation is needed to determine if there are opportunities for collaboration to treat runoff from both Caltrans and County-managed land. Of the three communities in the North County region, Colma contains the highest number of PCBs and mercury interest areas. The greatest concentration is along the BART W-Line, while other interest areas are located near various industrial facilities. Colma is located within the Colma Creek project area of the County's Flood Resilience Program, so GI implemented in this community may dovetail with current planning efforts in the watershed by providing some flood relief to downstream areas. Monitoring wells at 1216 Hillside Boulevard in Colma report groundwater depths as shallow as 18 feet (SWRCB 2019). Shallow groundwater in this area may pose a challenge and should be thoroughly investigated.

***Country Club Park***

The small community at Country Club Park is highly vegetated and has relatively low imperviousness, so is likely to experience little stormwater runoff for GI to capture. The streets are relatively narrow (25 to 30 feet) and have limited space available for GI. Country Club Park is also located within the Colma Creek project area of the Flood Resilience Program. The low

imperviousness (low runoff), residential character, and narrow streets are factors that may limit the benefit of GI in this area. The nearest well shows depth to groundwater of over 400 feet, which should not be a limiting factor for this area.

### 4.2.2 Foothill Communities

The streets in Emerald Lake Hills are narrow and residential with little pedestrian access. Streets are steeply sloped to the northeast. There are numerous cul-de-sacs and dead-end streets throughout the neighborhood. The steep terrain presents challenges for implementing GI and affects both feasibility and performance of infiltration measures. Lakeview Way and Lake Boulevard, which lie in flatter terrain directly upstream of Upper and Lower Emerald Lake, respectively, would be likely opportunities for GI.

The remaining Foothill Communities are characteristically similar and will feature many of the same challenges with GI implementation that Emerald Lake Hills faces. Narrow residential streets with steep slopes will inhibit the effectiveness of GI. The residential character of these neighborhoods may also be a challenge with construction activities in residential areas being potentially disruptive. Additionally, no PCBs and mercury interest areas were identified in these communities, due to lack of old industrial land uses in this area. While groundwater samples are sparse in the Foothill Communities, nearby well data suggests that parts of San Mateo Highlands, Emerald Lake Hills, and Kensington may have shallow groundwater (less than 20 feet below surface). GI opportunities in this region should focus on the few mildly sloped streets, wider arterial or connector streets, and public areas, such as community buildings, parks, or schools.

### 4.2.3 Harbor-Industrial

In the small industrial corridor at the Harbor-Industrial region, some of the streets are wide, some with multiple travel lanes and there are opportunities for GI in the right-of-way. No parking curb zones run along most of the street with occasional pockets of parking. The no parking zones represent opportunities for GI. Curb extensions can be added at existing no parking zones without compromising parking or the intended function of the curb striping. Additionally, this area has a predominance of industrial land uses which are likely to generate pollutants of concern. Over 60 percent (37 acres) of the Harbor-Industrial region contains parcels identified as potential PCBs and mercury interest areas. GI implemented in these areas have the potential to reduce pollutants in stormwater runoff near the source. In addition to targeting PCBs and mercury, GI may also present opportunities to install trash capture devices that would help to meet the County's trash reduction goals. Due to the wide streets, long stretches of no parking zones which can support GI, and proximity to potential pollutant-generating land uses, the Harbor-Industrial region is a promising area of focus. Additionally, the community is within the Belmont Creek project area of the Flood Resilience Program, so projects sited here would contribute to the current flood planning efforts of the County. One potential constraint to certain types of GI measures is shallow groundwater in the area. An inventory of well samples reported depths to groundwater of 15 to 20 feet. Infiltration devices (e.g., infiltration galleries, trenches, dry wells) are restricted in areas where the separation between the device and seasonal high groundwater level would be less than 10 feet. Although the reported values are higher than this threshold, the well readings represent "snapshot" samples that may not necessarily be indicative of high groundwater levels caused by seasonal changes, long-term trends, or other changes. Additional groundwater analysis will need to be performed for GI projects planned in this area.

### 4.2.4 Midcoast

The primary soils in the Midcoast communities have low infiltration rates (HSG C and D). However, there are pockets of moderately well-drained soils (HSG B) in Montara and El Granada, away from the coastline. While some storm drain infrastructure exists in the urbanized portions of the coast, many areas lack storm drains and instead convey runoff through gutter or surface flow. GI in low-infiltrating soils may include an underdrain where possible. Depth to groundwater in the Midcoast communities reported in the San Mateo Plain Subbasin Assessment (SMC Office of Sustainability 2018) range from around 50 feet to over 200 feet. However, monitoring wells at 860 Airport in Moss Beach report groundwater levels as shallow as 2 feet (SWRCB 2019). Due to high variance in well reports, depth to groundwater should be investigated thoroughly before project implementation. There are few areas in the Midcoast region that contain PCBs and mercury interest areas. The largest concentration of PCB/mercury interest areas in this region (14 acres) is in Princeton near the zones with industrial land uses. However, PCBs and mercury are not regulated by the MRP on the coastside.

Several plans exist or are underway that outline priorities for development along the coast, including "Connect the Coastside" and "Plan Princeton." Additionally, the Local Coastal Program Policies document developed by the SMC Planning and Building Department, outlines minimum development standards for parking (SMC Planning and Building 2013). Connect the Coastside is a draft Comprehensive Transportation Management Plan involving these communities in partnership with San Mateo County and the City of Half Moon Bay. This plan identifies multi-modal transportation improvements and programs along Highway 1 and Highway 92 to accommodate future transportation needs and evaluates existing and future residential and non-residential development. Connect the Coastside will conduct a land use buildout analysis and an assessment of future transportation needs, implementation costs, and character and vision of residents (SMC Planning and Building 2016). Plan Princeton addresses issues related to circulation routes for vehicles, pedestrians, and bikes, and provide coastal access to the community. The scope of the project includes Highway 1 and an adjacent area to its west, between Pillar Point Harbor and Moss Beach. Pedestrian-oriented improvements to street infrastructure include the implementation of a network of multiuse trails and on-street bike routes. Streetscape improvements along Princeton and Vassar Avenue between Broadway and West Point Avenue will improve coastal access and create an inviting route for visitors. Multi-use paths for bikes and pedestrians will run along Highway 1 (the "Parallel Trail") and Airport Street, and bike routes will be integrated into areas along Capistrano Road, Prospect Way, Broadway, Princeton Avenue, Vassar Avenue and Cypress Avenue.

Goals and local guidance from detailed development plans, like Connect the Coastside and Plan Princeton, are considered in the GI Plan. The planned improvements in these documents may also present opportunities for incorporation of GI. The developed portions of the coast, along the commercial and urban residential communities, should be the focus of GI in this region. Stormwater conveyance in the rural mid-coast is already managed by vegetated ditches that serve similar functions as GI. Project implementation should also focus on roads and pedestrian pathways around public access areas and commercial districts.

### 4.2.5 South County

***North Fair Oaks***

The neighborhood has a detailed long-term plan with established goals and policies for land use, housing, resident health and wellness, parks and recreation, circulation, and infrastructure, known as the North Fair Oaks Community Plan, adopted November 2011 (SMC Planning and Building Department, 2011). The plan was developed with extensive public outreach, analysis of current conditions and needs, engagement of North Fair Oaks residents, and guidance of a stakeholder steering committee. The plan includes a number of goals and recommended actions that relate to incorporation of GI into the community. For example, along Middlefield Road (Figure 4.1), planned improvements include wider sidewalks, additional trees and benches, and improved street lighting, which may provide opportunities for integration of GI. As the primary guiding document and vision for the future development of North Fair Oaks, the Community Plan should be referenced throughout implementation of the GI Plan to incorporate the needs and goals identified in the community.

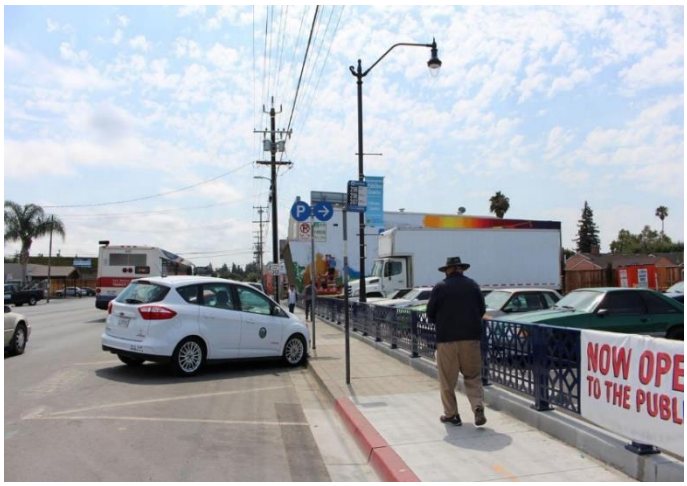



*Figure 4.1. A stretch of Middlefield Road in unincorporated North Fair Oaks.*
*(Source: The Daily Journal).*

Transportation in North Fair Oaks relies predominately on vehicular travel, though bus routes, walking, and bicycling are also important modes of transportation in the area. Connectivity is an issue identified in the Community Plan, especially with the two rail lines intersecting the neighborhoods. Future infrastructure improvements and redevelopment identified in the Community Plan, such as protected bike lanes and pedestrian crossings, may present ideal opportunities for implementing GI. Figure 4.2 depicts the future bicycle and pedestrian system outlined in the Community Plan. In addition, the Redwood City General Plan describes a future trolley line that would extend into North Fair Oaks at Middlefield Road and Fifth Avenue. Future transit stations and improved access points and pedestrian railroad crossings identified in the two plans may be prime opportunities for GI. North Fair Oaks also borders El Camino Real, near the planned location for multi-modal streetscape improvements in the Grand Boulevard Initiative in Redwood City. While El Camino Real is managed and maintained by Caltrans, opportunities for collaboration with similar streetscape improvements that include GI should be considered along the stretch of El Camino Real in North Fair Oaks.

Because of the denser population in North Fair Oaks compared to other communities, parking demands are high. Off-street parking is typically inadequate and many private and public parking lots experience high usage. Some parking improvements are detailed in the Community Plan and include solutions such as converting angled parking to parallel parking and purchasing private lots for public parking. A few parking improvements with GI elements have already been implemented by the County, like the parking lot constructed at Middlefield Road and Second Avenue, and more planned projects are pending. Because parking is challenging in North Fair Oaks, GI projects planned in this area must carefully consider and avoid any removal of valuable parking space. Projects should be prioritized in areas where parking would be least impacted.

North Fair Oaks contains streets that are developed to varying degrees. Several streets have narrow or missing sidewalks and lack adequate curb ramps, while some streets flood due to poor stormwater drainage. Much of the eastern residential areas contain narrow streets (20-feet wide) with no pedestrian improvements. The arterial and collector roads in the community range from 40 to 65 feet wide. The residential areas to the west that are closer to commercial areas feature relatively wider roads (35-feet wide) than the eastern area. North Fair Oaks has four improvement areas with specific road standards that differ from the County's general standards. Minimum standards are required to develop streets to 18, 22, and 36-feet wide depending on the improvement area, with combinations of curb and gutter or valley gutters.

Several planned or approved roadway and intersection improvements with opportunities to integrate GI are identified in the North Fair Oaks Community Plan (see Figure 4.2). One such opportunity, the Middlefield Road Improvement Project, involves roadway improvements, utility undergrounding, and sanitary sewer replacement along an approximately 2,900-foot stretch of Middlefield Road from Douglas Avenue to just north of Sixth Avenue. The major components of the roadway improvements include 12-feet sidewalks, buffered bike lane, parallel parking, and three lane roadways. GI elements are planned for the project, including street trees with modified tree wells for storage and bioretention bulb-outs at intersections.

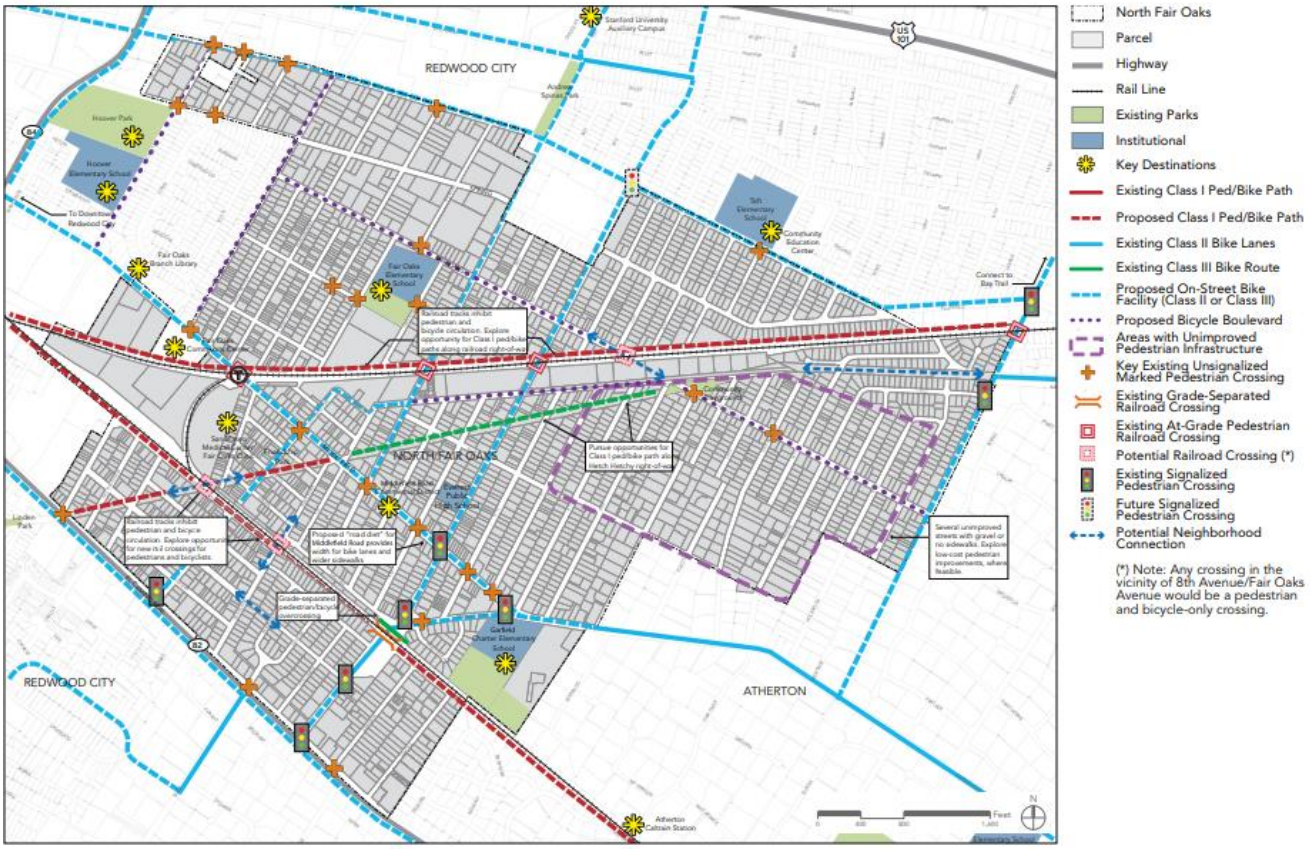



*Figure 4.2. Future bicycle and pedestrian system in North Fair Oaks (Source: North Fair Oaks Community Plan 2011.)*

According to the Community Plan, North Fair Oaks lacks an adequate storm drain network to convey stormwater runoff to downstream facilities during large storms. Stormwater conveyance is managed through a series of drains, bubble-ups, and surface flow. Regular flooding occurs throughout the

neighborhood, particularly in areas near the Southern Pacific Railroad tracks where the tracks are elevated above adjacent street grades. While the addition of GI may help reduce nuisance flooding, the lack of storm drain infrastructure may also present challenges with implementation. Areas of limited infiltration often require an underdrain that connects to an existing storm drain system. GI should be prioritized in areas with storm drain infrastructure. In areas with limited storm drain infrastructure, installation of additional storm drains paired with bioretention or biofiltration may help to reduce flooding issues. If improvements to storm drain infrastructure are not possible in these areas, GI may still be implemented if steps are taken to either maximize infiltration at the site or to minimize reliance on infiltration by selecting alternative GI measures.

North Fair Oaks is underlain by bay mud, a geological layer of clay that is highly impermeable and may vary in thickness from a few feet to over 60 feet deep below the surface. These areas are prohibitive to most types of infiltration measures. Cisterns can be used in these areas to capture and store stormwater runoff that can later be treated for non-potable uses, such as irrigation or indoor graywater uses. Flow-through planters do not utilize infiltration but still provide treatment of runoff through slowing of flows and providing filtration through soil media. Other solutions may include designing systems with small drainage areas, permeable pavements as self-treating areas, or flow-through measures that allow excess water to bypass.

While the Community Plan does not specifically discuss urban greenery, it does discuss the potential to increase open space by converting underutilized or vacant land. Identified opportunities can incorporate GI, increasing greenery and improving neighborhood beauty while providing stormwater benefits. There was found to be a significant amount of underutilized and vacant land in North Fair Oaks with the potential to be redeveloped. The Community Plan identifies open space improvements that may include street trees, special sidewalks, and green space at El Camino Real and Fifth Avenue, Middlefield Road and Eighth Avenue, Middlefield Road at Southern Pacific Railroad Crossing, Marsh Road at Southern Pacific Railroad Crossing, Bay Road and Fifth Avenue, and Spring Street and Charter Street. A map of existing and potential future green space, including pedestrian and bike paths, are shown in Figure 4.3.

In addition to transportation-related opportunities for GI, there are also many opportunities related to source control of target pollutants. Approximately 17 percent (131 acres) of land in North Fair Oaks contain PCBs and mercury interest areas and are mostly located along the industrial corridors near the railroads, Bay Road, and Middlefield Road. GI near these locations may help to reduce PCBs and mercury loads in stormwater runoff. GI may also present opportunities to integrate trash capture goals through installation of trash capture devices.

Seasonal high groundwater levels may be a constraint in some areas of North Fair Oaks. Well readings for most of the community are in the mid-depth range, with reported depths of 30 to 100 feet from the San Mateo Plain Subbasin Assessment (San Mateo County 2018). This range of depths would provide the required 10-foot minimum separation between infiltration devices and the seasonal high groundwater table. However, wells in the northwest side of the community near Bay Road report shallow depths between 15 to 25 feet. While this is above the minimum threshold, the readings are “snapshot” samples that may not represent the seasonal high groundwater level. Historical and long-term trends in groundwater levels should be carefully investigated to determine if groundwater will be a constraint for projects implemented in those areas.


*Figure 4.3. Existing and potential location of parks, community gardens, and open space. (Source: North Fair Oaks Community Plan 2011).*

There are unique opportunities to implement GI within the North Fair Oaks community. Planned transportation improvements and future development provide ample opportunities for GI. North Fair Oaks is also located within the Atherton Channel/Bayfront Canal project area of the Flood Resilience Program. GI in this community would align with goals of current flood planning efforts in the watershed. Removal of existing parking spots can be minimized by maximizing GI footprint in non-parking spaces (e.g., converting conventional landscaped areas to bioretention). Poorly drained soils, limited storm drain infrastructure, shallow groundwater, and a lack of significant grade are challenges that need to be addressed during plan implementation through careful selection and design of the appropriate GI measures. Additionally, there are numerous opportunities for GI through transportation and open space improvements identified in the other planning efforts. With awareness of the goals and opportunities identified from these efforts, GI can be integrated in a way that dovetails with the vision and priorities of the community.

***Menlo Oaks***

GI implementation in this area may be challenging due to the narrow streets and lack of curb or gutters to route runoff to GI features. Additionally, specific road standards in this area specify variable widths of street with no curb or gutter improvements. Menlo Oaks is shaded by a thick canopy of mature oaks, redwoods, eucalyptus and evergreen trees (Menlo Oaks Tree Advocacy). Because of the dense tree canopy, Menlo Oaks would likely not achieve additional benefit from increased vegetation from GI. Additionally, GI may require the cutting of roots of mature oak trees in a community sensitive to tree preservation. Due to the lack of stormwater conveyance from curbs and gutters, narrow streets (25-feet wide), and residential character of the neighborhood, Menlo

Oaks is not a priority area for GI. The vegetated areas in this community already serve a similar function to GI.

***Sequoia Tract***

Sequoia Tract has roads of moderate width (20 to 25 feet). Sidewalks, curb, and gutter are lacking on some streets. Valley gutters dividing the travel lane and parking are also common. The neighborhood has a high incidence of narrow private alleyways and cul-de-sacs. The narrower streets limit the amount and location of GI. Bioretention bulb-outs at intersections and mid-block curb extensions along one side of the street may allow GI to be implemented along narrower roads. Construction along residential streets instead of commercial districts may be more disruptive to residents. Given the residential character of the community, additional consideration must be given to minimize construction impacts and schedules for planned GI projects in this area.

Parking demands are addressed by parking lanes along the roads lacking sidewalks, as well as by parking spaces along private roads and cul-de-sacs. Narrower streets will present challenges with implementing GI that does not impact parking. While GI implemented in the right-of-way is expected to remove parking spots, it is also expected that GI would not be required along the entire length of street. Instead, GI distributed at moderate intervals along these streets should result in the loss of fewer parking spots while still sufficiently treating runoff from the full length of street segments. Overall, there should be potential opportunities for GI within this community area with limited and manageable impacts to on-street parking.

Sequoia Tract has moderately dense tree canopy throughout its residential neighborhoods along street lengths and property fronts, especially along the east side near Stockbridge Avenue. In areas with less-dense tree canopy, the implementation of GI may provide additional benefits associated with greening. Areas that contain large street trees are already served by some of the benefits associated with GI. Additional GI should be avoided along streets with existing large street trees to avoid impacting the function of those GI features. In addition, well data show that depth to groundwater ranges from 30 to 50 feet and should not be a limiting factor for GI.

***West Menlo Park***

As of February 2018, the City of Menlo Park is considering an annexation proposal brought forward by residents of a small portion of West Menlo Park. The City of Menlo Park has been engaged in negotiations with the County of San Mateo as the City would be required to retrofit the roads to meet different standards (The Almanac News 2018). The County may need to consider if and how much investment in GI should be prioritized in the area impacted by the potential annexation.

The streets in this area feature a mix of curbs and valley gutters, and some have neither curb nor gutter. Some narrow streets (20-feet wide) may limit the opportunities for GI, but most of the residential streets are between 25 to 30-feet wide. Alameda de las Pulgas and Santa Cruz Avenue, the primary collector and arterial roads in the area, are around 50 feet wide. Bioretention bulb-outs at intersections and mid-block curb extensions along one side of the street may allow GI to be implemented along narrower roads. Construction along residential streets instead of commercial districts may be more disruptive to residents. Given the residential character of the community, additional consideration must be given to minimize construction impacts and schedules. GI features such as street trees exist in the commercial area along Alameda de las Pulgas. Additional features should also be explored. Projects on residential streets should be paired with other planned street improvements in order to synchronize construction schedules and minimize disruption to residents. An example street improvement where GI was integrated with a planned improvement is the street

reconstruction along Croner Avenue from Orange Avenue to the city limits of Menlo Park near North Lemon Avenue. Reconstruction included 18 feet of pavement and 3-foot wide valley gutters on both sides. Similar projects, with appropriate planning, can incorporate GI elements such as bioretention curb extensions or permeable pavement in the parking lanes. West Menlo Park is a good opportunity for GI if prioritized in the commercial district or at planned roadway improvements if in residential areas.

West Menlo Park consists predominately of soils with low to moderate infiltration rates (HSG C), which may be a constraint for infiltration GI measures. In general, areas west of Alameda de las Pulgas feature moderately draining soils and areas to the east have poorly draining clay soils. GI implemented in low-infiltrating soils should incorporate an underdrain. Underdrains must be connected to an existing nearby storm drain. The community is served by a storm drain system present along most of the collector and arterial roads in the area, and a storm drain is present at the downstream end of most residential streets. While low-infiltrating soils may be a constraint for GI, the extensive storm drain system in this area should allow for connections with underdrains. Additionally, well data show that depth to groundwater may be shallow (less than 20 feet) in some areas of West Menlo Park, especially near the intersection of Alameda de las Pulgas and Avy Avenue. High groundwater may be a constraint for GI implementation in this area.

***Ladera and Los Trancos Woods***

The small residential communities of Ladera and Los Trancos Woods have few storm drains, so underdrain connections would be limited. Stormwater conveyance is managed by ditches and pervious areas that already provide some GI functions. The streets are steeper and relatively narrow (12 to 25-feet). These areas are not recommended as a priority for GI.

### 4.2.6 County Facilities on Incorporated Land

County facilities in incorporated areas also present opportunities for implementing GI. Because these parcels are surrounded by the jurisdictional areas of individual cities, projects would either focus on treating runoff on-site (LID) or on larger multi-jurisdictional regional projects. Notable examples include Flood Park in the City of Menlo Park and the San Mateo County Event Center in the City of San Mateo. The County Project Development Unit (PDU) maintains lists of projects slated for development on County-owned parcels, many of which are in incorporated areas and may present opportunities for integrating GI.

## 4.3 SUGGESTED AREAS OF FOCUS

While GI can be implemented in many locations, specific areas of focus are identified to maximize the benefit of the County's GI investments. The GI prioritization methodology outlined in Chapter 5 considers potential treatment effectiveness, site feasibility, and community benefits. The goals identified in community plans, where available, were considered in the development of the County-specific prioritization and other sections of the GI Plan. Additionally, GI opportunities that can be paired with other improvement projects can achieve multiple benefits such as synchronized construction schedules (and less disruption to residents), shared costs, and increased community support. An example would be road improvement projects, with pedestrian safety as the primary goal, that also integrate stormwater treatment. Neighborhoods with comprehensive community plans in place are the most likely to already have these opportunities identified. Several of the communities summarized above have the characteristics that support GI, while other regions are likely to have fewer opportunities. Suggested areas of focus are shown in Figure 4.4 and described below.

North Fair Oaks is a suggested area of focus for GI because it has one of the most comprehensive plans and vision for community development of the unincorporated communities. The North Fair Oaks Community Plan acknowledges GI as part of its policies for addressing stormwater treatment and flooding. Greening opportunities at transportation gateways, connectivity points, and other road improvements identified in the Community Plan present numerous opportunities for integration of GI. However, parking, lack of permeable soils, and drainage constraints are some of the limiting factors for GI implementation in North Fair Oaks. By identifying the areas with fewer parking limitations in the neighborhood, and with careful planning during project implementation, impact to parking can be minimized. Additionally, North Fair Oaks has four improvement areas with different specific road standards that will require community support to modify for GI.

Other recommended areas of focus include West Menlo Park in the South County (bayside) region, the Harbor-Industrial region, Unincorporated Colma in the North County region, and the urban areas of the Midcoast region communities. While large portions of these areas (with the exception of Harbor-Industrial) are residential, these communities have small commercial districts that will likely have wider streets and benefit from traffic and pedestrian improvements where GI can be easily integrated. Like North Fair Oaks, the Midcoast communities have a comprehensive plan for development, the Local Coastal Program, indicating a desire to invest in improvements where GI opportunities can also be explored. The Midcoast region contains several communities with different road standards that may require updating. West Menlo Park also has its own specific road standard. Community support will be required to modify these standards.

The Foothill Communities and North County regions are primarily residential neighborhoods with few areas with commercial or industrial land uses. The exception, Unincorporated Colma in the North County region, does have a significant amount of industrial area. Steeper terrain in the Highlands communities makes GI implementation a challenge and the relative lack of commercial districts with arterial or connector roads means GI would likely have to be implemented on residential streets that are either narrow or would be disruptive to the residents. In addition, these communities tend to already contain high vegetation and pervious area that already serve GI functions. For these reasons, the Foothill Communities, the North County region (with the exception of Unincorporated Colma), and the South County communities of Menlo Oaks, Ladera, and Los Trancos Woods are not recommended as areas of focus for the GI Plan.

A summary of the areas of focus for GI based on the community characteristics described above is provided in Table 4-1.

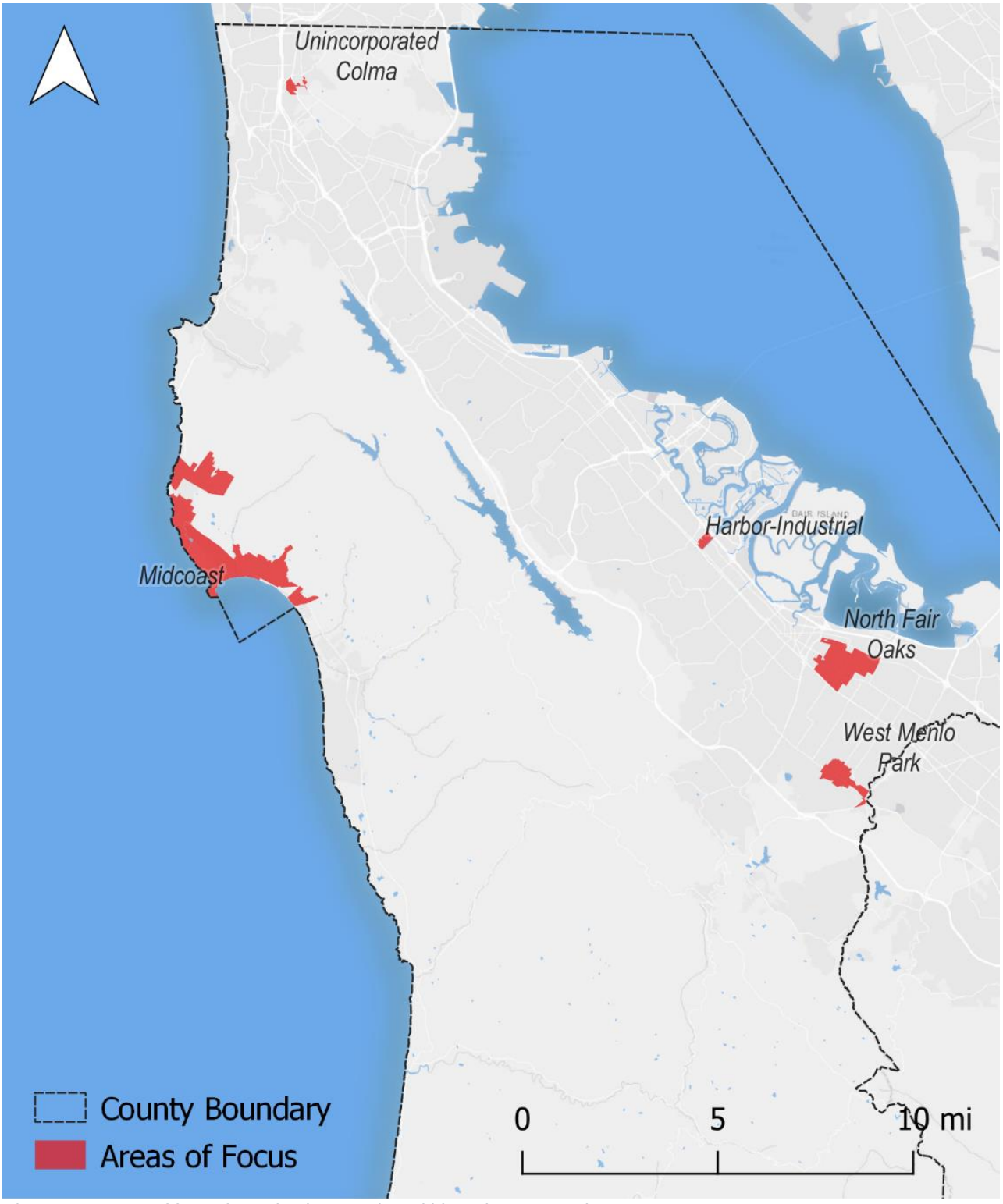



*Figure 4.4. Areas of focus for GI implementation within Unincorporated San Mateo County.*

*Table 4-1. GI Plan areas of focus and characteristics beneficial for GI implementation*

| Areas of Focus | Characteristics Beneficial for GI | | | | |
|---|---|---|---|---|---|
| | Commercial Districts | High Impervious Area Percentage | Few Existing Vegetative Drainage Features | GI Support in Community Plans | Opportunities to Integrate with Transit Improvements |
| North Fair Oaks | ● | ● | ● | ● | ● |
| West Menlo Park | ● | ● | ● | | |
| Harbor-Industrial | ● | ● | ● | | |
| Unincorporated Colma | ● | ● | ● | | |
| Midcoast (urban area)* | ● | | | ● | ● |

*Montara, Moss Beach, Princeton, El Granada, and Miramar

# 5 GI PROJECT PRIORITIZATION METHODOLOGY

## 5.1 INTRODUCTION AND BACKGROUND

The GI Plan leverages previous countywide stormwater planning efforts in the SRP. The County-specific prioritization builds upon the process from the SRP prioritization by modifying metrics from the SRP and augmenting with new metrics that capture local planning priorities of the unincorporated communities. The prioritization was refined to include stormwater capture estimates, site-level constraints, and other local priorities. The result of the prioritization process is a list of ranked potential project sites that forms the basis for the County's GI strategy described in Chapter 6. In addition to providing guidance for the GI strategy, the output from the prioritization process can be used as a tool to understand the costs and benefits of the identified opportunities and to serve as a starting point for assessment of future candidate projects as they arise.

## 5.2 PROJECT TYPES

Due to the differences in scale, GI types, and measures of effectiveness, GI opportunities were organized into three categories: regional stormwater capture, LID on public parcels, and green streets. These categories were evaluated separately and prioritized only in comparison to other opportunities within the same category. Regional stormwater capture projects are typically centralized facilities that capture and treat stormwater from a large drainage area by diverting from a nearby storm drain or channel. LID is a form of on-site urban infrastructure design that uses a suite of technologies intended to imitate pre-urbanization (natural) hydrologic conditions, such as bioretention, bioswales, permeable pavements, green roofs, etc. Green street projects are similar to LID in the technologies used but are typically implemented linearly along the public right-of-way. All three types of GI may utilize a variety of treatment mechanisms, including infiltration into native soils, settling, and filtration. Captured runoff is typically removed from the storm drain system through infiltration into native soil or non-potable use, or returned to the storm drain system after treatment. Example photographs of each category are shown in Section 1.3.2.

### 5.2.1 Regional Projects

Regional GI projects are large-scale stormwater projects that capture and treat stormwater runoff from both on- and off-site. Off-site runoff is typically routed to the project site via diversion from storm drains, channels, or streams. Regional projects can be designed for both subsurface (e.g., infiltration chamber shown in Figure 5.1) and above ground (e.g., detention, constructed wetlands) applications. Additionally, regional projects may treat captured runoff through a variety of mechanisms, including infiltration into native soils and filtration and return of runoff to the storm drain network, storage, and non-potable use. The benefits of regional GI projects may include flood attenuation, groundwater recharge, pollutant reduction, and water supply augmentation. They are often the most cost-effective projects due to the multiple benefits achieved and the economies of scale. The site characteristics and uses will determine what types of regional projects are feasible, e.g., how much flow the project can divert from the storm drain network, whether the project is above ground or underground, and the size of the project.

*Figure 5.1. Installation of subsurface storage for a Regional Project*
*(Source: Conteches.com)*

### 5.2.2 LID Retrofits

LID retrofit projects mitigate stormwater impacts by reducing runoff through capture and/or infiltration and treating stormwater on-site before it enters the storm drain system. LID retrofit projects may include bioretention facilities, infiltration trenches, detention and retention areas in landscaping, pervious pavement, green roofs, and systems for stormwater capture and use. These measures help to protect water quality by filtering stormwater through plants and soil and allowing stormwater to infiltrate into the ground, thus mimicking the pre-urbanized natural hydrology of the undeveloped site. For the purposes of this GI Plan, LID retrofit projects are GI facilities that are built on a parcel to treat runoff generated from impervious surface on that parcel. These projects may or may not be regulated projects (see Section 6.3). Figure 5.2 is an example of an LID retrofit project in San Mateo County.

*Figure 5.2. LID Retrofit Project in San Mateo County – Bioretention Area at Brisbane City Hall.*
*(Source: SMCWPPP)*

### 5.2.3 Green Streets

GI roadway projects are typically called “Green Streets.” Green streets projects are located in the public right-of-way and capture runoff from the street and adjacent parcels (Figure 5.3). Green streets are distributed, small-scale GI projects spread throughout an urban area that provide localized treatment and flood reduction for relatively small drainage areas. For example, green streets can include facilities such as bioretention bulb-outs, stormwater planters, or permeable pavers along street rights-of-way.

There are often opportunities to combine GI projects with another type of street design known as “Complete Streets.” This latter term refers to streets that incorporate all modes of travel equally and are designed to increase safety and access for cyclists and pedestrians regardless of age or ability. The integration of the goals of both Complete Streets and Green Streets has coined several new terms such as “Living Streets,” “Better Streets” and “Sustainable Streets.” This movement recognizes the multiple benefits that environmentally and holistically designed streets can achieve. Examples of GI integrated with Complete Streets include vegetated curb extensions, bulb-outs, chicanes, or medians. These green street elements may be designed to support pedestrian walkways, traffic islands, protected bike lanes, and mass transit infrastructure.

*Figure 5.3. Green Street example, Brisbane (left). Street design featuring multiple transportation options (right).* (Source: SMCWPPP)

## 5.3 STORMWATER RESOURCE PLAN PRIORITIZATION

One of the goals of the SRP was to identify and prioritize GI projects that would address several benefits defined in the Storm Water Resource Plan Guidelines by the State Water Resources Control Board (SWRCB 2015). The SRP prioritization utilized a two-step process. The first step consists of identifying GI opportunities on public parcels and rights-of-way and screening the identified opportunities based on site constraints. The second step consists of evaluating characteristics that approximate the sites’ potential to achieve effective, multi-benefit GI projects. Opportunities identified in the first step were assigned scores in the second step based on metrics that were determined to be indicators of project effectiveness, feasibility, and potential to incorporate benefits related to water supply, water quality source control, reestablishing natural hydrology, creating or enhancing natural habitat, and providing community enhancement.

### 5.3.1 Opportunity Identification and Screening

Both regional and LID project opportunities were defined using the County Assessor's parcel dataset. The focus of the SRP was implementation of GI on publicly owned land, so public ownership was a primary screening factor. Parcels that were owned by a public entity or were associated with a public use (e.g., park, school, golf course) were selected. Because sites with steeper slopes present additional design challenges, parcels with average slopes greater than 10 percent were removed from the selection. The remaining parcels in the selection continued to the prioritization step. Parcel size was also used to determine whether a project opportunity can be considered an LID opportunity only or both an LID and regional project opportunity. Sites less than 0.25 acres were considered an LID opportunity only while sites greater than or equal to 0.25 acres were considered both an LID and regional project opportunity. The set of regional project opportunities is a subset of the parcels that comprise the set of LID project opportunities. Table 5-1 shows the criteria used to screen the parcel-based opportunities (regional and LID).

*Table 5-1. Identification and screening factors for identifying parcel-based opportunities.*

| Category | Factor | Criteria | Reason |
|---|---|---|---|
| Identification | Ownership | Public | Identify all public parcels or parcels that are associated with public use |
| | Land Use | Park, School, Other (e.g., Golf Course) | |
| | Average Parcel Slope | ≤ 10 % | Steeper grades present additional design challenges |
| Screening | Parcel Size | < 0.25 acres | Opportunity for LID project only |
| | | ≥ 0.25 acres | Adequate space to support either LID or a regional project |

Green street opportunities were defined as street segments (one block) using the County street centerline dataset. Public access, street functional class, and slope were used to screen street segments suitable for green street projects. The focus of the SRP is on publicly managed land so public access was a selection criterion used in the screening of green street opportunities. 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. Street segments were selected if they fell into functional classes of arterial streets, local neighborhood roads, city streets, parking lots, and alleys, based on classifications in the 2015 Census TIGER road line dataset. These classes typically exhibit characteristics of lower traffic volume and lower speed limits as opposed to major arterials, collector roads, and highways. Site slope is also an important consideration in green streets, since it may affect project feasibility and effectiveness. Street segments with an average slope greater than 5 percent were removed from the selection. The remaining street segments in the selection continued to the prioritization step. Table 5-2 shows the criteria used to screen street-based opportunities (green street).

*Table 5-2. Identification and screening factors for identifying street-based opportunities.*

| Category | Factor | Criteria | Reason |
|---|---|---|---|
| Identification | Access | Public | Potential projects are focused on public and right-of-way opportunities |
| Screening | Street Functional Class | Alley<br>Arterial<br>Local<br>Parking lot road | Streets with lower traffic experience reduced challenges with implementation and maintenance |
| | Road Slope | ≤ 5% | Steep grades present additional design challenges and reduces capture opportunity due to increased runoff velocity |

### 5.3.2 Metrics and Opportunity Scoring

Metrics were selected that were considered indicators of the available opportunity, project effectiveness, and expected benefits. For example, imperviousness, parcel size, and land use may be considered surrogate indicators for the available opportunity (e.g., runoff-generating potential, available footprint, compatibility with current site use). Hydrologic soil group and slope may be considered surrogate indicators of project effectiveness (e.g., infiltration capacity, prohibitive constraints, and design challenges). Proximity to flood-prone streams, PCBs interest areas, or co-located projects may be considered surrogate indicators of the expected co-benefits (e.g., flood attenuation, source control, and cost synergies).

Each metric receives a score based on specified ranges. Prioritization scores for a project opportunity are derived by summing the score of each metric and, for some metrics, applying a weighting factor. Each project type was evaluated using its own table of metrics and ranked independently of each other. Figures 5.5 through 5.7 at the end of this chapter present the criteria used for each project type to assign scores for each metric. The metrics used in the analysis are described in detail below.

***Land Use***

Parcel land use was used to prioritize sites that would most likely have current uses that are compatible with the project type being considered. This factor was evaluated for the regional and LID project types only. For a regional project, parks or other public open space were given the highest priority since it was assumed these parcels would have the greatest amount of space to support a regional project footprint. Schools and golf courses, while having public uses and often containing significant open space, were considered lower priority since partnerships and coordination with the owners of these parcels is often difficult. Public buildings and parking lots were given higher priority for LID projects.

***Street Type***

Street type, evaluated for green street projects only, was used to prioritize sites that typically have lower traffic volume. Heavily used streets may require increased maintenance and reduce system performance. Highest priority was given to local neighborhood roads, city streets, parking lot roads, and alleys, understanding that many local streets have limited opportunities because of immediately adjacent conditions, while lower priority was given to major arterials, collector roads, and highways.

***Imperviousness***
Imperviousness was evaluated for all three project types because of the relationship between highly impervious areas and greater runoff potential. Because the primary goal of the SRP is to reduce runoff via stormwater capture projects, opportunities with potential to produce greater runoff should be prioritized.

***Parcel Size***
Parcel size, considered for regional projects only, was evaluated to prioritize sites that have sufficient space to treat runoff from larger drainage areas.

***Hydrologic Soil Group***
Hydrologic Soil Group was evaluated for all three project types to prioritize sites that sit on well-drained soils. Group A represents the most well-drained soils and Group D represents the least well-drained soils. Because infiltration is a common treatment mechanism of stormwater capture, highest priority was given to Soil Group A, with each subsequent group assigned fewer points. Projects that fall within the "Unknown" category were assumed to be a mix of Group C, the dominant soil group in the county, and Group D.

***Site Slope***
Slope was evaluated for all three project types. Sites with mild slopes often provide the most feasible opportunities for stormwater capture. Construction on steep slopes presents challenges with implementation and effectiveness of the GI project.

***Proximity to Flood-prone Streams***
Proximity to flood-prone streams was evaluated for all three project types using a list of flood-prone streams identified by C/CAG staff. Project opportunities located within the watershed of a flood-prone stream would help 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 conveyance of runoff to a flood-prone stream through detention and slow release or remove the captured runoff from the system through infiltration or non-potable use. Distributed LID and green street projects in the watershed of a flood-prone stream would reduce the imperviousness of the area so that less runoff can contribute to flooding. Points for this metric were only given to project opportunities within the watershed of a flood-prone stream; no points were given if a site was not within the watershed of a flood-prone stream. Higher priority was given to sites that were closer to the stream with the assumption that greater upstream area is available to be treated.

***PCBs Interest Areas***
PCBs interest areas were used in the prioritization to give higher priority to projects with the potential for source control. PCBs are one of the primary pollutants of concern within the Bay Area; therefore, siting of stormwater capture projects in PCBs interest areas can potentially address water quality issues. The PCBs interest area dataset was developed in a separate C/CAG study (SMCWPPP 2016). The interest areas are organized into either a High or Moderate category, defined in Table 5-3. Areas with High interest were given a higher priority than Moderate interest areas, while areas that were not of interest for potential to produce PCBs received no points. Regional capture and green street projects received points in this category if a PCBs interest area was within the project's representative drainage area. LID retrofit projects received points if the project parcel itself is a PCBs interest area. Figure 5.4 shows these interest areas countywide.

*Table 5-3. PCBs interest areas*

| Interest Category | Description |
|---|---|
| **High** | Parcels, broader land areas, or stormwater catchments associated with land uses (most commonly old industrial, electrical, recycling, railroad, and military) that have a relatively higher likelihood of having elevated concentrations of PCBs (≥0.5 mg/kg) in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration). These areas generally have not been redeveloped and do not contain stormwater treatment facilities. |
| **Moderate** | Parcels, broader land areas, or stormwater catchments associated with land uses (typically older non-industrial urban land uses) that have limited risk factors associated with PCBs. These areas generally have not been redeveloped and do not contain stormwater treatment facilities. Moderate interest areas are less likely to have elevated concentrations of PCBs. |

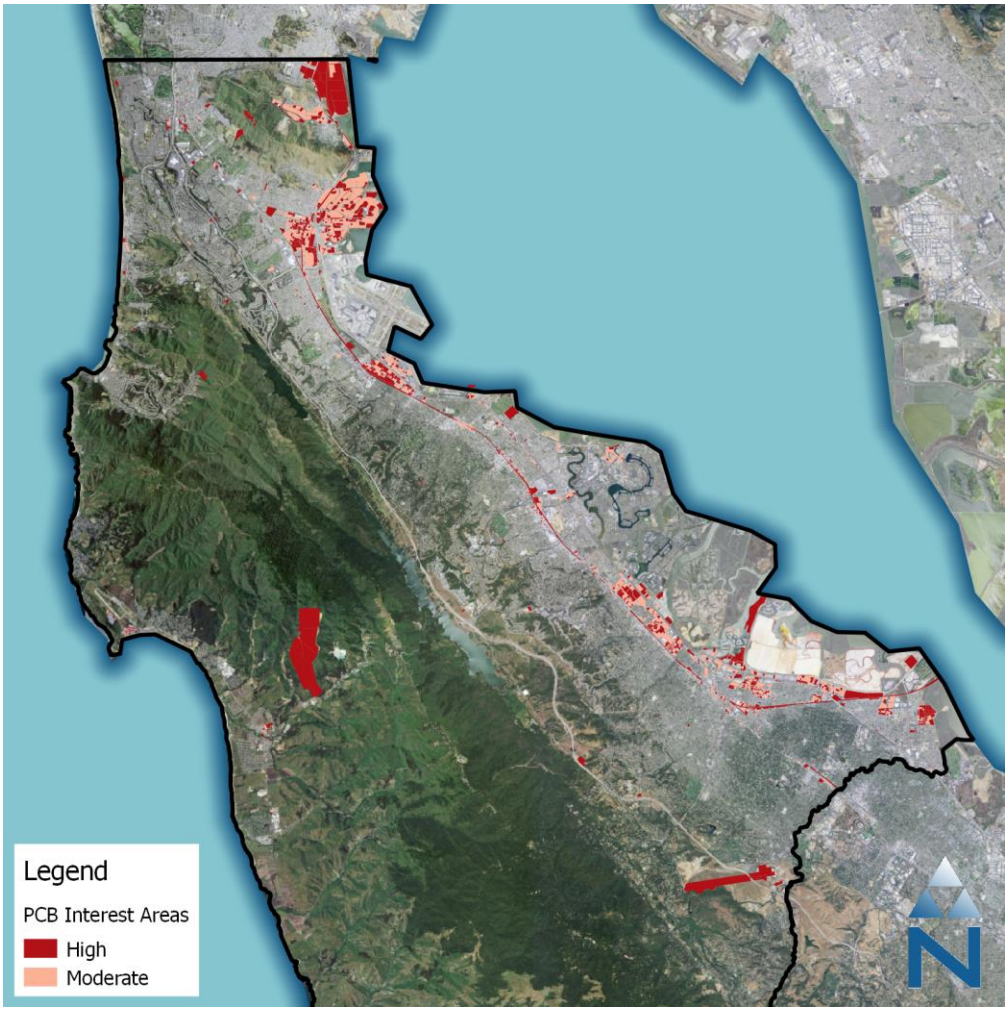



*Figure 5.4. PCBs risk areas in San Mateo County (SMCWPPP 2017)*

***Co-located Planned Projects***

Co-located planned projects were evaluated in the prioritization for several reasons. Project opportunities that can be implemented in parallel with new development and redevelopment projects or other municipal capital improvement projects currently in the planning phase were given higher priority. Co-locating stormwater capture and treatment projects with other priority projects increases opportunities for cost-sharing and maximizes multiple benefits that may not otherwise be achieved by a single project. 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 expected to be achieved by each project. Seven projects were submitted by the County in unincorporated areas or on County-owned parcels. Parcels and street segments that were located near one of the submitted projects were given higher priority. A project opportunity was considered to be co-located with a project if it was within 500 feet of a submitted project location.

***Safe Routes to School***

The Safe Routes to School Program is a coordinated effort by C/CAG and the San Mateo County Office of Education to identify recommended improvements for pedestrian and bicycle safety along school routes. Walk audits were performed to 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 GI implementation since 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. Proximity to recommended improvements through this program was evaluated for green street projects only.

***Drains to TMDL Waters***

Project opportunities at locations that drain to TMDL waters, i.e., San Francisco Bay, are given higher priority. All projects in the SRP contain some element of stormwater capture resulting in volumetric reductions of runoff. The Bay is subject to several TMDLs that require reductions in pollutant loads over the next several decades. 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 2013), volume reduction from stormwater capture projects will also result in reduction of these pollutants. Projects that are located in watersheds that drain to Bay TMDL waters were given higher priority.

***Multiple Benefits***

Multiple benefits that are expected of typical GI projects were also evaluated in the SRP prioritization. The Storm Water Resource Plan Guidelines specifies that the SRP should evaluate multiple benefits related to five benefit categories: Water Quality, Water Supply, Flood Management, Environmental, and Community. The benefits listed below were also evaluated in the prioritization and fall into at least one of these benefit categories. Because of the nature of GI, many of these benefits are expected for any GI project whether or not the specific details of those projects are yet known. For this reason, all project opportunities within one of the three project types were given the same points for these metrics, i.e., all regional project opportunities were given the same points in the benefit categories.

- **Groundwater recharge** and **augmenting water supply** are considered important benefits of stormwater capture projects. All stormwater projects listed in the SRP should be considered for infiltration since it is a major element in restoring natural watershed processes. These metrics fall under the Water Supply category of the Guidelines.

- **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. This metric falls under the Water Quality benefit category of the Guidelines.

- **Reestablishment of natural hydrology** is an important benefit of GI projects. Urbanization replaces pervious soils with impervious land cover, effectively converting infiltration to overland flow. 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 improves water quality in downstream waterbodies, as pollutants that are conveyed by runoff will be removed and treated when captured by a project. This metric falls under the Water Quality, Flood Management, and Environmental benefit categories of the Guidelines.

- **Creating or enhancing natural habitat** can be incorporated into stormwater capture projects by designing with a focus on habitat enhancement and maximization of open space. Vegetated treatment types often provide 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. This metric falls under the Environmental benefit category of the Guidelines.

- **Community enhancement** can be achieved by introducing urban green space and connectivity. Green street and LID projects would create the most opportunities for additional urban green space, as these projects often substitute impervious areas with vegetation. Additionally, the attainment of water quality standards through achieving the TMDLs will preserve beneficial uses, such as commercial fishing, sport fishing, and other recreational uses.

A weighting factor was applied to several metrics that were considered high priority. Through discussions with C/CAG and member agencies, several factors were deemed of special importance and given a weighting factor of 2. For these metrics, the scores from 1 to 5 were multiplied by the weighting factor when tallying total scores, giving increased weight to those metrics. The metrics that were given weighting factors were proximity to flood-prone streams, PCBs interest areas, co-located planned projects, and the Safe Routes to School Program.

## 5.4 COUNTY-SPECIFIC PRIORITIZATION

The GI Plan leverages previous countywide planning efforts from the SRP to identify, evaluate, and prioritize potential opportunities for GI improvements. Like the SRP prioritization process, the County-specific prioritization process separates project opportunities into 3 project types: regional

stormwater capture projects, LID projects, and green streets. The identification and screening methods described in Section 5.3.1 were not modified, resulting in a list of GI project opportunities that were the same as the SRP. Although this list contains some opportunities outside of the areas of focus identified in Chapter 4, these opportunities were not removed from consideration. The areas of focus highlight where GI may generally have the biggest impact, but it is possible that select sites outside of those areas are still good opportunities for GI and, for this reason, were kept for consideration. Many of the metrics described in Section 5.3.2 were updated so that the prioritization list of opportunities is specific to the County. The County-specific prioritization incorporates both updates to the original SRP prioritization metrics and new metrics specific to the local planning priorities of the County.

### 5.4.1 Adjustment of SRP Metrics to County Priorities

The metrics utilized in the SRP were intended to evaluate available opportunity, potential project effectiveness, and expected co-benefits of GI opportunities on a regional scale. The SRP focused on metrics that could be evaluated with widely available regional datasets, while local priorities of individual municipalities were excluded from the analysis to make possible the comparison of GI opportunities across the heterogeneous and diverse communities in San Mateo County. The specific focus of the GI Plan on unincorporated areas and County-owned parcels allowed for reevaluation of the metrics utilized in the SRP and tailoring of the methodology with local considerations and datasets. The metrics that were included in the SRP but modified for the GI Plan are outlined below.

***Street Type***

In the SRP, local streets were prioritized over arterial and collector streets. In many areas of unincorporated County, local streets lack curb or gutters that are typically necessary to implement GI. In addition, local streets often have the least available space for locating GI projects because they tend to be narrower and experience encroachment from yards. For this reason, the street type metric was reorganized to give higher priority to arterial and collector streets. In addition to being more conducive for GI implementation, arterial and collector streets tend to be in higher impervious areas that produce greater runoff.

***Hydrologic Soil Group***

Hydrologic soil group is considered a proxy for infiltrative capacity. This designation categorizes soils into either poorly drained soils (Groups C and D) or well-drained soils (Groups A and B). Because infiltration is featured in many types of GI, this metric is an indicator of potential GI project performance and impacts performance metrics such as drawdown and annual capture. Related to a project site's capacity for infiltration is the need for an overflow connection to existing storm drain infrastructure. GI measures that typically feature infiltration in well-drained soils require a connection to the storm drain via an underdrain in poorly drained soils to ensure proper drawdown and operation of the GI structure. These features are most common in LID and green street project types. For this reason, hydrologic soil group is combined in a separate metric with proximity to the nearest storm drain. Regional project scoring, however, considers hydrologic soil group separately from proximity to storm drain and remains unchanged from the SRP prioritization analysis. This is discussed in greater detail in the subsection below titled "Adequate Infiltration/Available Connection and Proximity to Storm Drain."

***Flood-prone Watersheds***

The SRP considered proximity to flood-prone streams to represent the potential benefit of GI projects for peak flow and volume reduction in areas with frequent flooding issues. The list of flood-prone streams was identified by C/CAG staff during development of the SRP through known study

watersheds of programs chartered to deal with flooding issues (e.g., County Flood Resilience Program, San Francisquito Creek Joint Powers Authority) and local flood reports received from C/CAG member agencies. The SRP evaluated not only the presence of opportunities in flood-prone watersheds but the proximity to the main stream reaches in those watersheds. The intent of the proximity consideration was an attempt to prioritize opportunities that were most likely to have the largest potential drainage areas. Projects nearest the main stem of a watershed's stream network would likely have larger drainage areas than those along a smaller branch. However, recognizing that all opportunities upstream of flooded areas have potential benefit, the proximity to the stream was removed from consideration for the GI Plan. Instead, all GI opportunities that were located within a flood-prone watershed were given the same number of points.

***Co-located Planned Projects***

Co-located planned projects were evaluated in the prioritization for several reasons. Project opportunities that can be implemented in parallel with new development and redevelopment projects or other municipal capital improvement projects currently in the planning phase may increase opportunities for cost-sharing, unlock alternate funding mechanisms, and maximize multiple benefits that may not otherwise be achieved by a single project. During development of the SRP, each jurisdiction was given the opportunity to submit projects for co-location with stormwater capture. Through a survey (e-mail from Matt Fabry to C/CAG Stormwater Committee, February 29, 2016), the County and cities submitted planned projects with the project description, contact information, and multiple benefits expected to be achieved by each project. Seven projects were submitted by the County for the SRP. The list was updated for the GI Plan to include new projects from the County's Capital Improvement Program list and to remove projects that have either been completed or are under construction. Opportunities within 500 feet of a submitted project location were given higher priority. Table 5-4 lists previous projects submitted for the SRP, those that were included or not included in the GI Plan, and new projects identified and included in the GI Plan analysis. Figure 5.5 illustrates the locations of planned projects with opportunities for co-location with GI.

*Table 5-4. Near-term planned projects for co-located GI opportunities*

| Project Title | Location | |
|---|---|---|
| **Identified in the Stormwater Resource Plan** | | |
| **Included in GI Plan** | | |
| Cordilleras Replacement Project | 200 Edmonds Rd. Redwood City, CA 94062 | |
| **Not Included in GI Plan** | | **Reason** |
| Skylonda Fire Station | 17290 Skyline Blvd, Woodside, CA 94062 | Under construction |
| Pescadero Fire Station | Pescadero, CA | Location not yet determined |
| Animal Shelter | 12 Airport Blvd, San Mateo, CA 94401 | Under construction |
| CEDAR EOC | 501 Winslow St. Redwood City, CA 94063 | Under construction |
| Tower Road Radio Shop | Tower Rd Campus, San Mateo, CA 94402 | Not in current CIP list |
| Carlos Street Green Infrastructure Project | Carlos St (California Ave to Virginia Ave) in Moss Beach | Construction completed |
| **Identified after the Stormwater Resource Plan** | | |
| County Office Building 3 | County Center, Redwood City | |
| Maple Street Homeless Shelter | 1580 Maple St, Redwood City | |
| South San Francisco County Campus | 1050 Mission Rd, South San Francisco | |
| County Government Center Parking Structure II | County Center, Redwood City | |
| Pescadero North St/Clinic/Puente Parking Flooding | 620 North St, Pescadero | |
| Fair Oaks Library | 2510 Middlefield Rd, Redwood City | |
| Sam McDonald Visitor Center Renovation & Interpretive Center | 13435 Pescadero Creek Rd, Loma Mar | |
| Coyote Point Eastern Promenade | 1701 Coyote Point Dr, San Mateo | |
| Flood Park Improvements & Baseball Field Renovations | 215 Bay Rd, Menlo Park | |
| Flood Park Tennis Court Renovation | 215 Bay Rd, Menlo Park | |


*Figure 5.5. Planned projects with opportunities for co-location with GI*

***Augments Water Supply***

The SRP evaluated an opportunity's potential for augmenting water supply and its location above a groundwater aquifer as two separate metrics. Because these two considerations are related, these metrics were combined into a single metric for the GI Plan. In addition, sites near groundwater wells with water table measurements less than 20 feet below the surface were avoided. This is because infiltration-type GI measures must maintain a certain distance from the bottom of the structure to the seasonal high groundwater to ensure proper drainage of the structure. Additionally, a project opportunity's proximity to an active groundwater contamination cleanup site (from the Geotracker database) was also considered to avoid prioritizing infiltration-based GI projects in areas with potential to mobilize pollutants. For the GI Plan, opportunities that were located above a groundwater basin, outside of an area with groundwater levels shallower than 20 feet below the surface, and at least 500 feet from an active cleanup site were given higher scores for this metric.

***Community Enhancement***

In the SRP, the community enhancement metric was evaluated qualitatively and based upon the typical benefits associated with a specific project type. For example, almost all green street projects contain an element of community enhancement (e.g., neighborhood greening, increased walkability, bicycle/pedestrian safety) so all project opportunities in this category were assigned the same number of points in the SRP. While all communities benefit from the introduction of GI into their neighborhoods, this metric was modified to consider communities that are identified as

disadvantaged. Disadvantaged communities (DACs) are those that are considered the most burdened from health, economic, and environmental factors. For the GI Plan, higher scores were assigned corresponding to the total number of datasets that evaluate disadvantaged communities that a project site is associated with. For example, if an opportunity was located within a "Community of Concern," from the Metropolitan Transportation Commission (MTC) and a "Disadvantaged Community," determined by identifying all communities below 80% of the American Community Survey (ACS)-calculated median household income (MHI), then the project would receive 3 points for being within at least two datasets. The datasets included in the analysis are MHI-based DACs from the U.S. Census American Community Survey data, economically DACs from the San Francisco Bay Restoration Authority, Cal Enviroscreen, MTC's Communities of Concern, and the top tier of the County Vulnerability Index. In addition to prioritizing projects that will enhance vulnerable communities, future updates to the GI Plan may take into consideration areas with high levels of existing or planned affordable housing units. The Department of Housing is in the process of finalizing data on location of affordable housing units that may be used in future updates.

Modifications to the SRP metrics are outlined in Table 5-5 through 5-7.

### 5.4.2 Consideration of Additional Local Priorities

In addition to modifications to the SRP metrics, new metrics were devised for the GI Plan that consider the local priorities and GI planning goals specific to the County. These metrics are used to augment the prioritization analysis with local data that could not be considered on the countywide scale of the SRP. These metrics are described below.

***Results of the San Mateo County Reasonable Assurance Analysis (RAA)***

C/CAG initiated a countywide effort to develop a Reasonable Assurance Analysis (RAA) to estimate the baseline pollutant loads to the Bay and set goals for the amount of GI needed to meet the portion of pollutant load reduction assigned to GI through the MRP. The RAA quantitatively demonstrates how proposed control measures will result in sufficient load reductions specified by the MRP. From the RAA, each jurisdiction received a tailored cost-optimized implementation strategy specifying the amount and type of GI (e.g., projected C.3-regulated new and redevelopment, existing GI projects, identified regional projects, green streets) in each subwatershed needed to meet water quality targets. The GI Plan includes an RAA metric that prioritizes opportunities where the RAA specified the greatest amount of GI is needed to meet permit requirements in the most cost-effective manner. The amount of GI in each subwatershed varies across the different project types and is reflected in each project type's respective prioritization. Figure 5.6 shows the GI capacities required for San Mateo County to meet the load reductions specified by the MRP (based on targets for sediment reduction as a surrogate pollutant) and provides a visual representation of how the County's GI needs are distributed spatially. The darker blue subwatersheds represent areas that require more GI, while lighter blue subwatersheds are areas requiring less GI. Refer to Appendix A for additional discussion of the RAA modeling process and a detailed explanation of results.

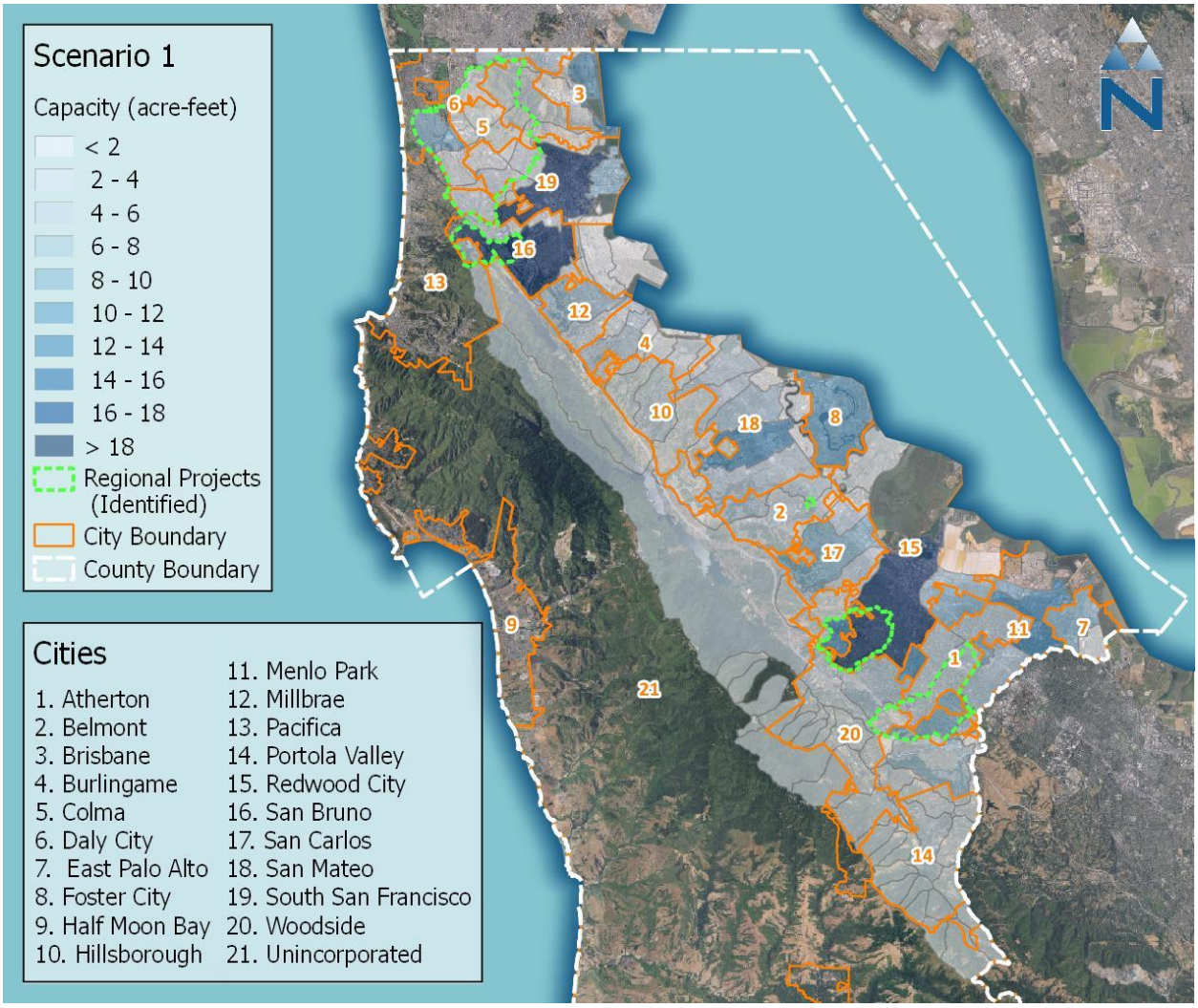



*Figure 5.6. RAA Scenario 1, County: Sediment Target (By Jurisdiction)*

***Potential to Protect Human Safety***

The County keeps an inventory of many assets and crucial infrastructure that are deemed important for the health and safety of the public. These assets include airports, emergency healthcare facilities, senior centers, schools and wastewater/stormwater infrastructure. In addition to crucial infrastructure, lifeline routes for emergency or natural disaster planning were identified by the County. Projects in watersheds with higher concentrations of assets and crucial infrastructure, or with lifeline routes, are given higher priority. When distributed across a watershed, GI has the potential to achieve significant stormwater capture and may help to alleviate flooding or protect from damage to assets and infrastructure in critical areas.

***Urban Heat Island Index***

One common benefit of GI is increased greenery in urban areas. Associated benefits include beautification of neighborhoods, increased shading, and reduced urban heat island effect. The California Environmental Protection Agency's urban heat island index (UHII) was used to prioritize LID and green street projects, those most likely to contain vegetative features, in census tracts with higher UHII values where the urban heat island effect is determined to be the greatest (CalEPA 2015).

***Utility Conflicts***
Utility conflicts are an important factor for GI project feasibility. Large utilities are often cost-prohibitive or infeasible to relocate or design around. Large gas mains are considered high conflict and are prohibitive to GI implementation. There are over 173 miles of PG&E gas mains that pass through San Mateo County. Street segments along PG&E gas lines are given a lower priority over other street segments. In addition, aggregate length of utility lines (only sewer mains are available for unincorporated County) were measured along each street segment. Streets with lower aggregate length of utility lines were prioritized since there would be smaller costs associated with utility relocation. While not specifically included in the prioritization, SFPUC water distribution and main line easements contain facilities with very restrictive development limitations which should be considered when evaluating a potential GI project sites.

***Width of the Right-of-Way***
Right-of-way width is used to evaluate the amount of area that may be available for GI retrofits. Because of the multiple functions the public right-of-way typically serves (e.g., pedestrian walkways, bicycle lanes, transit loading zones, parking, etc.), they can be space-constrained. Segments of street that are in wider right-of-way are more likely to contain the space necessary to support a GI project. Opportunities on segments with wider right-of-way width are given higher priority. Because width is often a function of street classification (i.e., arterial streets tend to be wider than residential streets), street segments were bracketed into the widest, middle, and narrowest 33 percent of street segments by street class.

***Adequate Infiltration/Available Connection and Proximity to Storm Drain***
Distributed GI projects are frequently designed to connect to the storm drain via an underdrain, required in areas of low infiltration. Opportunities for LID and green street projects are given higher priority if they are in well-drained soils (Groups A and B), since a connection to the storm drain may not be necessary. Opportunities in areas of poorly drained soils (Groups C and D) but within 200 feet of a storm drain are prioritized next. Sites in poorly drained soils with no nearby connection to the storm drain were assigned the lowest scores.

Regional projects often capture and treat runoff that is diverted from large storm drains, while distributed GI typically capture surface runoff. Regional projects that are sited close to a storm drain benefit from lower diversion and pumping requirements. This is true regardless if located above poorly drained soils, since these projects can instead be used for storage, treatment, and non-potable use instead of infiltration. Capital costs may increase substantially when captured runoff must be moved longer distances. Regional project sites that are closer to a storm drain are given higher points. As discussed in Chapter 4, hydrologic soil group is considered separately from proximity to storm drain for regional projects only because both infiltrating and non-infiltrating regional stormwater capture projects may benefit from shorter diversion distances.

***Caltrans Area***
Caltrans has become an important partner for pursuing implementation of several regional stormwater capture projects being explored in the Bay Area. Partnerships with Caltrans can be explored to collaborate on GI projects that would meet the separate regulatory stormwater requirements of both Caltrans and the County. This may open avenues for cost-sharing on larger projects that would achieve greater benefits than what one agency could achieve individually. Given previous Caltrans interest in larger regional stormwater capture projects, this metric is provided for regional project opportunities only. Project sites in watersheds with more Caltrans-managed area are given higher priority.

***Pavement Condition***
Pavement condition index is used to prioritize GI projects along street segments with poor surface conditions, to focus improvements on streets in need of maintenance or replacement, and to increase the chance that GI would be integrated with near-term street improvement projects by the County. Streets in poorer conditions are given higher priority.

***Distance to Creek***
Distance to a creek was considered in the prioritization. Infiltration that occurs too close to a natural stream bank has the potential to cause slope instability and greater erosion. GI opportunities that were greater than 200 feet away from a creek were given higher priority than those within the same distance.

***High Priority Zoning***
Because GI can significantly contribute to the enhancement of a community, shared spaces that are frequented by many of the community's residents should be prioritized. In unincorporated County, these areas often overlap with commercial districts and shopping centers. The County has identified high priority areas for implementing GI based on zoning designations that include commercial, industrial, mixed land use, and high density residential. A map identifying the high priority zones is presented in Figure 5.7. Project opportunities that are in one of the County's high priority zones were given higher priority.

County-specific metrics for the GI Plan are outlined in Tables 5-5 through 5-7.

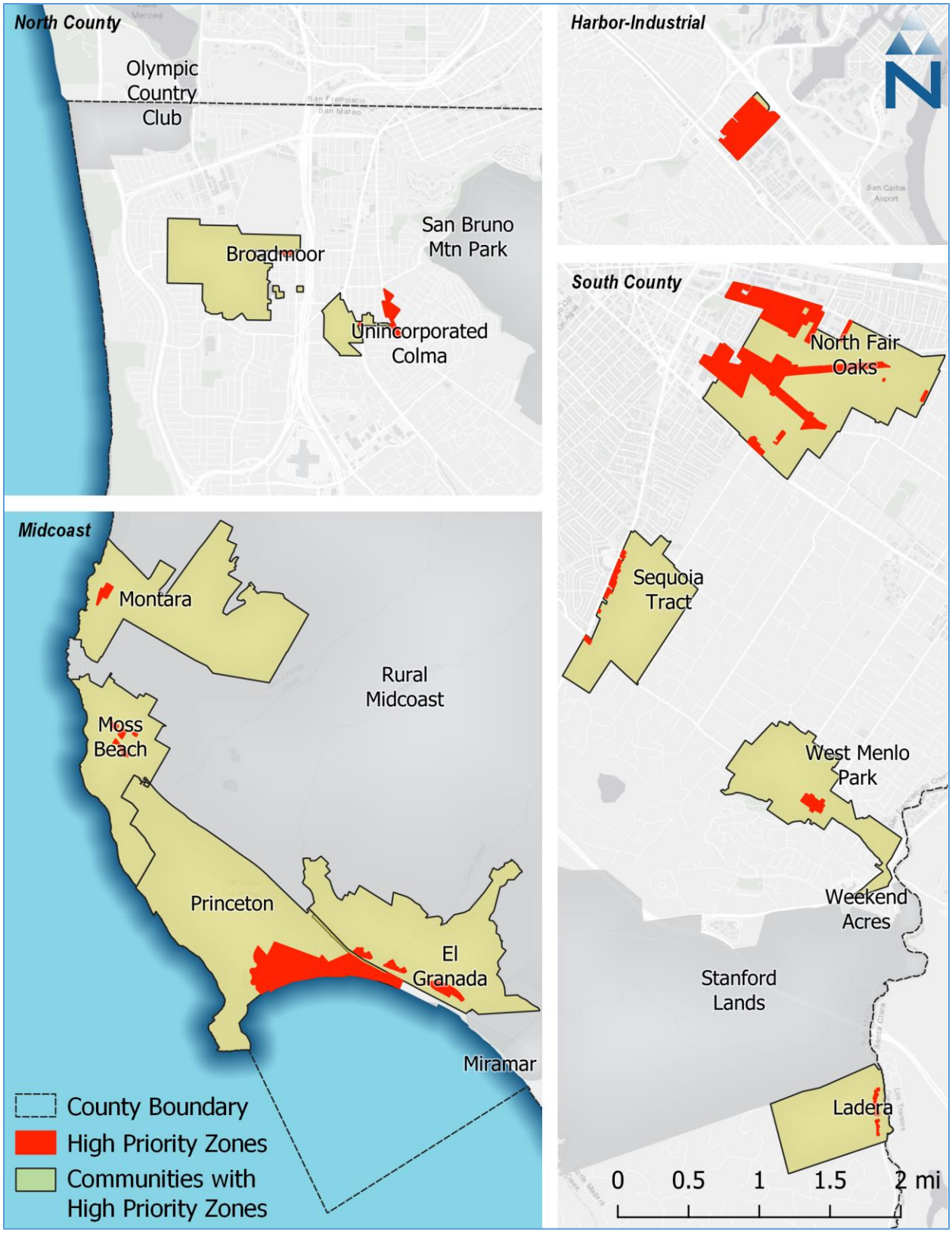



*Figure 5.7 High priority zones within Unincorporated San Mateo County*

*Table 5-5. Metrics for regional project opportunities*

(**Bold** = included in the SRP but modified for the GI Plan; Gray = included in the SRP but removed from GI Plan metrics)

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **Stormwater Resource Plan Metrics** | | | | | | | |
| Parcel land use | | | Schools / Golf Courses | Public Buildings | Parking Lot | Park / Open Space | |
| Parcel size (acres) | 0.25 - 0.5 | 0.5 - 1 | 1 - 2 | 2 - 3 | 3 - 4 | ≥ 4 | |
| Imperviousness (%) | < 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 100 | |
| Slope (%) | 5 - 10 | 4 - 5 | 3 - 4 | 2 - 3 | 1 - 2 | ≤ 1 | |
| Hydrologic soil group | | C or D | | B | | A | |
| Within a flood-prone watershed | Not in watershed | | | | | In flood-prone watershed | 2 |
| Contains PCB interest areas | None | | | Moderate | | High | 2 |
| **Currently planned by County or co-located with other County project** | **No** | | | | | **Yes** | **2** |
| Drains to TMDL water (Bay) | No | | | | | Yes | |
| Above groundwater basin | No | | Yes | | | | |
| **Augments water supply** | **No** | Yes | | | | **Above basin, outside of shallow GW, and 500' away from cleanup site** | |
| Water quality source control | No | Yes | | | | | |
| Reestablishes natural hydrology | No | Yes | | | | | |
| Creates or enhances habitat | No | Yes | | | | | |
| **Community enhancement** | **Not in any vulnerable community dataset** | | **In 1 vulnerable community dataset** | **In 2 vulnerable community datasets** | **In 3 vulnerable community datasets** | **In 4 or more vulnerable community datasets** | **2** |

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **County-Specific Metrics** | | | | | | | |
| Subwatershed with highest capacity in RAA (by project type) | Not in RAA subwatershed | Remaining subwatersheds | | Subwatershed ID 232521 or 230221 | | Subwatershed ID 230321 | |
| Potential to protect human safety (crucial infrastructure assets and lifeline routes) | No lifeline routes or assets | No lifeline routes and <10 assets | | No lifeline routes and 10-30 assets | | In watershed of lifeline route or >30 assets | |
| Proximity to storm drain (ft) | > 1,000 | 500 - 1000 | | 200 - 500 | | ≤ 200 | |
| Caltrans acreage in proxy drainage area | None | < 50 acres | | 50 - 200 acres | | > 200 acres | |
| Distance to creek (unstable creek banks) | Within 200’ of creek | | | | | Outside 200’ of creek | |
| High priority zoning | None | | | | | In County’s high priority zone | |

*Table 5-6. Metrics for LID project opportunities*

(**Bold** = included in the SRP but modified for the GI Plan; Gray = included in the SRP but removed from GI Plan metrics)

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **Stormwater Resource Plan Metrics** | | | | | | | |
| Parcel land use | | | Schools / Golf Courses | Park / Open Space | Parking Lot | Public Buildings | |
| Imperviousness (%) | < 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 100 | |
| Slope (%) | 5 - 10 | 4 - 5 | 3 - 4 | 2 - 3 | 1 - 2 | ≤ 1 | |
| Hydrologic soil group | | D | Unknown | C | B | A | |
| **Within a flood-prone watershed** | **Not in watershed** | | | | | **In flood-prone watershed** | **2** |
| Contains PCB interest areas | None | | | Moderate | | High | 2 |
| **Currently planned by County or co-located with other County project** | **No** | | | | | **Yes** | **2** |
| Drains to TMDL water (Bay) | No | | | | | Yes | |
| Above groundwater basin | No | | Yes | | | | |
| **Augments water supply** | **No** | Yes | | | | **Above basin, outside of shallow GW, and a minimum of 500' away from cleanup site** | |
| Water quality source control | No | Yes | | | | | |
| Reestablishes natural hydrology | No | Yes | | | | | |
| Creates or enhances habitat | No | Yes | | | | | |
| **Community enhancement** | **Not in any vulnerable community dataset** | | **In 1 vulnerable community dataset** | **In 2 vulnerable community datasets** | **In 3 vulnerable community datasets** | **In 4 or more vulnerable community datasets** | **2** |

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **County-Specific Metrics** | | | | | | | |
| Subwatershed with highest capacity in RAA (by project type) | Not in RAA subwatershed | Remaining subwatersheds | | SWS 221221 | | SWS 230221 | |
| Potential to protect human safety (crucial infrastructure and lifeline routes) | No lifeline routes or assets | No lifeline routes and <10 assets | | No lifeline routes and 10-30 assets | | In watershed of lifeline route or >30 assets | |
| Urban Heat Island Index | < 4,000 | 4,000 – 8,000 | 8000 – 12,000 | 12,000 – 16,000 | 16,000 – 20,000 | > 20,000 | |
| Adequate infiltration/Available connection to storm drain | Group C or D soils not near storm drain | | | Group C or D soils and within 200’ of storm drain | | Group A or B soils | |
| Distance to creek (unstable creek banks) | Within 200’ of creek | | | | | Outside 200’ of creek | |
| High priority zoning | None | | | | | In County’s high priority zone | |

*Table 5-7. Metrics for Green Street project opportunities*

(**Bold** = included in the SRP but modified for the GI Plan; ~~Gray~~ = included in the SRP but removed from GI Plan metrics)

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **Stormwater Resource Plan Metrics** | | | | | | | |
| **Street type** | **Other** | | **Local** | **Collector** | | **Arterial** | |
| Imperviousness (%) | < 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 100 | |
| Slope (%) | | 4 - 5 | 3 - 4 | 2 - 3 | 1 - 2 | ≤ 1 | |
| ~~Hydrologic soil group~~ | | ~~D~~ | ~~Unknown~~ | ~~C~~ | ~~B~~ | ~~A~~ | |
| **Within a flood-prone watershed** | **Not in watershed** | | | | | **In flood-prone watershed** | **2** |
| Contains PCB interest areas | None | | | Moderate | | High | 2 |
| **Currently planned by County or co-located with other County project** | **No** | | | | | **Yes** | **2** |
| *Safe Routes to School* program | No | | | | | Yes | 2 |
| Drains to TMDL water (Bay) | No | | | | | Yes | |
| ~~Above groundwater basin~~ | ~~No~~ | | ~~Yes~~ | | | | |
| **Augments water supply** | **No** | ~~Yes~~ | | | | **Above basin, outside of shallow GW, and 500' away from cleanup site** | |
| Water quality source control | No | Yes | | | | | |
| Reestablishes natural hydrology | No | Yes | | | | | |
| Creates or enhances habitat | No | Yes | | | | | |
| **Community enhancement** | **Not in any vulnerable community dataset** | | **In 1 vulnerable community dataset** | **In 2 vulnerable community datasets** | **In 3 vulnerable community datasets** | **In 4 or more vulnerable community datasets** | **2** |
| **County-Specific Metrics** | | | | | | | |

| | Points | | | | | | Weight Factor |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Subwatershed with highest capacity in RAA (by project type) | Not in RAA subwatershed | Remaining subwatersheds | | Subwatershed ID 230321 or 232821 | | Subwatershed ID 230221 | |
| Potential to protect human safety (crucial infrastructure and lifeline routes) | No lifeline routes or assets | No lifeline routes and <10 assets | | No lifeline routes and 10-30 assets | | In watershed of lifeline route or >30 assets | |
| Urban Heat Island Index | < 4,000 | 4,000 – 8,000 | 8000 – 12,000 | 12,000 – 16,000 | 16,000 – 20,000 | > 20,000 | |
| Utility conflicts<br>*High conflict – PG&E gas mains*<br>*Conflict – water mains > 18" dia.* | | High conflict utilities | > 1000 ft of conflict per 1000 LF of street | 500 - 1000 ft of conflict per 1000 LF of street | 100 - 500 ft of conflict per 1000 LF of street | < 100 ft of conflict per 1000 LF of street | |
| Right-of-way width (ft) | Narrowest 33% of street class | | | Middle 33% of street class | | Widest 33% of street class | |
| Adequate infiltration/Available connection to storm drain | Group C or D soils not near storm drain | | | Group C or D soils and within 200' of storm drain | | Group A or B soils | |
| Pavement Condition Index | Category I Very Good | Category II Good (Non-Load) | Category III Good (Load) | Not Evaluated | Category IV Poor | Category V Very Poor | |
| Distance to creek (unstable creek banks) | Within 200' of creek | | | | | Outside 200' of creek | |
| High priority zoning | None | | | | | In County's high priority zone | |

### 5.4.3 Resulting County-Specific Prioritization List

The screening of parcels and street segments resulted in 249 regional, 310 LID, and 1,665 green street project opportunities across public parcels or rights-of-way in Unincorporated County or on County-owned land. For comparison, project opportunities were bracketed into High, Medium, and Low priority categories based on the total score from the prioritization analysis:

High – above the 90$^{th}$ percentile of project opportunities.

Medium – between the 60$^{th}$ and 90$^{th}$ percentile.

Low – below the 60$^{th}$ percentile.

These categories represent the likelihood a project opportunity would result in an effective GI project if implemented at that site and is used as the basis for the implementation strategy of the GI Plan. Many of the metrics in the County-specific prioritization were selected to identify project opportunities in the areas of focus identified in Chapter 4, where GI would be the most effective. From the resulting prioritized list of projects, many of the high priority projects are in those areas of focus, typically urban areas near the Bay. Most of the low priority projects were identified in the rural coastal communities, where vegetated ditches and pervious area already serve functions similar to GI. The number of project opportunities that fall into these brackets is summarized in Table 5-8. Figure 5.9 through Figure 5.13 show the project opportunities bracketed into High, Medium, and Low categories for each of the three project types.

*Table 5-8. Summary of prioritization results for County of San Mateo*

| Bracket | Criteria | Project Type | | |
|---|---|---|---|---|
| | | Regional | LID | Green Street |
| High | 90$^{th}$ percentile | 23 | 21 | 157 |
| Medium | 60$^{th}$ to 90$^{th}$ percentile | 74 | 98 | 504 |
| Low | Below 60$^{th}$ percentile | 152 | 191 | 1,004 |
| **TOTAL** | **-** | **249** | **310** | **1,665** |

***Potential Regional Projects***

The County-specific prioritization process resulted in 249 total potential regional project opportunities within Unincorporated County or on County-owned land in incorporated cities. Based on the process, 24 projects are identified as high priority, 70 are medium priority, and 155 are low priority.

This list can be used as a starting point for future evaluation of sites for potential regional projects. Future evaluation may include more detailed analysis of stormwater performance, constructability, and expected co-benefits. Criteria such as drainage area estimates, surrounding land use, parcel size, and an understanding of community needs can be considered to select sites for advancing projects through feasibility studies and conceptual development. Future regional projects identified from this list may contribute to the reduction of pollutant loads specified by the permit and may potentially lessen the burden of implementing other, less cost-effective projects.

Table 5-9 depicts an example score sheet for two regional project opportunities. Figure 5.8 and Figure 5.9 show maps of the regional project opportunities bracketed into High, Medium, and Low categories.

*Table 5-9. Example scoring for two regional project opportunities*

| Project Opportunity Site Name | Everest Public High School | | San Mateo County Event Center | |
|---|---|---|---|---|
| **Category** | **High** | | **Low** | |
| **Total Score** | **70** | | **45** | |
| **Characteristic** | **Value** | **Score** | **Value** | **Score** |
| Parcel Land Use | School | 2 | Public Building | 5 |
| Parcel Size (acres) | 1.62 | 2 | 48 | 5 |
| Imperviousness (%) | 60 | 3 | 60 | 3 |
| Slope (%) | 0 | 5 | 1 | 5 |
| Hydrologic Soil Group | C | 1 | C | 1 |
| Within a flood-prone watershed | Yes | 10 | No | 0 |
| Contains PCB Interest Areas | High | 10 | High | 10 |
| Currently planned by County or co-located with other County project | No | 0 | No | 0 |
| Drains to TMDL water | Yes | 5 | Yes | 5 |
| Augments water supply | Yes | 5 | Groundwater level < 20’ | 0 |
| Water quality source control | Yes | 1 | Yes | 1 |
| Reestablishes natural hydrology | Yes | 1 | Yes | 1 |
| Creates or enhances habitat | No | 0 | No | 0 |
| Community enhancement | In 2 datasets: Economically DAC and County Vulnerability Index | 6 | Not in a disadvantaged community | 0 |
| Subwatershed with highest capacity in RAA (by project type) | SWS 230221 | 3 | Not in unincorporated county RAA subwatershed | 0 |
| Potential to protect human safety | 23 crucial assets in watershed | 3 | In watershed of “Lifeline Route” and 32 crucial assets | 5 |
| Proximity to storm drain (ft) | 147 | 5 | 649 | 1 |
| Caltrans area in watershed (ac) | 185 | 3 | 118 | 3 |
| Distance to creek (ft) | > 200’ away from creek bank | 5 | < 200’ away from creek bank | 0 |

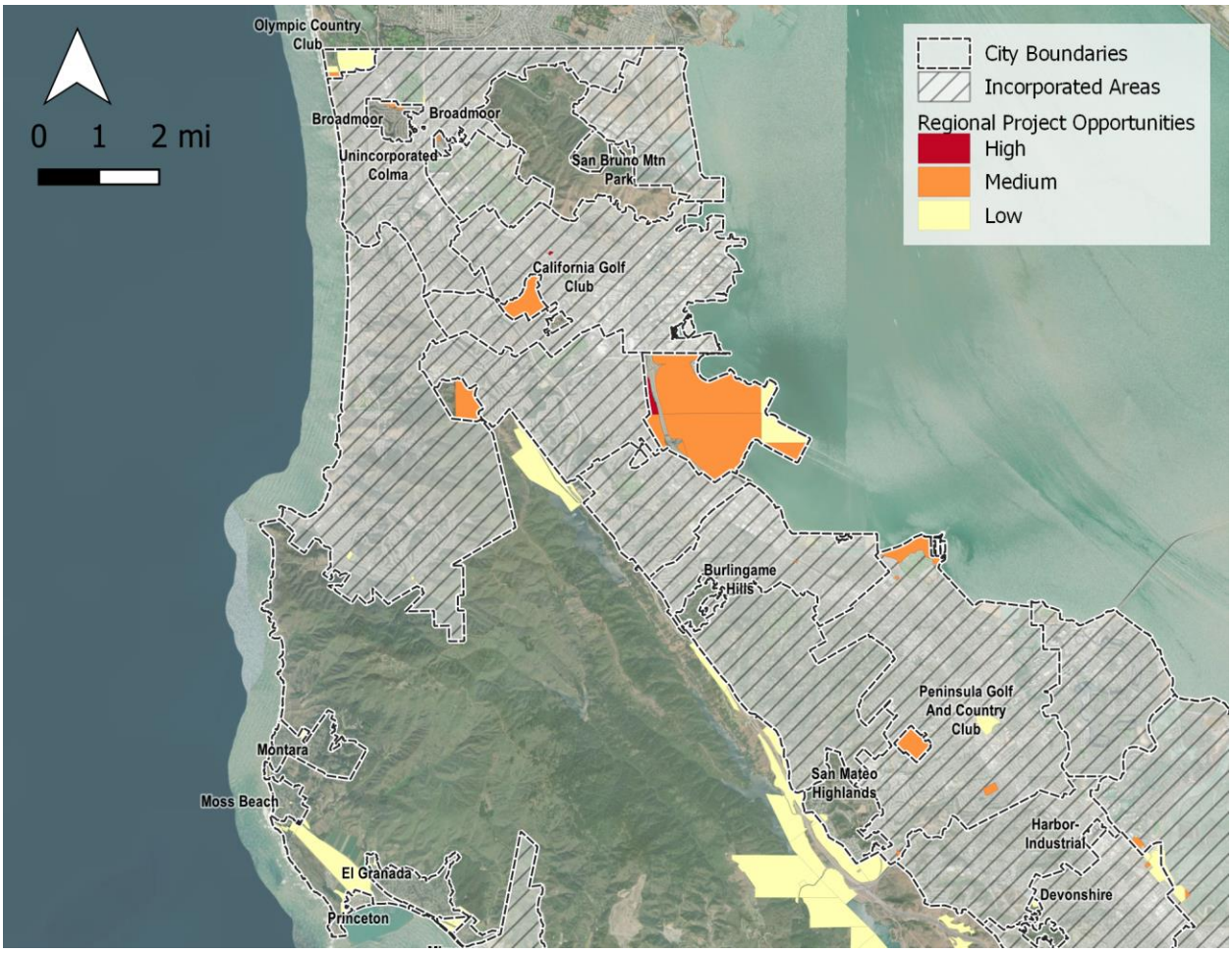



*Figure 5.8. Regional project opportunities (north)*

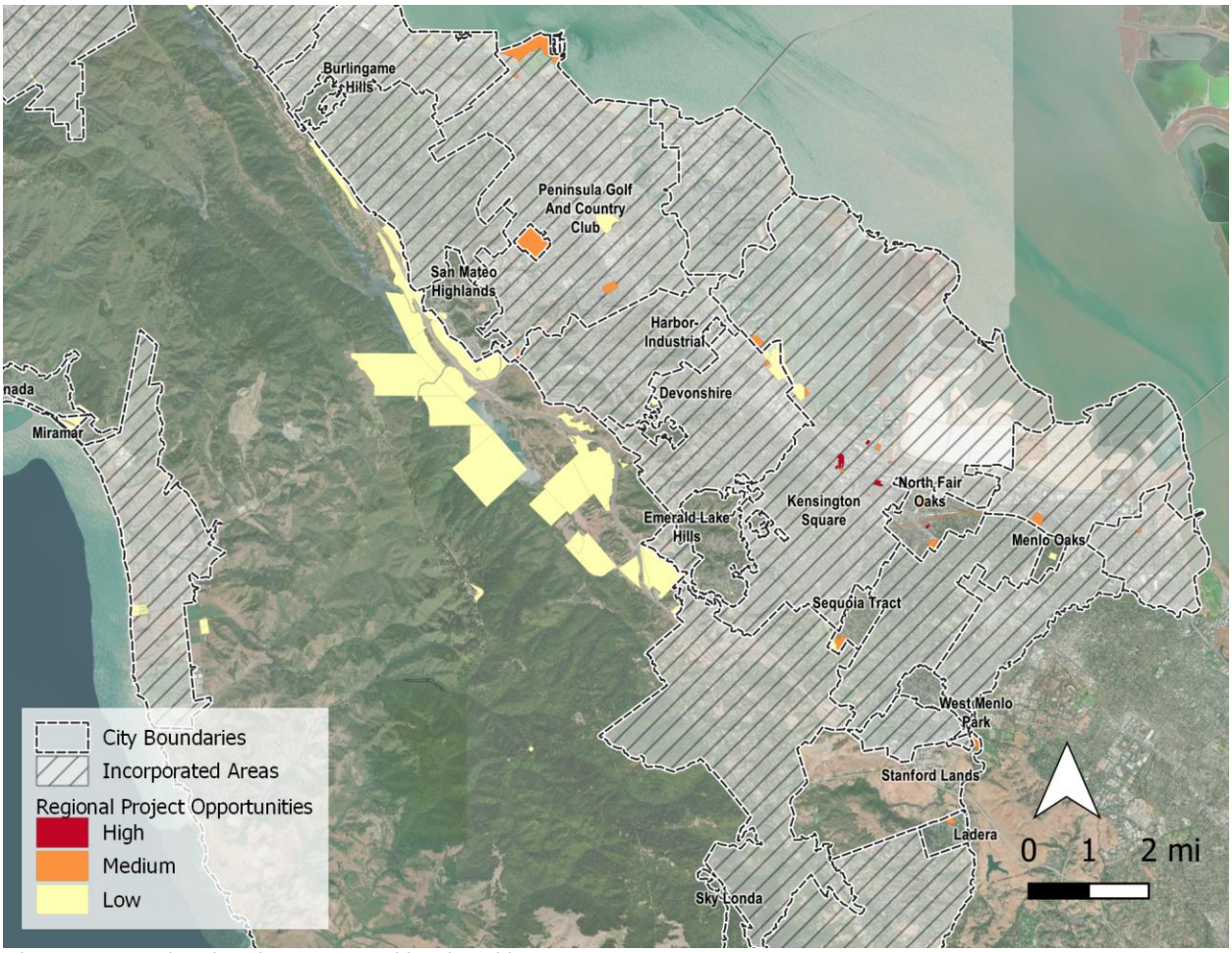



*Figure 5.9. Regional project opportunities (south)*

***Potential LID Projects***

The County-specific prioritization process resulted in 310 total potential LID project opportunities within Unincorporated County or on County-owned land in incorporated cities. Based on the process, 30 projects are identified as high priority, 92 are medium priority, and 188 are low priority. These parcels mainly include public buildings, schools, parks, parking lots, and open spaces from land owned by the County, as well as several other public entities.

This list can be used as a starting point for future evaluation of sites for potential LID projects. LID on public parcels may serve as useful pilots that kick-start the County's implementation efforts and provide educational opportunities for the public on GI and stormwater issues. In some cases, LID on public parcels may be more favorable than green streets due to reasons that are site-specific and not quantifiable in the County-specific prioritization. Future evaluation may include more detailed analysis of stormwater performance, constructability, and expected benefits. Criteria such as surrounding land use, parcel size, and an understanding of community needs can be considered to select sites for advancing projects through feasibility studies and conceptual development. Future LID projects identified from this list may contribute to the reduction of pollutant loads specified by the permit and potentially reduce the number of green street projects needed to meet implementation goals. Table 5-10 depicts an example score sheet for two LID project opportunities. Figure 5.10 and Figure 5.11 show maps of the LID project opportunities bracketed into High, Medium, and Low categories.

*Table 5-10. Example scoring for two LID project opportunities*

| Project Opportunity Site Name | County Center | | San Carlos Airport | |
|---|---|---|---|---|
| **Category** | **High** | | **Low** | |
| **Total Score** | **67** | | **34** | |
| **Characteristic** | **Value** | **Score** | **Value** | **Score** |
| Parcel Land Use | Public Building | 5 | Public Building | 5 |
| Imperviousness (%) | 86 | 5 | 80 | 5 |
| Slope (%) | 1 | 5 | 0 | 5 |
| Within a flood-prone watershed | No | 0 | No | 0 |
| Contains PCB Interest Areas | Moderate | 6 | None | 0 |
| Currently planned by County or co-located with other County project | County Office Building 3 | 10 | No | 0 |
| Drains to TMDL water | Yes | 5 | Yes | 5 |
| Augments water supply | No. Shallow GW and near Geotracker site. | 0 | No. Shallow GW. | 0 |
| Water quality source control | Yes | 1 | Yes | 1 |
| Reestablishes natural hydrology | Yes | 1 | Yes | 1 |
| Creates or enhances habitat | Yes | 1 | Yes | 1 |
| Community enhancement | In 4 datasets: Economic DAC, ACS, MTC, County | 10 | In 2 datasets: Economic DAC, County | 6 |
| Subwatershed with highest capacity in RAA (by project type) | None (in an incorporated area) | 0 | None (in an incorporated area) | 0 |
| Potential to protect human safety | 96 crucial assets in watershed | 5 | 1 crucial asset in watershed | 1 |
| Urban Heat Island Index | 20,150 | 5 | 19,654 | 4 |
| Adequate infiltration/Available connection to storm drain | Soil Group C and within 200’ of storm drain | 3 | Soil Group C and farther than 200’ from storm drain | 0 |
| Distance to creek (ft) | > 200’ away from creek bank | 5 | < 200’ from creek bank | 0 |

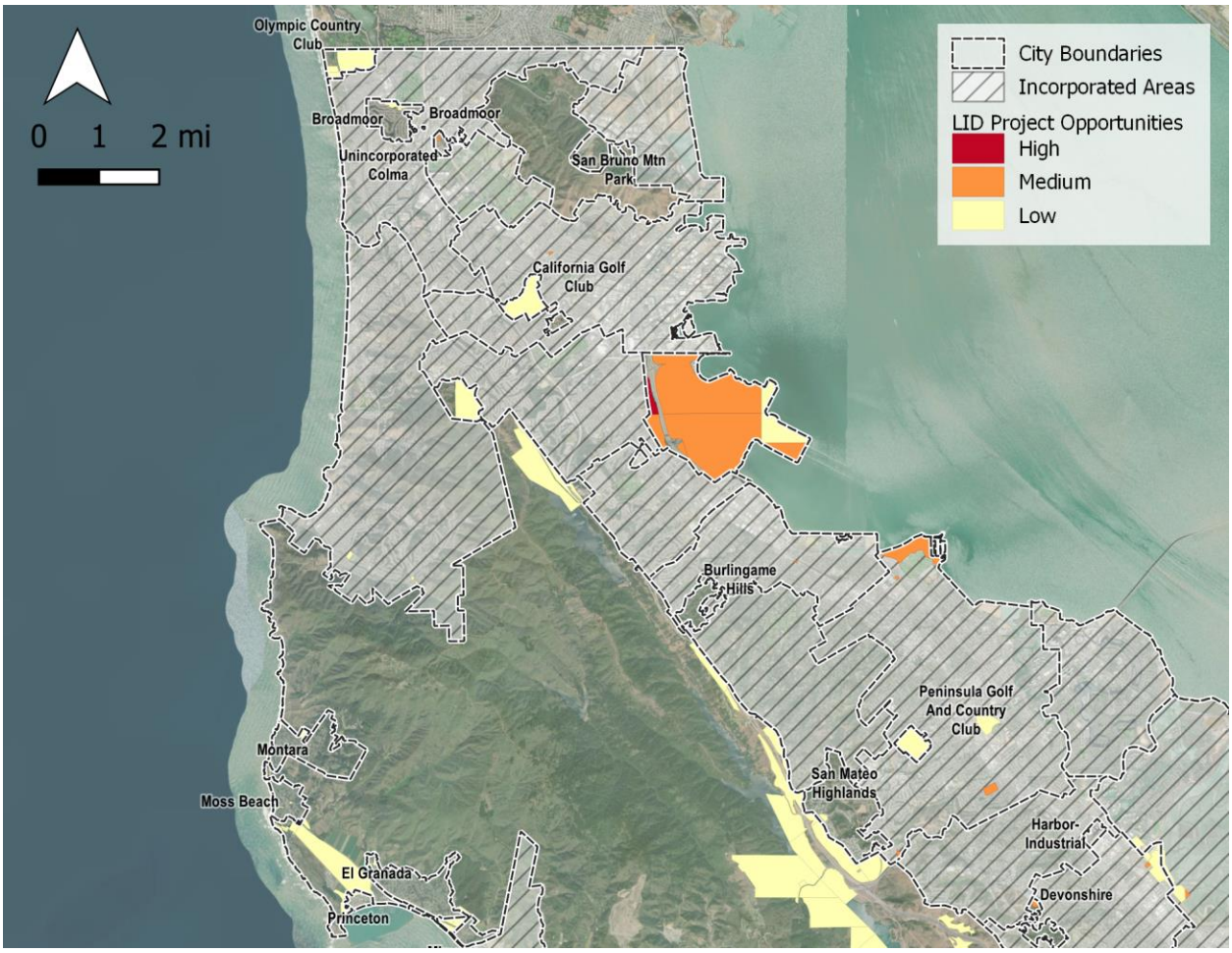



*Figure 5.10. LID project opportunities (north).*

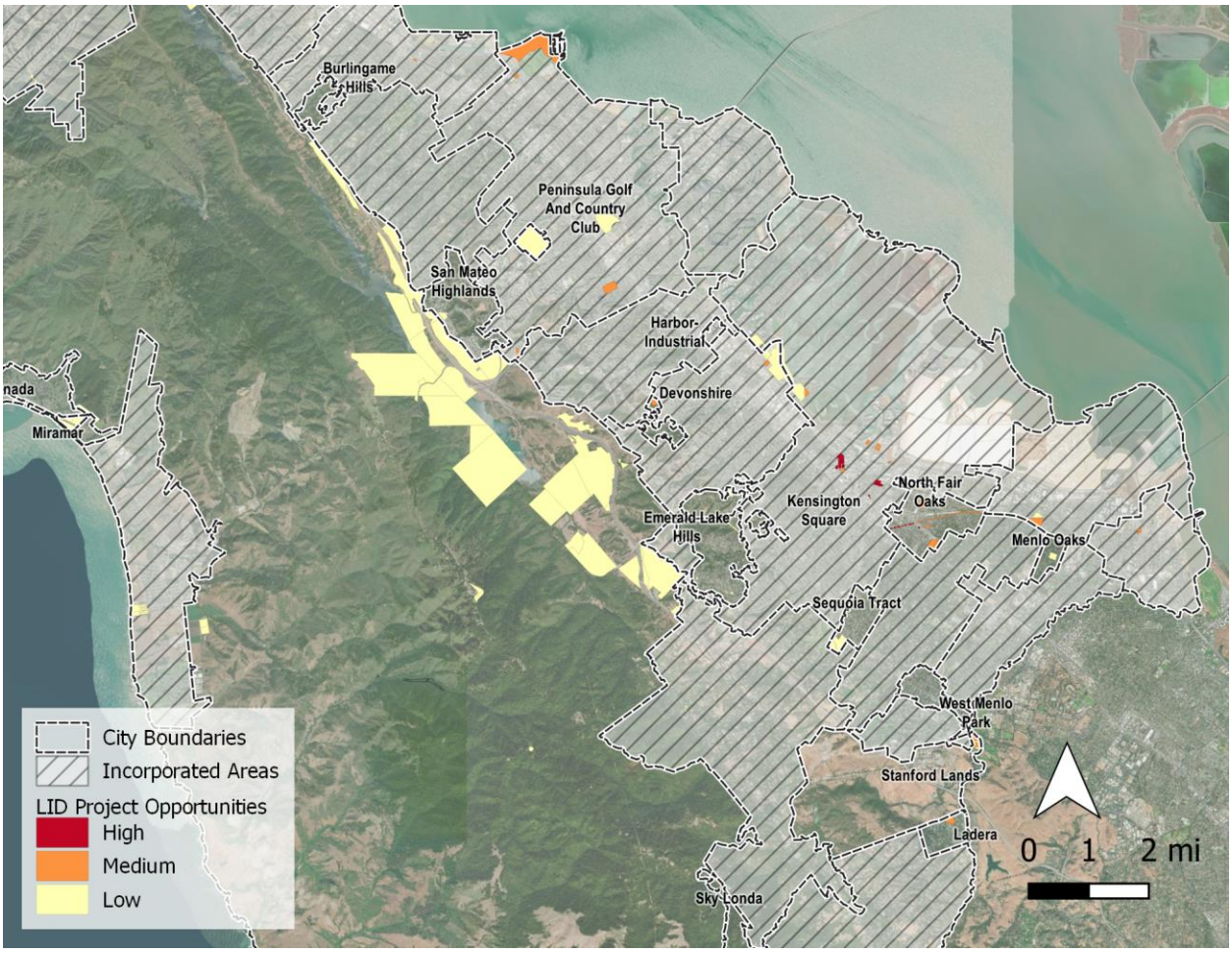



*Figure 5.11. LID project opportunities (south).*

***Potential Green Street Projects***

The County-specific prioritization process resulted in 1,665 total potential green street project opportunities within Unincorporated County. Based on the process, 158 projects are identified as high priority, 501 are medium priority, and 1,006 are low priority. This list can be used as a starting point for future evaluation of sites for potential green street projects. Future evaluation may include more detailed analysis of stormwater performance, constructability, and expected benefits. Table 5-11 depicts an example score sheet for two green street project opportunities. Figures 5.12 and 5.13 show maps of the green street project opportunities bracketed into High, Medium, and Low categories.

*Table 5-11. Example scoring for two green street project opportunities*

| Project Opportunity Site Name | Bay Rd (North Fair Oaks) | | Avenue Granada (El Granada) | |
|---|---|---|---|---|
| **Category** | **High** | | **Low** | |
| **Total Score** | **79** | | **38** | |
| **Characteristic** | **Value** | **Score** | **Value** | **Score** |
| Street type | Collector | 3 | Local | 2 |
| Imperviousness (%) | 89 | 5 | 46 | 1 |
| Slope (%) | 1 | 5 | 1 | 4 |
| Within a flood-prone watershed | Yes | 10 | No | 0 |
| Contains PCB Interest Areas | High | 10 | None | 0 |
| Currently planned by County or co-located with other County project | No | 0 | No | 0 |
| Safe Routes to School | No | 0 | No | 0 |
| Drains to TMDL water | Yes | 5 | No | 0 |
| Augments water supply | Yes | 5 | Yes | 5 |
| Water quality source control | Yes | 1 | Yes | 1 |
| Reestablishes natural hydrology | Yes | 1 | Yes | 1 |
| Creates or enhances habitat | Yes | 1 | Yes | 1 |
| Community enhancement | In all 5 datasets | 10 | SFBRA Economic DAC | 4 |
| Subwatershed with highest capacity in RAA (by project type) | 230221 | 5 | None | 0 |
| Potential to protect human safety | 23 crucial assets in watershed | 3 | 3 crucial assets in watershed | 1 |
| Urban Heat Island Index | No Data | 0 | 2,088 | 0 |
| Utility conflicts | 2,000 ft of utility conflict per 1,000 ft of street | 2 | No conflicts | 5 |
| Right-of-way width (ft) | 80; Widest 33% of Streets | 5 | 114; Widest 33% of Streets | 5 |
| Adequate infiltration/Available connection to storm drain | Soil Group C and within 200’ of storm drain | 3 | Soil Group C and within 200’ of storm drain | 3 |
| Pavement Condition Index | Category I – Very Good | 0 | Category I – Very Good | 0 |
| Distance to creek (ft) | > 200’ away from creek bank | 5 | > 200’ away from creek bank | 5 |

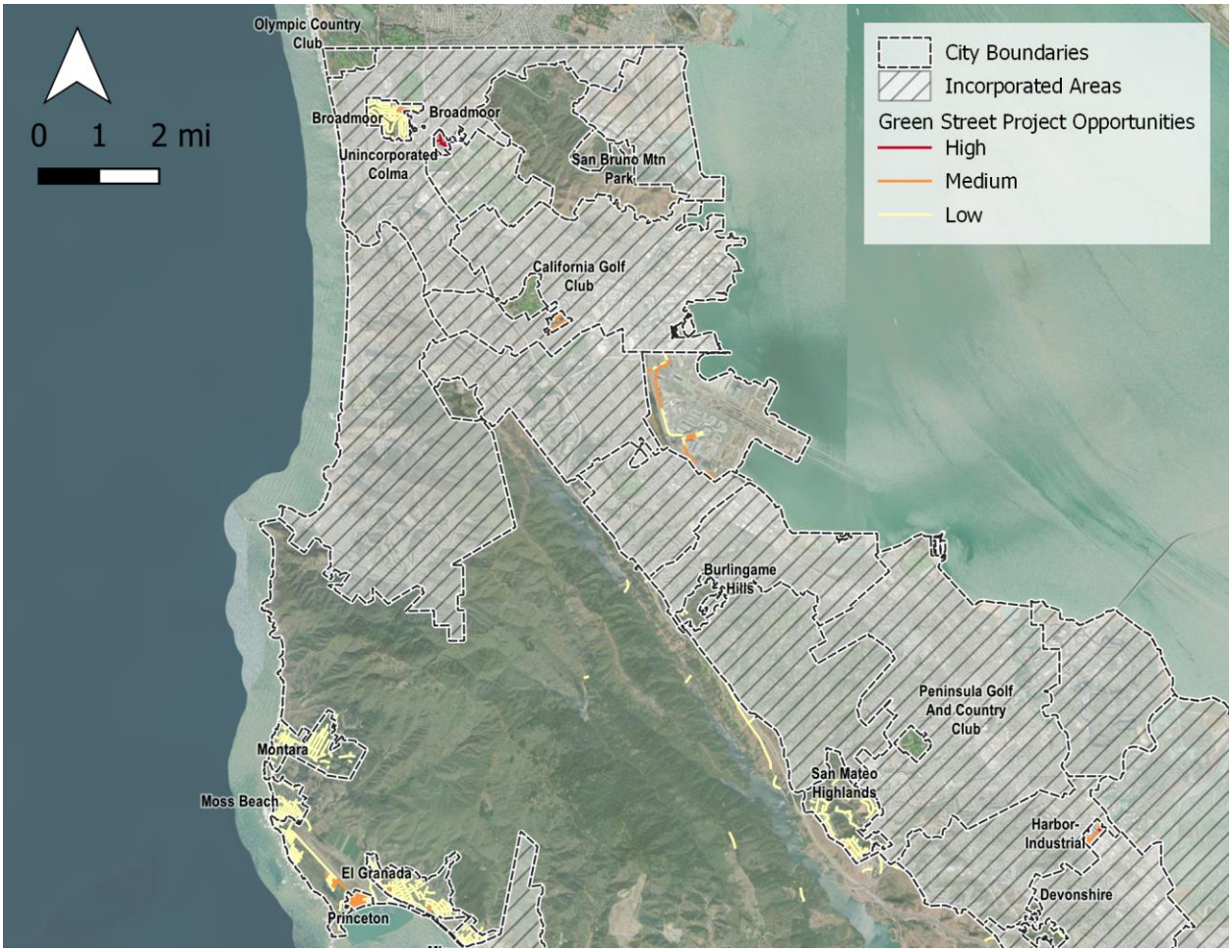



*Figure 5.12. Green street project opportunities (north).*

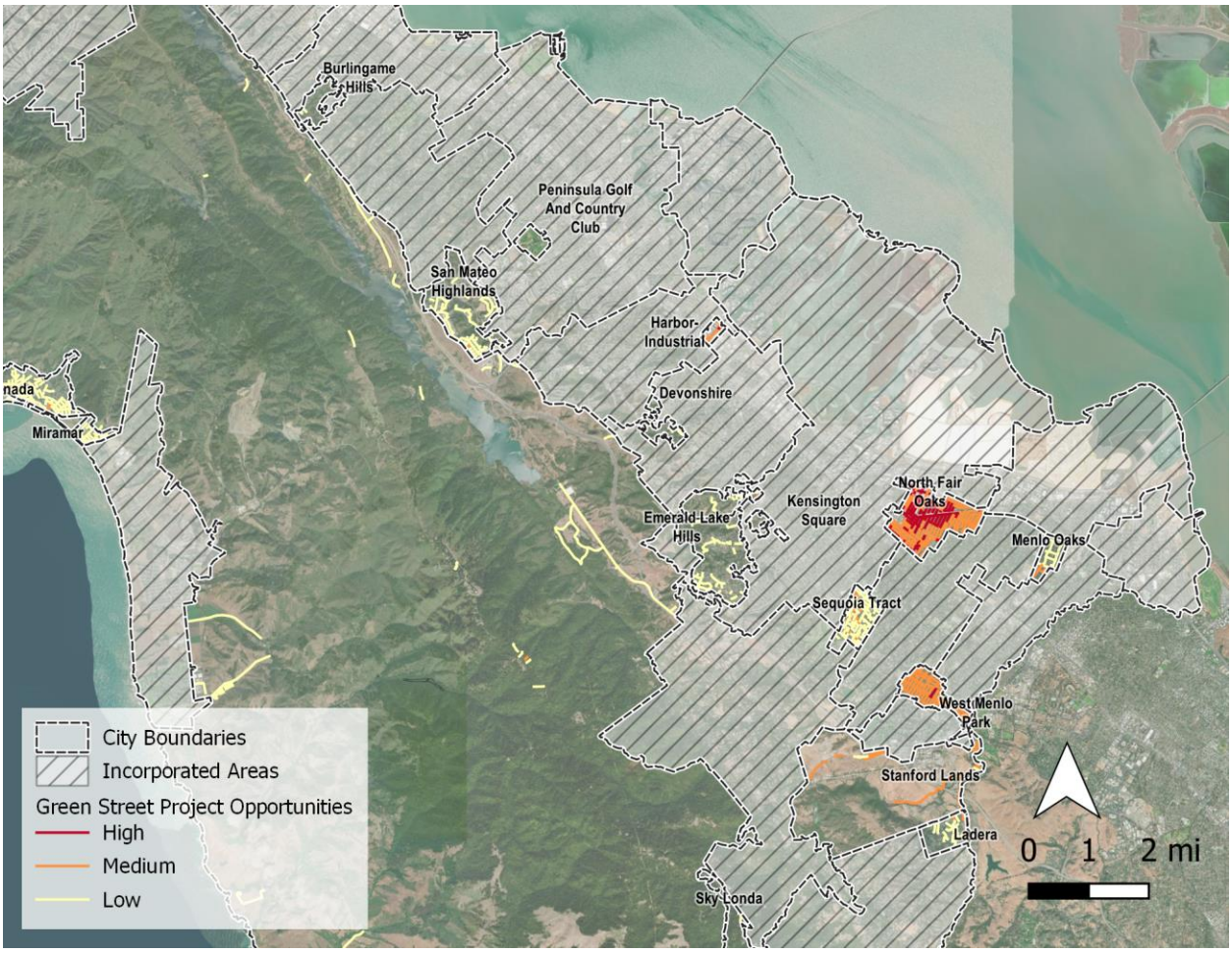



*Figure 5.13. Green street project opportunities (south).*

# 6 COUNTY GREEN INFRASTRUCTURE STRATEGY

This chapter defines goals for runoff capture and impervious area treated based on the results of the RAA and presents the results of County-specific prioritization to demonstrate how GI project types (i.e., existing GI projects, C.3 regulated projects, regional projects, green streets, and public-parcel LID retrofits) can combine to meet these goals by 2040.

## 6.1 STRATEGY OVERVIEW

In addition to the SRP, the County has participated in another countywide planning initiative known as the San Mateo County Green Infrastructure Reasonable Assurance Analysis (RAA), which was completed in 2017 and updated in 2019. The RAA is defined as "the demonstration that the implementation of control measures will, in combination with operation of existing or proposed storm drain system infrastructure and management programs, result in sufficient pollutant reductions over time" (BASMAA 2017). The RAA quantifies the runoff storage capacity from a combination of five types of GI projects to meet the pollutant reduction requirements of the MRP and forms the basis for the County's GI strategy. The County's strategy utilizes the RAA results to specify an optimal mix of project types – including the three types prioritized in Chapter 5 – that would most cost-effectively achieve GI implementation goals. For more detailed information on the RAA and cost-optimization, refer to the RAA summary for the County of San Mateo in Appendix A.

The five project types that are used in the RAA and form the basis of the County's GI strategy include:

1. **Existing and Early Implementation Projects**: Regulated stormwater treatment and GI projects that have been implemented since FY-2004/05[12], and non-regulated GI projects that have been constructed or are planned for construction prior to December 2020. This category primarily consists of all existing regulated projects that were mandated to treat runoff via Provision C.3 of the MRP, but also includes existing public green street or other demonstration projects that were not subject to Provision C.3 requirements.

2. **Future C.3 Regulated Projects:** Future new and redevelopment projects that will be subject to Provision C.3 requirements to treat runoff via LID. This category is estimated based on spatial projections of future new and redevelopment tied to regional models for population and employment growth (described in more detail in Section 6.3.3).

3. **Regional Projects (identified)**: Four projects within public parks or Caltrans property, identified by C/CAG in cooperation with the County and other agencies, to provide regional capture and infiltration/treatment of stormwater, for which conceptual designs were developed to support further planning and designs.

[12] For regulated projects in the early years of C.3 implementation, stormwater treatment may have been achieved through non-GI means, such as underground vault systems or media filters.

4. **Green Streets**: Opportunities throughout San Mateo County identified and prioritized in the SRP for retrofitting existing streets with GI in public rights-of-way. Green streets were ranked as high, medium, and low priority based on a multiple-benefit prioritization process developed for the SRP.

5. **Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of additional parcel-based LID and other Regional Projects. The SRP screened and prioritized public parcels for opportunities for onsite LID and Regional Projects. These opportunities need further investigation to determine the best potential projects.

Figure 6.1 shows an example of how each of the project types builds upon each other in the GI strategy to achieve the County's stormwater capture goals. Stormwater capture is one metric that can be used to represent the amount of GI needed to achieve pollutant load reduction goals for the purpose of planning, implementation, and tracking.

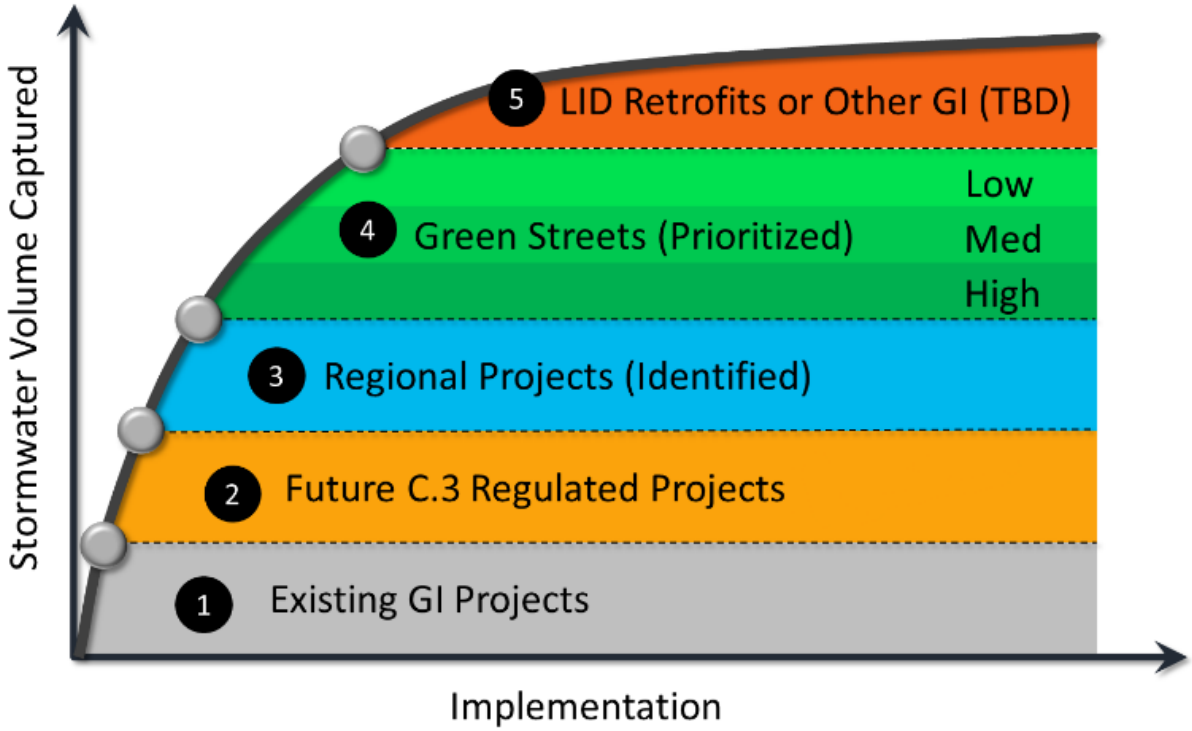



*Figure 6.1. Multifaceted GI strategy.*

Given the relatively small scale of most GI projects (e.g., LID on an individual parcel, a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction goals. All the GI projects will require site investigations to assess feasibility and costs. As a result, the County's GI strategy is based on the preliminary investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction target. The RAA sets the GI Plan "goals" in terms of the amount of GI implementation over time to address pollutant load reductions. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, the adaptive management process will be key to ensuring that goals are met. The

County's strategy may be updated based on these considerations, and the amount of GI prescribed by the RAA for one project type may be met through any other type of GI. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

The GI strategy presented in this chapter forms the core of the GI Plan and enables the County to establish the near-term steps for GI Plan implementation, as defined in Chapter 7. The recommended strategy was selected based on achieving the capture targets as cost-effectively as possible, while maximizing multiple benefits. For more detailed cost-benefit analysis of the various project combinations evaluated, refer to the RAA report in Appendix A. The GI Plan is intended to be continually updated as needed to capture changing conditions and the state of science. As methods for quantifying pollutant reductions evolve – from updated GI assumptions, improved data quality, or new accounting methods for the effects of non-structural programmatic controls – the GI Plan and strategy may be updated through an adaptive management process. The strategy presented in this section represents an initial strategy based on best available data that will be improved over time.

## 6.2 EXISTING AND EARLY IMPLEMENTATION PROJECTS

Early Implementation Projects are GI projects that have already been implemented by the County or are already scheduled and funded for implementation during the permit term (i.e., through December 2020). The County identified additional Early Implementation Projects through a review of its Capital Improvement Program (CIP). Some street improvement projects already planned for design and construction can be modified to incorporate green infrastructure in addition to or in lieu of traditional drainage infrastructure to achieve multiple benefits while helping reach water quality goals. In addition, both C.3-regulated and non-regulated projects on County parcels have been constructed. The County actively looks for these types of opportunities, which has resulted in several GI projects being constructed. These existing and early implementation green street projects include:

- Fitzgerald Marine Reserve Parking Lot
- Reconstruction of San Benito Avenue
- Athlone Way Drainage Improvements
- San Mateo County Rifle Range
- Middlefield Road
- Carlos Street
- Reconstruction of Lucky Avenue and Liberty Park Avenue
- Reconstruction of Oak Drive and Placitas Avenue

Each of these projects is described in more detail below.

**Fitzgerald Marine Reserve Parking Lot**
A trench drain was installed, along with 400 square feet of bioretention, to treat drainage from a parking lot at the Fitzgerald Marine Reserve in Moss Beach. The project treats a drainage area of 9,375 square feet. The project was completed in November 2014.

**Reconstruction of San Benito Avenue**
San Benito Avenue in North Fair Oaks was reconstructed to include over 2,650 cubic feet of stormwater storage. The project utilized 610 linear feet of Stormtech chambers with installed rock swale and french drains. The project was completed in April 2015.

**Athlone Way Drainage Improvements**
Improvements to drainage on Athlone Way in North Fair Oaks included installation of a 600-foot long, 3-foot wide infiltration trench. The installed trench is 4 feet deep with a 24-inch perforated underdrain. The project was completed in January 2016.

**San Mateo County Rifle Range**
Two bioretention areas were installed at the San Mateo County Rifle Range in City of San Mateo. The bioretention areas treat a total of 0.4 acres. The project was completed in May 2017.

**Middlefield Road**
This project will reconfigure Middlefield Road between Pacific Avenue and Fifth Avenue from a four-lane, two-way roadway to a three-lane (one lane in each direction with a center left turn lane) roadway with parallel parking, bike lanes, and wider sidewalks. The project will include six bioretention planters and 8 flow through planters. The project is currently in the design phase; construction is scheduled to start in spring of 2020.

**Carlos Street**
Two bioretention areas were installed on Carlos Street between California Avenue and Virginia Avenue in front of the San Mateo County Sheriff North Coast Substation in the Moss Beach area. Carlos Street is a residential street separated from Highway 1 by a landscape strip. The bioretention bulbouts receive sheet flow runoff from the sidewalk and runoff from the roadway via curb cuts. The bioretention areas include an underdrain placed 6 inches above the bottom of the aggregate storage layer. The project was completed in late 2017.

**Reconstruction of Lucky Avenue and Liberty Park Avenue**
This project completed in 2017 is located in a residential, single-family home neighborhood of west Menlo Park that does not have sidewalks. The project incorporated a 750 cubic foot subsurface stormwater storage system filled with permeable material that is located between the roadway gutter and private property line. Stormwater runoff from the roadway enters through large curb cuts.

**Reconstruction of Oak Drive and Placitas Avenue**
The project area is located in a single-family residential neighborhood of North Fair Oaks that does not have sidewalks. As part of the street reconstruction, approximately 510 linear feet of subsurface stormwater chambers were installed, creating more than 2000 cubic feet of storage.

## 6.3 C.3 REGULATED PROJECTS

### 6.3.1 Current Requirements

Provision C.3 of the MRP requires new development and redevelopment projects that create and/or replace defined amounts of impervious surface to implement post-construction control measures to address stormwater runoff generated on-site and comply with other applicable elements of the provision. These projects are known as “C.3 Regulated Projects” or “regulated projects.” Regulated projects include private development or redevelopment projects, such as multi-family residential buildings, commercial office buildings, or shopping plazas, as well as public projects, such as libraries, police stations, and parking lots, exceeding the impervious surface thresholds identified in the MRP.[13] For most regulated projects, post-construction control measures must include LID site

[13] As of Order R2-2015-0049, which became effective on January 1, 2016, the threshold for most regulated project types is 10,000 square feet of impervious area created and/or replaced. For gas stations, restaurants, automotive shops, and uncovered parking lots, the threshold is 5,000 square feet.

design, source control, and treatment measures, such as bioretention, pervious pavement and infiltration trenches. These are the same types of facilities described in the GI Plan for implementation in non-regulated projects on public parcels and rights-of-way. GI facilities on regulated projects help achieve multiple benefits within County watersheds and are considered part of the County's total inventory of GI facilities.

### 6.3.2 Existing Project Inventory to Date

Since 2005, nearly 200 acres of development in unincorporated County have been subject to the Provision C.3 regulations. The County tracks the locations of these facilities and conducts an operation and maintenance verification inspection program to ensure that they are maintained properly. The locations of GI facilities on regulated projects constructed from FY 05/06 through FY16/17 are presented in Figure 6.2.

### 6.3.3 Future C.3 Regulated Projects

The County will continue to require future C.3 regulated projects to incorporate appropriate GI measures, as part of the County's long-term GI implementation strategy. An estimated additional 35 acres will be treated by approved new or redevelopment projects that are currently under construction or planned for construction.

The amount of new and redevelopment to occur between present day and 2040 was projected by C/CAG to support the development of GI plans within the County[14]. This analysis utilized a range of information including available land use and demographic files for new households and jobs that were developed and used for the San Mateo Countywide Transportation Plan. Available capacity and demand for future residential housing and work places were identified. The result of this analysis was an estimate of projected growth in terms of total land area of new and redevelopment, which was used to determine the amount of GI that will be implemented due to future regulated projects.

[14] Memorandum to C/CAG Green Infrastructure Committee from Community Design + Architecture re: *SMCWPPP Green Infrastructure Plan Development Support – methodology and initial estimate of land area for new and redevelopment from 2015 to 2040*, January 30, 2017.

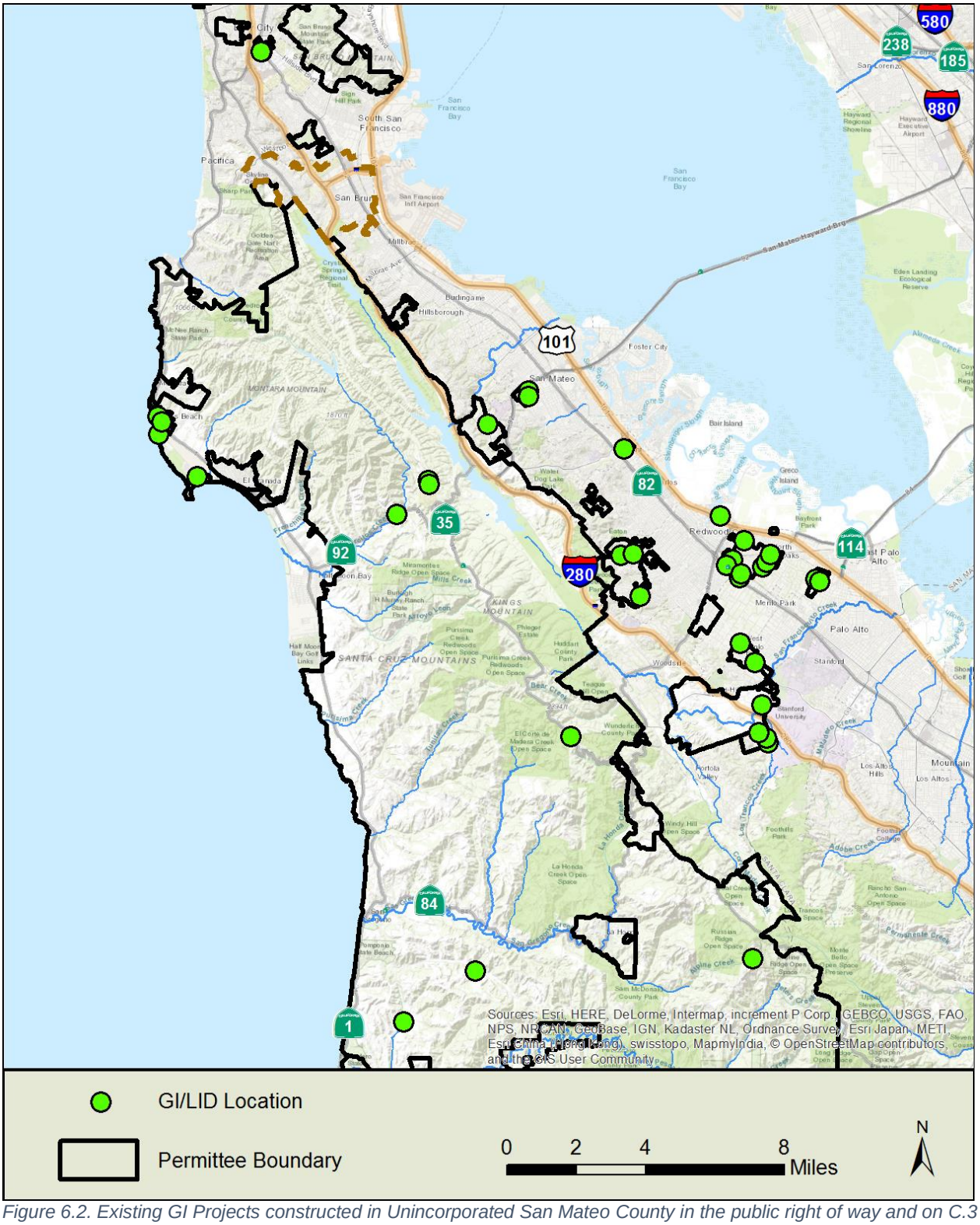
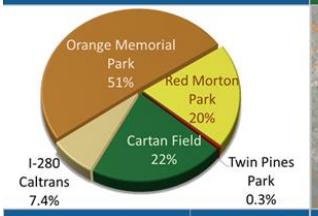



*Figure 6.2. Existing GI Projects constructed in Unincorporated San Mateo County in the public right of way and on C.3 Regulated Projects from FY05/06 through FY16/17*

## 6.4 REGIONAL GI PROJECTS

Based on the prioritization from the SRP described in Section 5.3, five potential regional projects across the County were identified for preparation of project concepts. Of those projects, the drainage areas of four projects overlapped with area within the unincorporated areas of the County. These projects include Cartan Field in Atherton, I-280 on Caltrans property in San Bruno, Orange Memorial Park in South San Francisco, and Red Morton Park in Redwood City. The projects are conceptualized as subsurface stormwater capture facilities, featuring a mix of infiltration and filtration features. The projects are opportunities for the County to partner on multi-benefit, multi-jurisdictional stormwater capture projects that will make progress towards the County's implementation goals. The projects are estimated to provide treatment for approximately 513 acres of impervious area in unincorporated County. The proposed project locations, drainage areas, and estimated treated impervious area are shown in Figure 6.3. Concept designs have been developed for the I-280, Orange Memorial Park, Red Morton Park, and Twin Pines Park sites and are provided in Appendix B.

| Regional Facilities | Cartan Field | I-280 (Caltrans) | Orange Memorial Park | Red Morton Park | Twin Pines Park |
|---|---|---|---|---|---|
|   |  |  |  |  |  |

| Jurisdiction | Treated Impervious Area (acres) | Cartan Field | | I-280 (Caltrans) | | Orange Memorial Park | | Red Morton Park | | Twin Pines Park | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % |
| Atherton | 210 | 210 | 32% | -- | -- | -- | -- | -- | -- | -- | -- |
| Belmont | 8 | -- | -- | -- | -- | -- | -- | -- | -- | 8 | 100% |
| Colma | 130 | -- | -- | -- | -- | 130 | 9% | -- | -- | -- | -- |
| Daly City | 601 | -- | -- | -- | -- | 601 | 40% | -- | -- | -- | -- |
| Menlo Park | 169 | 169 | 26% | -- | -- | -- | -- | -- | -- | -- | -- |
| Pacifica | 4 | -- | -- | -- | -- | 4 | 0% | -- | -- | -- | -- |
| Redwood City | 462 | -- | -- | -- | -- | -- | -- | 462 | 77% | -- | -- |
| San Bruno | 184 | -- | -- | 177 | 79% | 7 | 0% | -- | -- | -- | -- |
| South San Francisco | 637 | -- | -- | -- | -- | 637 | 42% | -- | -- | -- | -- |
| Woodside | 89 | 82 | 13% | -- | -- | -- | -- | 7 | 1% | -- | -- |
| San Mateo County | 513 | 192 | 29% | 46 | 21% | 141 | 9% | 134 | 22% | -- | -- |
| **Total** | **3,007** | **652** | **100%** | **224** | **100%** | **1520** | **100%** | **603** | **100%** | **8** | **100%** |

*Figure 6.3. Estimates of treated impervious area for regional projects evaluated in the RAA.*

The County will continue to evaluate additional regional project locations. The County-specific prioritization process included considerations of site conditions, constraints, and priority planning areas that may indicate potential project performance. The resulting list of prioritized potential regional projects may serve as a starting point for identification of additional projects. High-ranking sites from the list may be evaluated for feasibility and additional considerations, such as community priorities, understanding of current site uses, and schedules for other capital improvement projects, may be used to identify additional regional projects. Identified projects may then be advanced through conceptual design to determine the details necessary for estimating project performance and benefit. Future updates to the RAA may evaluate the stormwater capture provided by these additional projects. Regional projects tend to be more cost-effective than green street and LID

projects in terms of runoff volume managed due to economies of scale. Future regional projects would offset the number of green street and LID retrofit projects needed to meet pollutant reduction goals.

## 6.5 GREEN STREET PROJECTS

In addition to early implementation green street projects, discussed in Section 6.2, the County will continue to explore opportunities for implementation of green infrastructure in the right-of-way. A significant portion of the County's impervious area exists in the right-of-way and coupling GI with streetscape improvements is an effective way to increase treatment of stormwater runoff across the County.

Green street opportunities will be prioritized in areas where existing, regulated, and regional projects are not sufficient to meet GI implementation goals of the County. The results of the prioritization coupled with the results of the RAA (Appendix A) form the basis of the green street portion of the County's strategy. The prioritization identifies the highest-ranking sites considering feasibility and potential performance, while the RAA determines volume capture needs by subwatershed. The strategy can be refined as funding and grant opportunities are assessed and ongoing coordination with various County departments occurs.

## 6.6 LID RETROFITS AND OTHER GI

Based on the RAA results, the County's storage capacity needs can be almost entirely met through a combination of C.3 projects on private development, the identified regional projects, and green streets. Minimal storage capacity (0.1 acre-feet) is specified in the RAA results as being met through "other GI projects," including LID retrofits on public parcels and additional regional projects yet to be identified.

While the RAA sets goals for where and which types of GI projects should be implemented, further engineering analysis (e.g., feasibility studies, site evaluations) may result in implementation of project types different from those specified by the RAA. For example, future analysis may determine that certain LID projects on public parcels may be more favorable than green streets in the lower priority category. LID retrofits on public parcels may offset the volume from green streets specified by the RAA. Regional projects may also offset the need for green streets and other GI projects determined by the RAA. Regional projects tend to be more cost effective than green streets due to scale. Because opportunities for more cost-effective projects may not be identified until a later time, the GI strategy will be subject to adaptive management.

The County will continue to evaluate other project opportunities that may improve the cost-effectiveness of the strategy and ensure goals are met. The list of potential regional and LID retrofit projects from the prioritization may facilitate identification of other GI projects.

## 6.7 IMPERVIOUS AREA TARGETS

To help estimate the pollutant load reductions that can achieved by GI during the 2020, 2030, and 2040 timeframes, the MRP requires that Permittees include in their GI Plans estimated targets for the amounts of impervious surface to be "retrofitted" (i.e. redeveloped with GI facilities to treat runoff from impervious surfaces) as part of public and private projects during the same timeframes.

Impervious area treated by GI may be used in addition to storage capacity as a metric to gauge progress towards implementation for achieving goals set in the GI Plan. For existing projects, the total impervious area treated (i.e., the impervious area draining to stormwater treatment measures constructed at each project) was estimated based on information that is tracked for annual reporting purposes (project area and land use classification), and associated imperviousness land use assumptions. The impervious area treated that will be associated with future new and redevelopment projects was estimated using regional development projections developed by C/CAG, discussed in Section 6.3.3. For the remaining three GI project types, impervious area treated was estimated based on the RAA results, using imperviousness land use assumptions and estimates of the amount of each land use that contributes to each project type.

Table 6-1 presents the GI implementation goals based on the metrics of storage capacity (in acre feet) and impervious area treated (in acres) that will be achieved through the County's GI strategy across the milestones specified in the MRP. The 2020 implementation goal represents the amount of GI the County is currently on-track to implement by 2020 based on existing data. The 2030 and 2040 goals represent the additional amount of GI implementation that will be required to achieve the County's water quality goals by 2040. The mix of project types is preliminary and is subject to change based on project feasibility, funding availability, and other factors.

*Table 6-1. GI Plan implementation metrics and goals*

| GI Implementation Metrics | GI Project Type | Implementation Goals by Year | | |
|---|---|---|---|---|
| | | 2020 | 2030 | Final 2040 |
| Project Storage Capacity (acre-ft) | Existing Projects[a] | 6.7 | 6.7 | 6.7 |
| | Future New & Redevelopment[b] | 3.5 | 7.7 | 10.0 |
| | Regional Projects[c] | -- | 2.0 | 16.0 |
| | Green Streets[d] | -- | 4.2 | 8.8 |
| | LID and Other GI Projects (TBD)[e] | -- | 0.0 | 0.1 |
| | **Total** | **10.3** | **20.7** | **41.7** |
| Impervious Area Treated (acres) | Existing Projects[a] | 28.1 | 28.1 | 28.1 |
| | Future New & Redevelopment[b] | 12.2 | 34.3 | 42 |
| | Regional Projects[c] | -- | 48.1 | 134.7 |
| | Green Streets[d] | -- | 17.7 | 37 |
| | Other GI Projects (TBD)[e] | -- | 0.1 | 0.4 |
| | **Total** | **40.3** | **128.3** | **242.2** |

[a]Existing Projects = stormwater treatment and GI projects that have been constructed between 2005 and 2018 and expected to be constructed by 2020.
[b]Future New & Redevelopment = the amount of future private development based on C/CAG development projections.
[c]Regional Projects = project opportunities identified in the County's Stormwater Resource Plan to provide regional capture and infiltration/treatment of stormwater;
[d]Green Streets = prioritized opportunities to retrofit existing streets with GI in public rights-of-way.
[e]Other GI Projects = other types of GI projects on publicly owned parcels.

The process of advancing project opportunities from the GI strategy through implementation is described in Chapter 7. GI projects will undergo feasibility analysis, site investigations, and funding evaluations before moving to the next phase of implementation. As the GI Plan is implemented, the strategy presented in this chapter can be refined using adaptive management to incorporate new information and coordinate with ongoing municipal planning, such as capital improvement planning and master planning.

# 7 IMPLEMENTATION PLAN

## 7.1 WORK PLAN FOR PRIORITIZED PROJECTS

The Workplan for Prioritized Projects defines the process for implementing the prioritized regional, green streets, and LID retrofit capital projects identified to meet County water quality goals. This includes describing the steps and schedule to move near-term projects into the design phase, as well as establishing the procedures for integrating prioritized projects into the County's capital planning framework. The process is a collaborative effort between several County departments and—pending the scope of the GI project—may involve coordination with other city, regional, or state agencies as well.

An overview of the GI project development stages is shown in Figure 7.1.

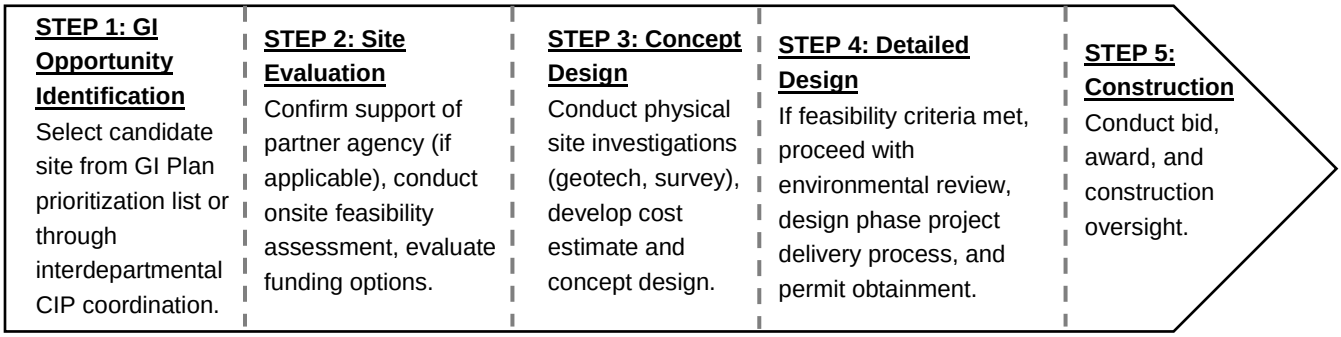



*Figure 7.1. Overview of project development stages.*

The Workplan defines the process for Steps 1 – 3, from GI opportunity identification through concept design. After Step 3, the concept enters the County's standard capital project delivery process. A critical aspect of deciding whether a project should move to Step 4 is early evaluation of technical feasibility and stakeholder acceptance. For this purpose, at the end of Step 2 and Step 3 of the process, data for the GI candidate project is updated and evaluated against defined GI feasibility criteria. The criteria are used to evaluate the project's ability to meet sizing and performance requirements given the updated information about local site constraints. Similarly, during Step 3 of the process, outreach is conducted to assess local stakeholder preferences. In order to recommend moving to Step 4, the concept design should address critical feedback from the outreach process to increase the likelihood of stakeholder support. The evaluation criteria are summarized below.

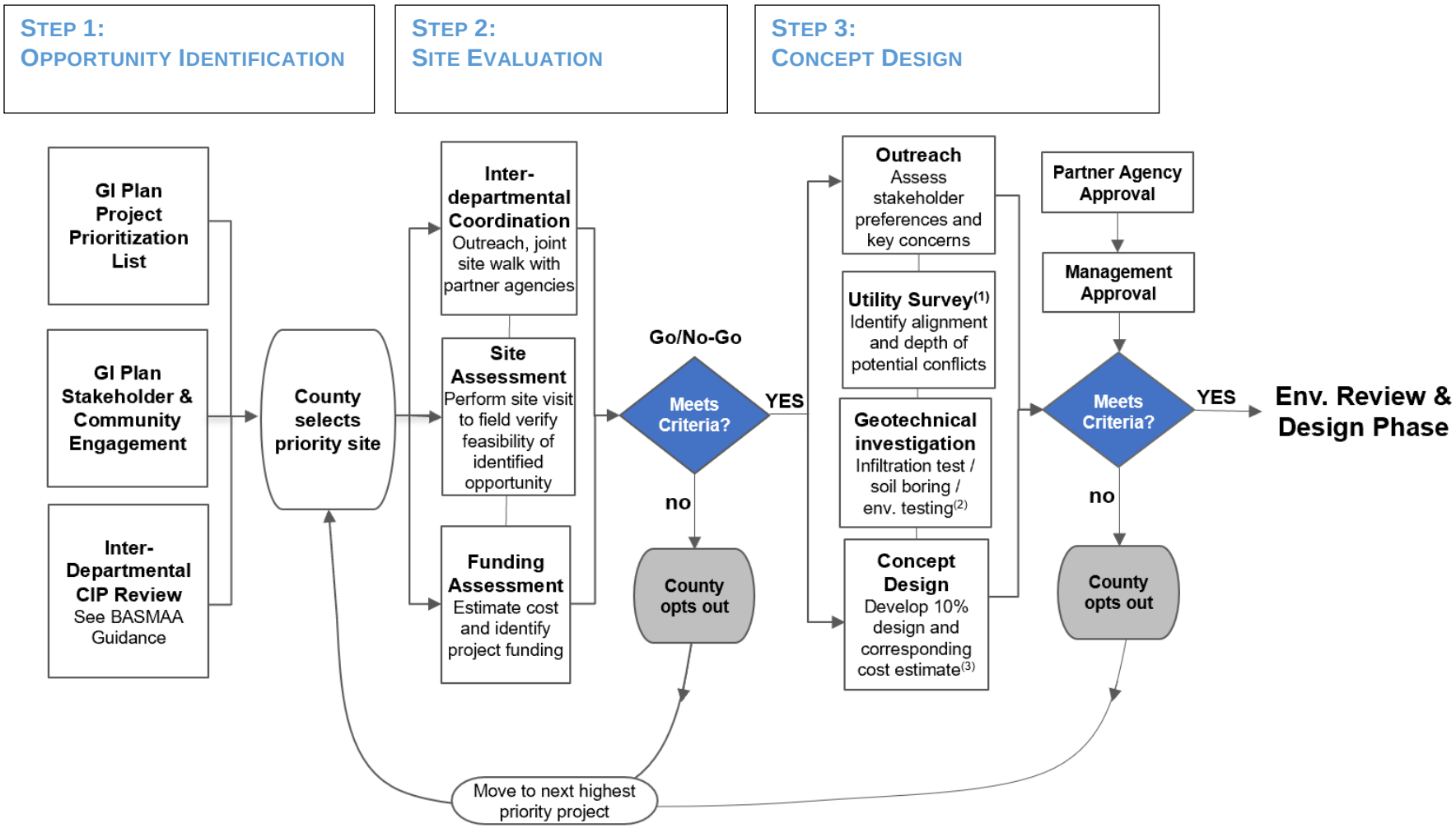
**Update Project Information During Step 2 and 3 and Evaluate Against GI Feasibility Criteria:**

- Meets minimum impervious drainage area thresholds (i.e., ≥ 1 acre for co-located project, ≥ 2 acres for GI-only capital project)[15]

15 Due to fixed costs associated with delivering capital projects, GI projects must be of minimum scale to achieve reasonable cost-effectiveness. The minimum drainage area thresholds are based on precedents set by other Bay Area GI programs (e.g., SFPUC Collection System Plan 2018).

- Meets minimum GI sizing ratios
- Meets infiltration feasibility criteria (or rainwater capture and use feasibility for regional projects)
- Addresses key feedback from outreach process and has community support

These criteria provide the County with guidelines to implement higher performing GI capital projects. However, if a project fails to meet one of the criterion above, the County may still elect to proceed due to the project's overall benefits. Figure 7.2 depicts the overall flow chart for Steps 1 – 3, including where these criteria are applied as part of deciding when to progress the GI opportunity to the next step versus when to opt-out and select the next opportunity on the prioritization list.




1) If utilities are not expected to be a conflict, then only site survey is required.
2) Environmental testing if soil contamination is possible.
3) Consider structural testing if roof BMPs, such as green roofs, are central to the project.

*Figure 7.2. Workplan for Prioritized Projects.*

### 7.1.1 Regional Projects

***Step 1: Opportunity Identification***

As summarized in Chapter 6 - GI Strategy, the County developed a prioritization list of regional project opportunities. Although the regional project prioritization list will continue to be refined throughout the life of the GI Plan, three of the more promising opportunities are currently part of the proposed GI strategy for the County. One of these three—Orange Memorial Park Regional GI Project—received a grant from Caltrans and is currently in the detailed design phase. To further evaluate the feasibility and potential design of the other two opportunities, the County and its project partners applied for and were selected to receive a grant from the EPA under the San Francisco Bay Water Quality Improvement Fund (SFBWQIF). The grant was awarded in the summer of 2019 and will enable the County and its partners to proceed with the evaluation of these opportunities. Although the two projects are located in other cities—one in San Bruno and one in Redwood City—they include 220 and 467 acres of County drainage area, respectively. The site location and potential drainage area of the regional project opportunity located in San Bruno is shown in Figure 7.3.

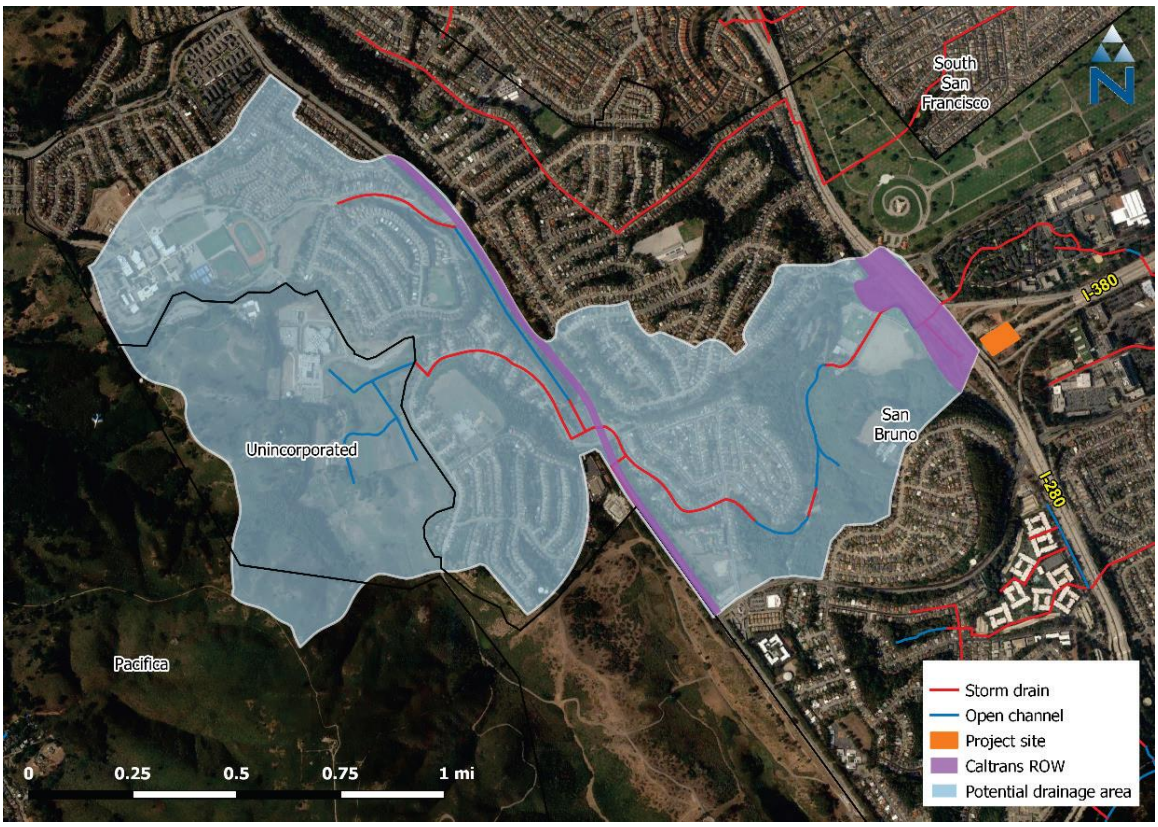



*Figure 7.3. Identified Regional Project opportunity*

In addition to utilizing the results of the GI Plan, the County will continue to engage with potential regional project collaboration partners to identify new opportunities. Example potential partners include C/CAG and member agencies, Caltrans, the Flood Resilience Program, and the new Flood and Sea Level Rise Resiliency District. Similarly, projects proposed by others as part of regional water management plans, such as the San Francisco Bay IRWMP, may provide collaboration potential.

The identified opportunities must undergo more feasibility assessment and interdepartmental coordination in Step 2 before they are considered viable sites. Thus, community engagement within Step 1 is focused on higher-level educational outreach and solicitation of GI preferences and concerns from communities throughout the County, particularly from low-income residents and communities of color at greatest risk of displacement. The County has already begun this outreach process, including giving four public presentations on the GI Plan in 2019 and providing recommendations on an equitable and inclusive green streets engagement strategy as part of the countywide Sustainable Streets Master Plan. As opportunities move through Step 2 and become more viable candidate sites, the type of outreach conducted evolves to be more location-based, soliciting feedback from the communities that would be impacted by a proposed concept. This level of community engagement is discussed in Step 3.

***Step 2: Site Evaluation***

Step 2 evaluates which GI technologies could be integrated at the candidate site and conducts stage one feasibility assessment to select preferred technologies and develop the site layout that moves forward to concept design. The workplan for Step 2 includes:

**Step 2a: Interagency Coordination** – The area draining to regional project sites often extends across multiple jurisdictions. Thus, after the County selects a prioritized regional opportunity to move forward, the next step is to reach out to related agency stakeholders and potential collaboration partners to discuss the opportunity. Based on the results of the regional project prioritization, some example relevant interagency stakeholders include: SMCWPPP, Caltrans, and San Mateo County Office of Education. In addition to interagency coordination, interdepartmental coordination should also be conducted at this phase. To have enough space for implementation, regional projects are often located in parks or open spaces and may involve coordination with the Office of Sustainability, Parks Department, Public Works, Planning and Building, Project Development Unit, and others before proceeding with development of a concept. Figure 7.4 provides a summary of potential project collaboration stakeholders.

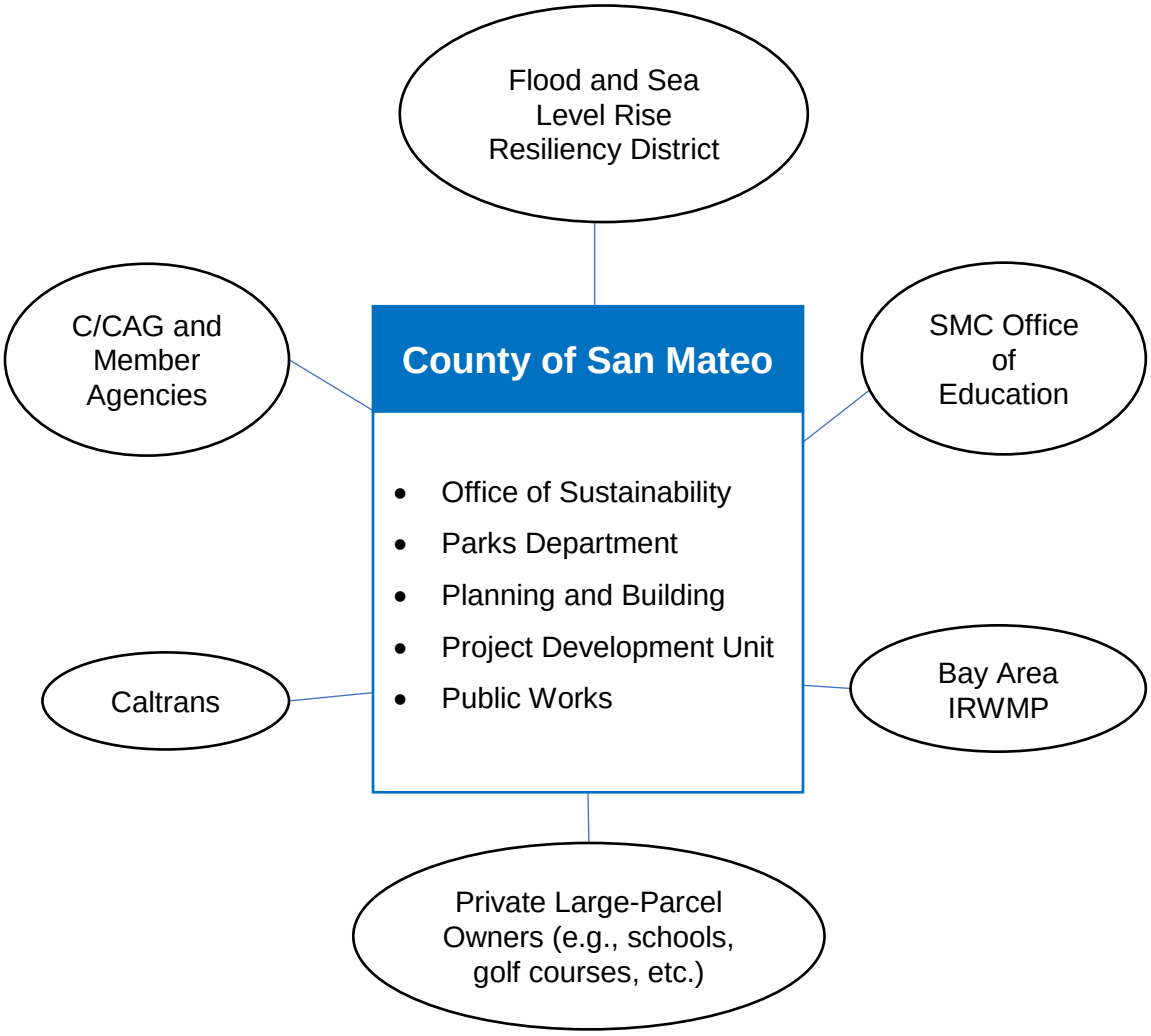



*Figure 7.4. Example of potential GI project collaboration stakeholders*

**Step 2b: Funding Potential** – Critical to the feasibility of the identified opportunity is the assessment of project costs and funding sources. Due to the scale of regional projects, grants or contributing funds from other agencies may be needed to enable design and implementation. For example, a grant award from Caltrans enabled the Orange Memorial Park regional project opportunity to move forward to design and feasibility evaluation. If the opportunity is proposed as a co-located project with another planned project, the GI design and implementation schedule should be developed in this step to assess feasibility of project integration. During this step, note any co-located project schedule constraints that would preclude including time to integrate GI into the design and construction. Also note any constraints on project schedule that would complicate aligning a separate funding stream for the GI elements. Section 7.2 provides a more detailed description of the GI funding options that should be evaluated as part of this process.

**Step 2c: Site Assessment** – During Step 1 Opportunities Identification, sites were prioritized primarily based on desktop analysis using best available spatial data. Within the Site Evaluation, this data should be updated and the site reassessed based on the following steps:

1. Information Collection – Compile as-built and private utility data to update the utility conflict assessment. Identify the most feasible location for a storm drain diversion to the proposed regional project site and identify the most feasible overflow or flow-through treatment discharge location. Confirm the drainage area to proposed storm drain tie-in and develop a site map for the field visit.
2. Site Visit Coordination – Coordinate a site walk with partnering agencies and County departments to review proposed GI locations, discuss potential concerns, and field-verify site constraints.
3. GI Integration Analysis – While on the site walk, field verify the location of storm drain connections, area drains, and drainage pathways. Identify the most feasible GI locations within the site and confirm the drainage area based on the proposed storm drain connection. Discuss key design parameters with agency stakeholders, such as: sources and quantity of dry-weather flows, site potable water irrigation demand, existing site drainage issues, local stakeholder preferences based on past projects, and planned site projects or masterplans.
4. Constraints Analysis – While on the site walk, update the site space constraints data based on visual assessment of utilities and mature trees. Discuss key design constraints with agency stakeholders, such as the predominant current site use and potential loss of use due to the regional project (e.g., types of sports played, frequency of use, parking demand, etc.). Assess the ability to access proposed GI locations for construction and maintenance. Consider key setback criteria when assessing constraints, such as vertical separation from high groundwater and horizontal separation from utilities, water supply wells, trees, hydrants, foundations, and steep slopes.

As part of the GI Plan, the County developed a GI site assessment guide and field forms to assist in completing these steps (see examples in Figure 7.5). After updating site information, the opportunity should be compared against the criteria below. If the site still has GI potential, then the opportunity proceeds to Step 3 – Concept Design.

**GI Feasibility Criteria:**

- Meets minimum drainage area thresholds
- Meets minimum GI sizing requirements
- Meets infiltration feasibility criteria (or rainwater capture and use feasibility)
- Schedule development indicates that GI elements could be completed in time to meet any constraints associated with proposed co-located projects (if applicable) and in time to meet any required funding deadlines.

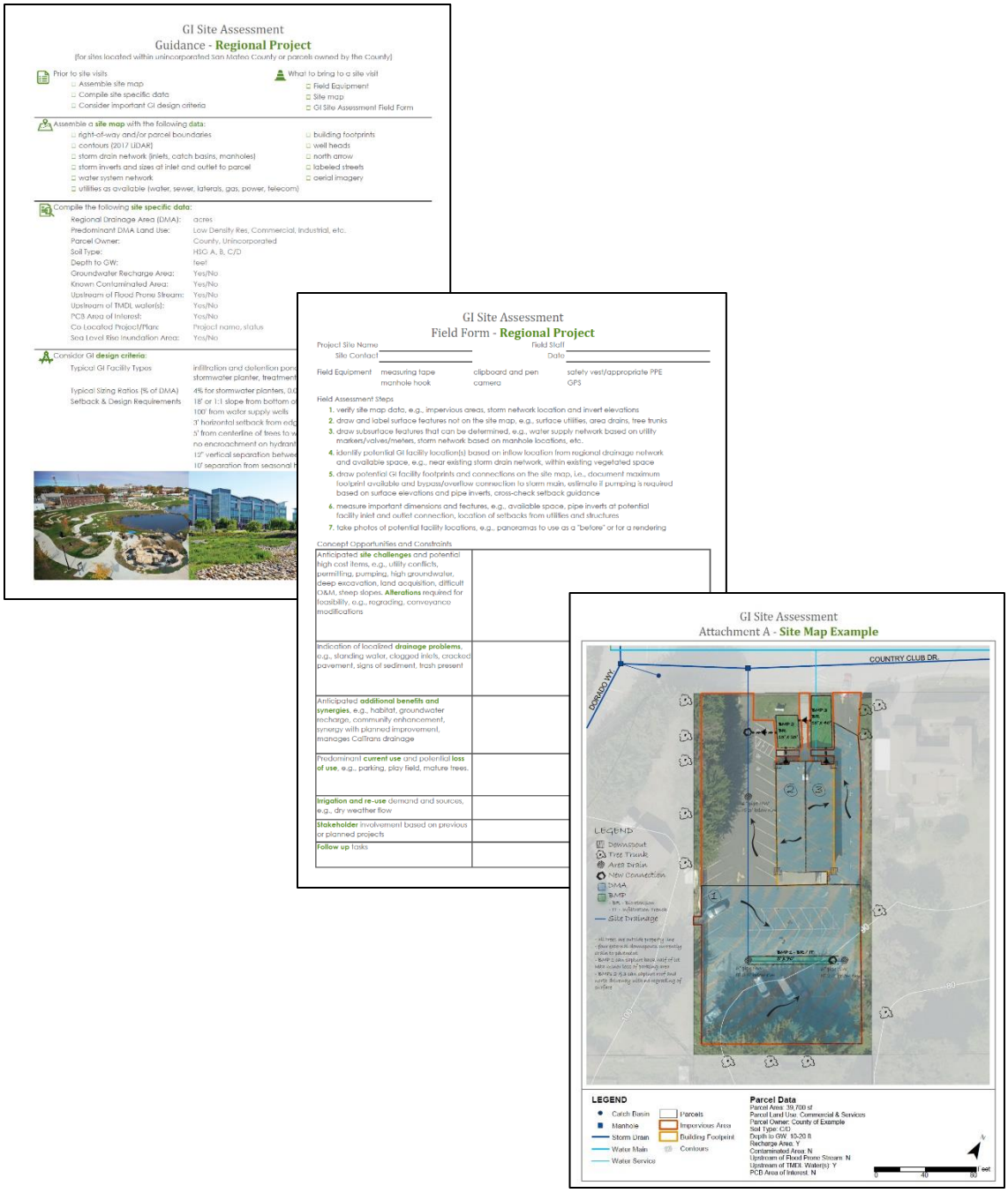



*Figure 7.5. GI Site Assessment Guide, Field Form, and Site Mark-Up Example*

***Step 3: Concept Design***

In addition to developing the concept design, Step 3 involves direct expenditures for site investigations, such as site surveys, potholing, and geotechnical investigations. The objectives of this step are to further refine site data (e.g., utility constraints and infiltration assumptions) and public preference information in order to develop a well-informed concept. Conducting these investigations during this early step enables the County to opt-out of sites with identified fatal flaws or poor cost-benefit in favor of moving to the next prioritized GI opportunity.

**Step 3a: Public Outreach** – To inform concept development, outreach should be conducted to assess local stakeholder preferences and concerns. Educational-based outreach regarding GI types and benefits can be presented, along with general information about identified opportunities for GI integration compiled from Step 2. Outreach should attempt to assess local preferences related to GI technology types (below-ground vs. above-ground improvements, vegetated vs. low maintenance). Outreach should also gauge priority of site uses (e.g., playing field usage, parking demands) and perceived importance of stormwater issues relative to other community needs.

Outreach should consider adopting empowering mechanisms to engage the community, particularly low-income residents and communities of color at greatest risk of displacement, to build leadership and create public ownership of issues and projects. Examples of these mechanisms include:

- Creating a committee of community and technical experts that can make priority site recommendations to the County;
- Requesting letters of support from community-based organizations in low-income neighborhoods and communities of color demonstrating broad community support. This effort can leverage the County's existing partnerships with these organizations;
- Adopting linguistically accessible and culturally relevant outreach processes described in the County Health Policy and Planning's "Recommended Best Practices for Community Engagement."

**Step 3b: Soils/Geotech Investigation** – Conduct geotechnical investigations to confirm soil types and infiltration rates. The type and quantity of investigations will vary based on project scale and type (e.g., borings, infiltration tests, and environmental soils testing). Initiate USA North 811 ticket process to mark utility locations if there is any excavation/boring/potholing required for the investigations.

**Step 3c: Surveys** – Conduct a site survey to enable concept design development. Include an underground utility survey if the site is in the right-of-way or shows potential for utility conflicts based on existing conditions data or based on the site inspection conducted in previous step. Request private utility data if not yet acquired.

**Step 3d: Concept Development** – Develop a 10% concept design showing existing and proposed conditions and an associated construction cost estimate. An example of information included in the concept plans is listed in Table 7-1.

*Table 7-1. Example concept design information*

| Existing Conditions | Proposed Site Plan |
|---|---|
| • Impervious areas (e.g., roof, pavement, driveway)<br>• On-site stormwater infrastructure (drains, downspouts, inlets, etc.), pipe and structure locations<br>• Flow direction arrows for sheet/surface flow and pipe flow<br>• Existing connections to the storm sewer<br>• Utilities (e.g., water, sewer, gas, electric)<br>• Trees (drip line and trunk diameter)<br>• Existing contours<br>• Road labels<br>• Labels of existing uses (playground, parking, etc.)<br>• North arrow and scale<br>• Property and easement boundaries | • Project boundary<br>• Stormwater management practices (BMPs): footprint of each, corresponding drainage areas, and drainage components (e.g., underdrain, outlet control structures)<br>• Proposed connections to existing conveyance systems or storm drains<br>• Proposed site drainage features (new drains, downspouts, etc.)<br>• Flow direction arrows for sheet flow and pipe flow<br>• Changes to land cover, including impervious surfaces<br>• Areas that require regrading or grading contours<br>• Labels of proposed uses (playground, parking, etc.)<br>• BMP Performance Summary Table<br>  ○ BMP ID Number<br>  ○ Facility type and sizing information<br>  ○ Size of each drainage area |

Although the degree of concept design development may vary depending on the identified opportunity and available funding, a 10% design set for a GI project should consider the following:

- Plan Sheets: Existing Conditions and Demo, Site Layout, Facility Layout, Grading and Stormwater, Civil Details, Landscape Planting, Landscape Details;
- An evaluation of ADA, Fire, and other permit needs;
- A constructability evaluation based on maintenance and construction access (e.g., County moratorium constraints, site access constraints, etc.);
- Construction cost estimate and schedule; and
- CEQA checklist.

After developing a concept that is informed by the data gathered in Steps 3a through 3c, the resulting concept should be compared against the criteria below. If the site still has GI potential, proceed to the design phase.

**GI Feasibility Criteria:**

- Meets minimum drainage area thresholds;
- Meets minimum GI sizing requirements;
- Meets infiltration feasibility criteria (or rainwater capture and use feasibility);

- Schedule development indicates that GI elements could be completed in time to meet any constraints associated with proposed co-located projects (if applicable) and in time to meet any required funding deadlines; and
- No critical flaws identified through public outreach process.

### 7.1.2 Green Streets and LID Retrofits

***Step 1: Opportunity Identification***

As described in Chapter 6 - GI Strategy, the prioritization results and capture requirements from the RAA establish the target quantity of high, medium, and low-priority green streets per subwatershed. The results also establish the remaining quantity of LID Retrofits (or "Other GI") needed to achieve capture goals. This forms the basis of the identified green street and LID retrofit GI opportunities.

In addition, the County will continue to identify GI opportunities through ongoing CIP and interagency coordination, as well as through frontage improvement opportunities as part of private redevelopments. Through this process of reviewing plans and programs for potential synergies with GI objectives, the County has already identified several near-term projects to be evaluated for GI integration (see project list in Chapter 5). The County may identify additional opportunities through coordination with C/CAG's Sustainable Streets Master Plan (SSMP), which is currently in development. As noted in 7.1.1, this process should also incorporate community engagement to make stakeholders aware of the search for and prioritization of opportunities and to get feedback on their GI preferences and concerns. This is particularly important for vulnerable communities, who may benefit most from improvements, but are also susceptible to unintended displacement consequences if proposed improvements are not properly vetted through thoughtful and inclusive engagement.

The next steps for evaluating identified opportunities is outlined in the following sections. These steps are consistent with but further build upon the BASMAA Guidance for Identifying GI Potential in Municipal CIP Projects[16] to provide a descriptive workflow for moving projects from opportunities identification into the design phase.

***Step 2: Site Evaluation***

Step 2 evaluates which GI technologies could be integrated at the candidate site and conducts stage one feasibility assessment to select preferred technologies and develop the site layout that moves forward to concept design. The workplan for Step 2 includes:

**Step 2a: Interagency Coordination** – The first step after selecting a prioritized opportunity for further evaluation is to conduct interagency or interdepartmental coordination. Green street implementation typically requires collaboration between multiple County departments—such as Public Works and the Office of Sustainability. Similarly, LID Retrofits on parcels typically require the County's stormwater staff to collaborate with Planning and Building, Project Development Unit, and/or Parks Department. Coordination with stakeholder agencies should be conducted prior to proceeding with development of a concept.

**Step 2b: Funding Potential** – Critical to the feasibility of the identified opportunity is the assessment of project costs and funding source. Part of the role of the countywide SSMP is to identify potential implementation mechanisms and funding sources for prioritized green streets. This

[16] BASMAA Development Committee. 2016. Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Program Projects. May 6, 2016.

could include Safe Route to Schools projects, bike/pedestrian plans, transportation plans, etc. It may also include proposed policies or negotiated agreements with redevelopments, such as required frontage improvements at select developments. Several of the high-priority green street and LID Retrofit sites identified in the County's GI Plan overlap with already planned capital improvement projects. For these projects, in addition to developing a preliminary cost estimate of the GI opportunity, the GI design and implementation schedule should be developed to assess feasibility of project integration. During this step, any co-located project schedule constraints that would preclude including time to integrate GI into the design and construction should be noted. Similarly, any constraints on project schedule that would complicate aligning a separate funding stream for the GI elements should also be noted. Section 7.2 provides a description of the GI funding options that should be evaluated as part of this process.

**Step 2c: Site Assessment** – During Step 1 Opportunities Identification, sites were prioritized primarily based on desktop analysis using best available spatial data. Within the Site Evaluation, this data should be updated and the site reassessed based on the following steps:

1. Information Collection – Compile as-built and private utility data to update the utility conflict assessment. Delineate the drainage area based on best available data and develop a site map for the field visit.
2. Site Visit Coordination – Coordinate a site walk with partnering agencies and County departments to review proposed GI locations, discuss potential concerns, and field-verify site constraints.
3. GI Integration Analysis – While on the site walk, field verify the location of catch basins, area drains, downspouts, and drainage pathways. Identify the most feasible GI locations within the site and confirm the drainage area, including run-on to the street from adjacent parcels. Draw facility footprints and piped connections on the site map (i.e., document maximum footprint available and overflow/underdrain connections to storm drains). Discuss key design parameters with agency stakeholders, such as: available soils data, site ownership and easements, existing site drainage issues, local stakeholder preferences based on past projects, and planned site projects or masterplans.
4. Constraints Analysis – While on the site walk, update the site space constraints data based on visual assessment of utilities and mature trees. Discuss key design constraints with agency stakeholders, such as the predominant current site use and potential loss of use due to the regional project (e.g., types of sports played, frequency of use, parking demand, etc.). Assess the ability to access proposed GI locations for construction and maintenance. Consider key setback criteria when assessing constraints, such as vertical separation from high groundwater and horizontal separation from utilities, water supply wells, trees, hydrants, foundations, and steep slopes.

As noted earlier, the County developed GI site assessment guides and field forms to assist in completing these steps (see examples in Figure 7.5). After updating site information, the opportunity is compared against the criteria below. If the site still has GI potential, then the opportunity proceeds to Step 3 – Concept Design.

**GI Feasibility Criteria**:

- Meets minimum drainage area thresholds;
- Meets minimum GI sizing requirements;

- Meets infiltration feasibility criteria (or rainwater harvesting and use feasibility); and
- Schedule development indicates that GI elements could be completed in time to meet any constraints associated with proposed co-located projects (if applicable) and in time to meet any required funding deadlines.

***Step 3: Concept Design***

In addition to developing the concept design, Step 3 involves direct expenditures for site investigations, such as site surveys, potholing, and geotechnical investigations. The objectives of this step are to further refine site data (e.g., utility constraints and infiltration assumptions) and public preference information in order to develop a well-informed concept. Understanding utility constraints is especially critical for right-of-way projects like green streets. Conducting these investigations during this early step enables the County to opt-out of sites with identified fatal flaws or poor cost-benefit in favor of moving to the next prioritized GI opportunity.

**Step 3a: Public Outreach** – To inform concept development, outreach should be conducted to assess local stakeholder preferences and concerns. Educational-based outreach regarding GI types and benefits can be presented, along with general information about identified opportunities for GI integration compiled from Step 2. Outreach should attempt to assess local preferences related to GI technology types (below-ground vs. above-ground improvements, vegetated vs. low maintenance). Outreach should also gauge priority of site uses (e.g., sidewalk width, community spaces, parking demands) and perceived importance of stormwater issues relative to other community needs.

As noted in Step 3 for regional projects, outreach should consider adopting empowering mechanisms to engage the community, particularly low-income residents and communities of color at greatest risk of displacement, to build leadership and create public ownership of issues and projects. See regional projects Step 3 for examples of these mechanisms.

**Step 3b: Soils/Geotech Investigation** – Conduct subsurface investigations to confirm soil types and infiltration rates. The type and quantity of investigations will vary based on project scale and type (e.g., borings, infiltration tests, and environmental soils testing). Initiate USA North 811 ticket process to mark utility locations if there is any excavation/boring/potholing required for the investigations.

**Step 3c: Surveys** – Conduct a site survey to enable concept design development. Include an underground utility survey if the site is in the right-of-way or shows potential for utility conflicts based on existing conditions data or based on the site inspection conducted in previous step. Request private utility data if not yet acquired.

**Step 3d: Concept Development** – Develop a 10% concept design showing existing and proposed conditions and an associated construction cost estimate. An example of information included in the concept plans was listed earlier in Table 7-1.

## 7.2 IMPLEMENTATION MECHANISMS

### 7.2.1 Legal Mechanisms

Provision C.3.j.i.(3) of the MRP requires permittees to "Adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of the Green Infrastructure Plan in accordance with the requirements of this provision."

As described in Section 1.1.2, the County and other municipalities subject to Provision C.3 of the MRP must require post-construction stormwater control measures on regulated development projects. Post-construction stormwater controls reduce pollutants from flowing to streams, creeks, and the Bay and help address local flooding by reducing peak flows. Chapter 4.100 of the County's Municipal Code (Storm Water Management and Discharge Control) provides broad legal authority for the County to require regulated private development projects to implement best management practices to comply with MRP requirements.

GI projects are typically not regulated projects (although they must conform to the sizing and design requirements contained in Provision C.3, except under certain circumstances) and they are primarily public projects under control of the County. As part of the GI Plan process, the County reviewed its existing policies, ordinances, and other legal mechanisms related to the implementation of stormwater NPDES permit requirements and found that it has sufficient legal authority to implement the GI Plan. However, the County is planning to strengthen support for the GI Plan by adding a new "Watershed and Stormwater Management" element to its General Plan (as described in Section 2.4.1), which is currently under development. Adoption of the GI Plan by the County Board of Supervisors will further strengthen the Plan's support and authority.

As described in Section 2.2.1, the County is expanding upon its existing *Guidelines for Drainage Review* by updating its Municipal Code to create a new Stormwater and Drainage Control Ordinance section to codify the requirements for drainage and water quality review. The Stormwater and Drainage Control Ordinance (currently under development) establishes the requirements for new and redevelopment projects related to the design, construction, and post-construction operations and maintenance of project drainage and treatment systems. The County also intends to include language giving the County authority to require GI improvements in the public right-of-way along the street frontage of a private development on a case-by-case basis.

The new General Plan element and Stormwater and Drainage Control Ordinance are expected to be completed by December 2020.

### 7.2.2 Evaluation of Funding Options

Provision C.3.j.i.(2)(k) of the Municipal Regional Stormwater Permit (MRP) requires that the County's Green Infrastructure (GI) Plan include:

> *"An evaluation of prioritized project funding options, including, but not limited to: Alternative Compliance funds; grant monies, including transportation project grants from federal, State, and local agencies; existing Permittee resources; new tax or other levies; and other sources of funds."*

Consequently, the County has reviewed its current funding sources and is evaluating improvements that can be made to increase funding and leverage new development activities pursuant to the goals and objectives of the Plan.

To aid this effort, SMCWPPP has developed a report for permittees entitled *Green Infrastructure Funding Nexus Evaluation*[17] (referenced herein as the GI Funding Report) that provides guidance on funding types, challenges and strategies. That report was used as a resource for the County's evaluation of future funding sources.

Another resource is the BASMAA *Roadmap of Funding Solutions for Sustainable Streets*[18]. In 2017, BASMAA convened a Regional Roundtable on Sustainable Streets with meetings with local, regional, state, and federal agencies, private sector and non-profit partners to identify solutions for obstacles to funding projects that include both GI and transportation improvements. The final report of the Roundtable process was the Roadmap, which identified specific actions to improve the capacity – both statewide and in the San Francisco Bay Area -- to fund Sustainable Street projects that support compliance with regional permit requirements to reduce pollutant loading to San Francisco Bay, while also helping to achieve the region's greenhouse gas reduction targets. Appendix B of the Roadmap, Potential Sources of Funding for Sustainable Streets, presents a summary of grant and loan monies that may be used to fund projects that include both GI and transportation improvements.

The County will review these resources as part of developing a funding plan for prioritized projects as they are advanced to the County's capital improvements program.

***Current Funding Sources for GI Program Elements***

The County currently uses a mix of funding sources. The County's General Fund, development and permit fees, and grants are used for public street, parking lot, and building construction and maintenance and maintenance of other landscaped areas (e.g., parks, medians, public plazas, etc.) The County was selected to receive two one-time grants for a Capital Improvement Project and design and planning of a regional project.

The funding of the GI Plan can be considered a part of San Mateo County's overall stormwater management program; therefore, GI can be integrated with related County asset management programs. Implementing and maintaining the GI Plan, and constructed GI assets, can be aligned with the following costs related to MRP compliance and County stormwater and drainage infrastructure:

- Overall stormwater and GI program administration, reporting and planning;
- Public GI asset management - administration and planning;
- Public GI asset delivery - design, engineering, inspection and construction;
- Public GI asset maintenance - assessment, tracking, mapping, inspection, operations and maintenance (O&M), utility relocation, repair and replacement;
- Private GI (LID) program administration – design review, inspection, reporting, tracking and mapping;
- Public and private GI outreach, training, education and communication; and
- Other stormwater program components – e.g., municipal operations, illicit discharge detection and elimination, commercial and industrial controls, construction site controls, etc.

[17] SMCWPPP – January 2019

[18] BASMAA. 2018. Roadmap of Funding Solutions for Sustainable Streets. http://www.sfestuary.org/wp-content/uploads/2018/05/Roadmap_Funding_Solutions_Sustainable_Streets_FINAL_reduced.pdf

***Potential Future Funding Options***

It is likely that no single source of revenue will be adequate to fund implementation of GI, therefore a portfolio of funding sources will probably be needed. There are a variety of approaches available to help fund up-front and long-term asset delivery.

The County has reviewed the SMCWPPP GI Funding Report and determined that the following additional sources of funding could be considered in the future to increase revenues and implementation of GI:

- Balloted funding approaches (stormwater fees and property-related fees);
- Special financing districts;
- Alternative compliance (i.e., offsite mitigation, in-lieu fees, and credit trading);
- Grants; and
- Partnerships with other agencies, such as Caltrans, and public-private partnerships (P3).

The municipalities within San Mateo County are considering formation of a new countywide agency called the Flood and Sea Level Rise Resiliency District, described in Section 1.4.1, which could provide future funding for GI to the County and the other SMCWPPP Permittees.[19] One step in that process is establishing a nexus to support implementation of a stormwater infrastructure impact fee (stormwater fee). The new District may also facilitate Permittee partnerships on regional projects.

Each of the options being considered by the County as future funding options are discussed in more detail in Appendix D of this GI Plan.

### 7.2.3 Internal Agreements, Policies, and Procedures

The County has conducted a series of interdepartmental meetings, including representatives from Office of Sustainability, Public Works, Planning and Building, Parks, and Project Development Unit, to discuss current and future roles related to GI implementation. These roles include: identification of GI opportunities, design and construction of GI projects and GI components of capital projects; operation and maintenance (O&M); installation and O&M inspections; and tracking and reporting. Once these roles have been defined and agreed upon, County staff plan to document department roles and responsibilities via a memorandum of agreement, internal policy, standard operating procedure, and/or other appropriate mechanism(s). As the County gains more experience with GI implementation, periodic interdepartmental meetings will be held to review procedures and policies and make adjustments as needed.

## 7.3 PROJECT TRACKING SYSTEM

MRP Provision C.3.j states that the GI Plan "shall include means and methods to track the area within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area", and a "process for tracking and mapping completed projects, public and private, and making the information publicly available." This section describes the County's current tracking systems and the proposed project tracking system being developed by C/CAG for use by the County and other permittees within SMCWPPP.

[19] Flood and Sea Level Rise Resiliency District: https://resilientsanmateo.org/

### 7.3.1 Current County Tracking Systems (Regulated and GI)

The County maintains a database of GI projects and associated project activities. Once the status of a project is updated to reflect that GI has been installed, then that particular installation enters an inspection cycle. From that point on, all inspection records are uploaded to the database, and facilities are adaptively managed to meet the observed needs of each project. This comprehensive project data tracking system provides assurance that inspections and maintenance are being conducted in compliance with the MRP requirements.

### 7.3.2 Proposed C/CAG Project Tracking System

C/CAG is in the process of developing a Green Infrastructure Tracking Tool (GI Tracking Tool) to document planned and completed GI projects countywide pursuant to the MRP. The GI Tracking Tool will be used to document GI projects, quantify key metrics related to their performance, and compare those metrics to goals established by the MRP. While the GI Tracking Tool is not scheduled for completion until the end of Fiscal Year 2019-2020, the GI Plan outlines protocols for incorporating completed projects into the system once developed.

***Tracked Metrics***

The GI Tracking Tool will document projects and quantify performance metrics on a project and city/countywide basis. The most basic tracking mechanism incorporates the location and type of each project that has been uploaded into the GI Tool with respect to the following:

- The locations of projects will be shown on a dynamic map along with key base layers (watershed boundaries, waterbodies, jurisdictional boundaries, storm drains, etc.);
- The user may click on any project and view information including its type (LID on a parcel, green street, regional facility, etc.) and other desired fields set by C/CAG members; and
- The user may also query the GI Tool to find projects based on keywords (as opposed to clicking through the map).

The GI Tracking Tool will also include algorithms to quantify performance metrics and track progress toward key goals, including the following:

1. **Estimate of total area and impervious area treated with GI:** for each project, the user will provide information on capture area or the system will use ‘default’ values.
2. **Stormwater volumes managed during the annual average year:** the GI Tracking Tool will include algorithms that estimate stormwater runoff volumes managed with GI using methods that are consistent with the RAA/GI Plans. The stormwater volume metrics will also be useful to the SRP (which encourages tracking of stormwater volume capture) and for engaging third parties who are interested in broader water resources programs such as water supply.
3. **Progress toward implementation goals:** the GI Tracking Tool will include a user-editable database of compliance/implementation goals from the GI Plan (and/or other programs), and will visualize the progress toward those goals.

The GI Tracking Tool will be developed in a manner in which additional metrics could be added over time. For example, in future phases the tool could track metrics related to flood control such a peak flow reduction. The Tracking Tool could also quantify triple bottom line benefits that would highlight the multiple additional benefits provided to promote investment in projects, such as carbon sequestration, public health benefits, heat island reduction, and water supply augmentation.

***Tool Components***

The Tracking Tool will contain components to document GI projects across San Mateo County. The tool will be organized into several interfaces to support mapping, project details, and annual reporting. The components of the GI Tracking Tool are outlined in Figure 7.6 and further described below.

**Mapping**

A dynamic interactive map will be included as part of the Tracking Tool to support the visualization of planned and completed projects across the county. The mapping interface locates implemented projects and helps convey the scale of constructed efforts to-date. The map will be interactive and display pictures, renderings, project details, and key metrics on stormwater capture benefits. Base layers, such as administrative and planning boundaries, storm drains, creeks, and watersheds, will be overlaid to provide context with project locations.

**Dashboard/Visualization**

A dashboard of completed projects will be included to view dynamic charts displaying capture metrics and progress towards goals. Graphics will be interactive and intuitive, enabling users to gain supplemental details or more technical information by interacting with dynamic graphics. The user will also have the ability to query and edit project information.

**Project Pages**

In addition to the high-level visualization and analytics, the Tracking Tool will catalog project details as they are submitted to the system. Types of details that will be included are location, GI type, construction (or planned) date. In addition, the system will estimate key attributes (e.g., soils) using regional geospatial datasets when site-specific information is unavailable.

**Reporting**

The Tracking Tool also facilitates annual reporting of GI to meet MRP requirements. For example, the system allows for exporting project summaries into multiple formats (e.g., Word, PDF). These generated outputs include tables summarizing key project characteristics (such as location and drainage area) to supplement annual reports for regulatory agencies.

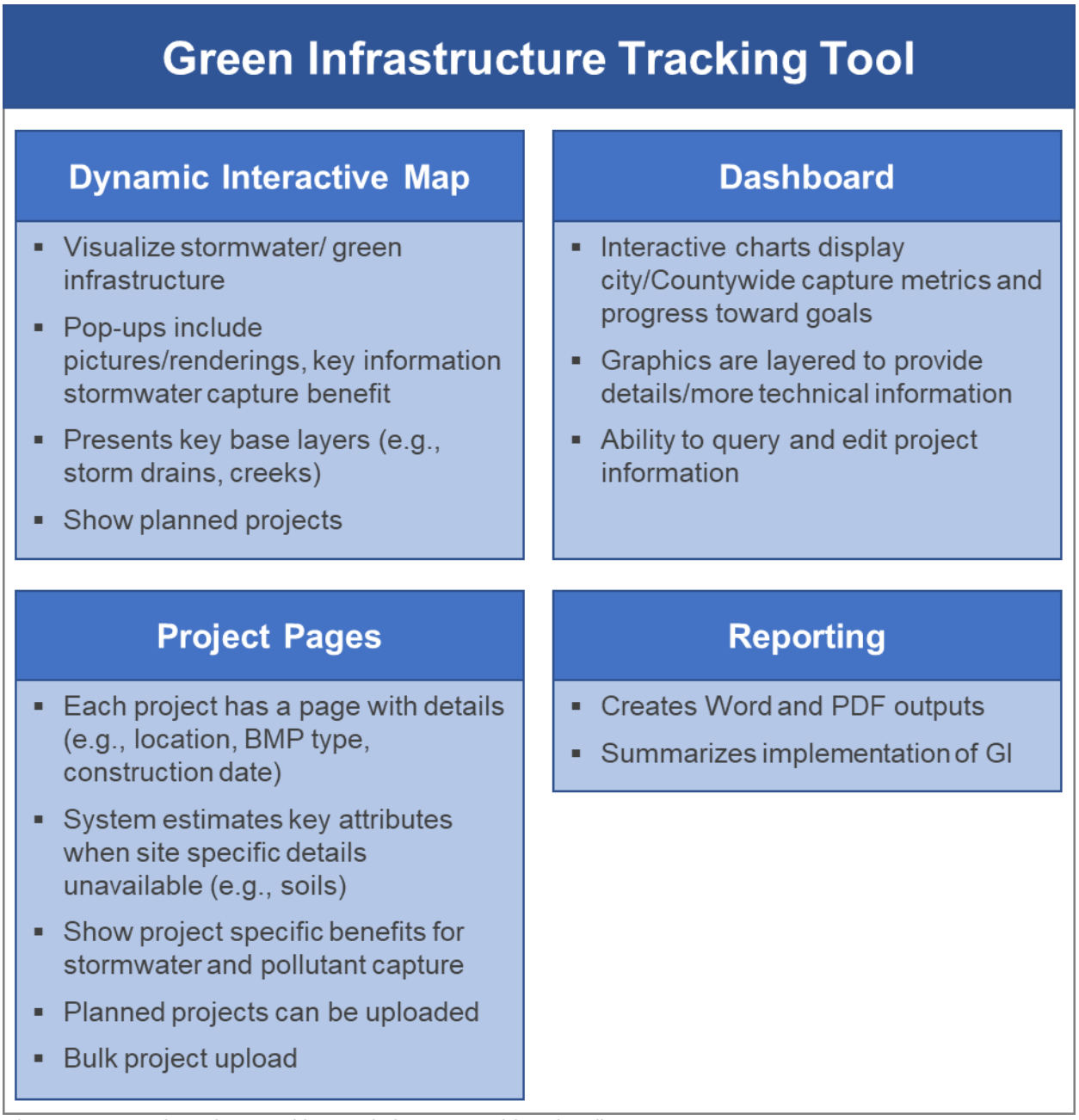



*Figure 7.6. Overview of GI Tracking Tool elements and functionality*

### 7.3.3 Proposed Process and Timeline for Tracking System Integration

The County's current process for annual reporting will be updated to integrate with the Tracking Tool once completed. Currently, project information is compiled annually to C/CAG which in turn packages the data for annual reporting to the San Francisco Bay Regional Water Quality Control Board. Current methods typically utilize desktop applications (e.g., Microsoft Excel) to display project details, calculate benefits, and transfer information between users. The Tracking Tool's web-based platform will streamline the County's annual reporting process while providing the following benefits:

- **System maintainability:** a web-based tool will be easier to maintain than existing desktop applications. Current project tracking utilizes Excel files for maintaining project information which is prone to multiple versions, unintended modifications, and accidental use of outdated or incorrect versions. The transition to a web-based tool will ensure users will only have access to the most recent version of the database.

- **Incremental data entry:** the web-based system will allow for projects to be entered incrementally throughout the year in lieu of large-scale annual uploads. This may ease the burden on County staff by reducing data compilation into manageable blocks. Additionally, planned projects may be entered into the system and updated throughout different phases of development (e.g., design, construction). An inventory of planned projects may help provide a better picture of implementation progress, increase awareness of near-term projects, and creates a placeholder for project details prior to completion.

- **Data consistency:** standardized data entry ensures that the same parameters are tracked for all completed projects. Furthermore, this promotes consistency in calculation outputs and streamlines annual reporting to the Water Board while minimizing errors. For example, missing or erroneous values (i.e., out of reasonable bounds) may be flagged prior to submission of project information to the database.

- **Bulk upload:** completed projects prior to the Tracking Tool's development may opt to upload projects in bulk using current reporting methods (e.g. Excel). This option accelerates an easy transition from existing processes to the new tracking mechanism.

The data and metrics tracked by the GI Tracking Tool will be based upon data provided by the C/CAG members, including the following:

- **Base GIS layers:** the base layers for the dynamic map will be compiled and hosted through the GI Tracking Tool. Layers to be compiled and incorporated into the map include watershed boundaries, jurisdictional boundaries, storm drains, soil types (to support infiltration estimates), rain gages (to support performance estimates), and aerial imagery and street maps (from ESRI). Users will be able to toggle these layers off and on.

- **Project data:** each C/CAG member agency will hold responsibility for uploading data for projects in its jurisdiction. Users will have both 'bulk upload' and manual (through browser) data upload options. The bulk upload Excel template will be similar to formats currently used for MS4 annual reporting. This Excel template will include required fields such as location, project type, and sizing information, along with optional fields set by C/CAG members. The GI Tracking Tool will also have an option to 'assume typical values' for pending field inputs that can be edited in the future once available.

The GI Tracking Tool is scheduled for completion at the end of Fiscal Year 2019/2020. At the time the tool is completed, existing projects will be uploaded to the system via bulk upload to transition to the new tracking system. The newly tracked metrics (i.e., impervious area treated, capture volumes) will be calculated for the existing projects. New projects may be entered into the system as they are completed.

# 8 REFERENCES

Almanac (The Almanac News). 2018. Menlo Park to consider West Menlo annexation proposal. Accessed January 7, 2019. <https://almanacnews.com/news/2018/02/21/menlo-park-to-consider-west-menlo-annexation-proposal>.

BASMAA (Bay Area Stormwater Management Agencies Association). 2018. Roadmap of Funding Solutions for Sustainable Streets. Prepared for the Urban Greening Bay Area Initiative. Final April 26, 2018.

Bay Area Regional Health Inequities Initiative (BARHII). n.d. Taking Action on Climate Change for Health. Guide 01 – Climate Change: What's Public Health Got to Do With It?

CalEPA (California Environmental Protection Agency). 2015. Creating and Mapping an Urban Heat Island Index for California. Agreement No. 13-001.

EOA, Inc. 2018. Draft Planning Document Review for the County of San Mateo GI Plan. Prepared for San Mateo County Office of Sustainability. December 17, 2018.

Fabry, Matthew. Program Coordinator, San Mateo Countywide Water Pollution Prevention Program (SMCWPPP). "RESPONSE REQUIRED: Request for Information for Stormwater Resource Plan and Grant Application." Message to C/CAG Stormwater Committee and NPDES Technical Advisory Committee representatives. February 29, 2016. E-mail.

Menlo Oaks Tree Advocacy. Menlo Park's Most Oak-Filled Neighborhood. Accessed January 7, 2009. <menlooaks-mota.org/Menlo-oaks/>.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2015. NPDES Phase I MS4 Municipal Regional Stormwater Permit (MRP) for San Francisco Bay Region. Order No. R2-2015-0049. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SMC (San Mateo County) Parks and Recreation Department. 2006. Decision-Making Guidelines for Vegetation Management. County of San Mateo Planning and Building Department, Redwood City, CA.

SMC (San Mateo County) Planning and Building Department. 2011. North Fair Oaks Community Plan. County of San Mateo Planning and Building Department, Redwood City, CA. Accessed January 7, 2019. < https://planning.smcgov.org/north-fair-oaks-community-plan>.

SMC (San Mateo County) Planning and Building Department. 2013. Local Coastal Program Policies. County of San Mateo Planning and Building Department, Redwood City, CA.

SMC (San Mateo County) Planning and Building Department. 2016. Briefing on the Comprehensive Transportation Management Plan ("Connect the Coastside"). County of San Mateo Planning and Building Department, Redwood City, CA. Accessed January 7, 2019. <https://planning.smcgov.org/sites/planning.smcgov.org/files/press-release/files/1.2%20PLN2014-00430_PCC20160525_SRT.pdf>.

SMC (San Mateo County) Planning and Building Department. 2018. The Protected Tree Ordinance of San Mateo County (*in development*). County of San Mateo Planning and Building Department, Redwood City, CA.

SMC (San Mateo County) Office of Sustainability. 2018. San Mateo Plain Groundwater Basin Assessment. County of San Mateo Office of Sustainability, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2016. C.3 Stormwater Technical Guidance (ver. 5.0). City/County Association of Governments, SMCWPPP, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2017. Stormwater Resource Plan for San Mateo County. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo County Water Pollution Prevention Program. February 2017.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2019. Green Infrastructure Funding Nexus Evaluation. Prepared by SCI Consulting Group and Larry Walker Associates for San Mateo County Water Pollution Prevention Program. January 2019.

U.S. Census Bureau. 2010. United States Census Bureau Population Estimates.

U.S. EPA. 2011. Evaluation of Urban Soils: Suitability for Green Infrastructure or Urban Agriculture. EPA 905-R-11-003. U.S. Environmental Protection Agency, Washington, D.C.

# 9 APPENDICES

**Appendix A: Reasonable Assurance Analysis**
**Appendix B: Project Concepts**
**Appendix C: County GI Design Resources**
**Appendix D: Supporting Information for Evaluation of Future Funding Options**

# APPENDIX A

## REASONABLE ASSURANCE ANALYSIS SUMMARY FOR COUNTY OF SAN MATEO

# Reasonable Assurance Analysis and Green Infrastructure Implementation Goals

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires the development of Green Infrastructure (GI) Plans (Provision C.3) and Polychlorinated Biphenyls (PCBs) and Mercury Control Measure Implementation Plans (Provisions C.11 and C.12) that provide the necessary pollutant load reductions to meet Total Maximum Daily Load (TMDL) wasteload allocations (WLAs) over specified compliance periods. A key component of these plans is a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of PCBs and mercury to meet WLAs for municipal stormwater discharges to the Bay. The City/County Association of Governments (C/CAG) of San Mateo County, via its San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), led a county-wide effort to develop an RAA to estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs, and set goals for the amount of GI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GI (SFBRWQCB 2015). Documentation of the county-wide RAA can be referenced in the separate documents:

- Phase I Baseline Modeling Report – Provides documentation of the development, calibration, and validation of the baseline hydrology and water quality model, and the determination of PCB and mercury load reductions to be addressed through GI implementation (SMCWPPP 2018).
- Phase II Green Infrastructure Modeling Report – Provides documentation of the application of models to determine the most cost-effective GI implementation for each municipality, setting stormwater improvement goals for the GI Plan (SMCWPPP 2019).

The following sections provide an overview of the purpose of the RAA, and a summary of RAA results for County of San Mateo to serve as stormwater improvement goals that set the stage for an adaptive management approach.

## 1 PURPOSE OF THE REASONABLE ASSURANCE ANALYSIS

In 2017, the U.S. Environmental Protection Agency (EPA) Region 9 released *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning* (EPA RAA Guide) (USEPA 2017), which provides guidance on the technical needs of the RAA and considerations for model selection. Building upon the EPA RAA Guide, the Bay Area Stormwater Management Agencies Association (BASMAA) prepared the *Bay Area Reasonable Assurance Analysis Guidance Document* (Bay Area RAA Guidance) (BASMAA 2017), which provides specific guidance on modeling to support RAAs performed in the Bay Area to meet MRP requirements, address TMDLs for PCBs and mercury, and support GI planning. The EPA RAA Guide and Bay Area RAA Guidance both outline essential steps for performing an RAA, as depicted in Figure 1-1.

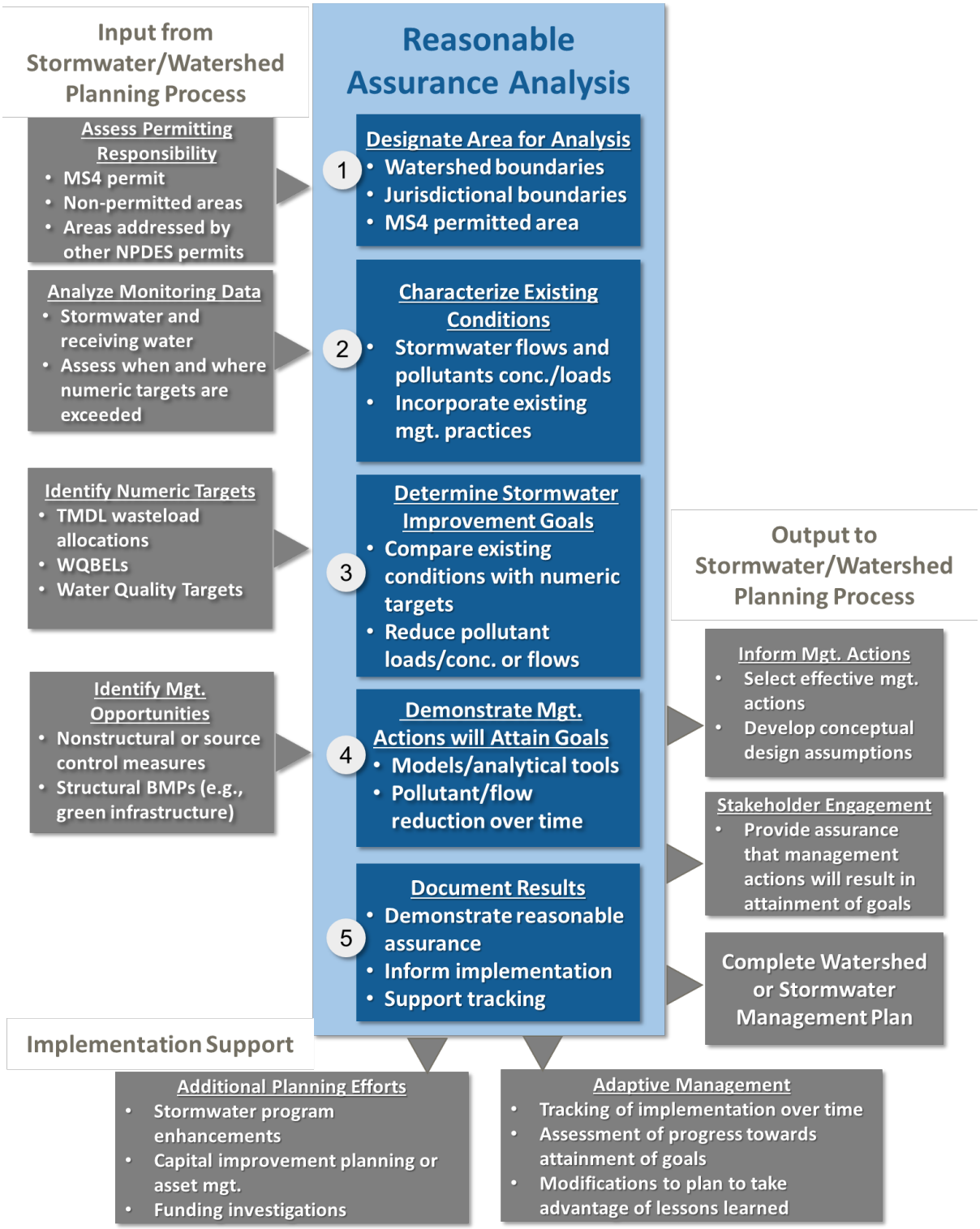



Figure 1-1. RAA Process Flow Chart (USEPA 2017).

Depending on the audience, the purpose of the RAA can vary in terms of what constitutes reasonable assurance. The EPA RAA Guide provides an example of three differing perspectives for defining reasonable assurance (USEPA 2017):

- **Regulator Perspective** - Reasonable assurance is a demonstration that the implementation of a GI Plan will result in sufficient pollutant reductions over time to address TMDL WLAs or other targets specified in the MRP.
- **Stakeholder Perspective** - Reasonable assurance is a demonstration that specific management practices are identified with sufficient detail, and implemented on a schedule to ensure that necessary improvements in water quality will occur.
- **Permittee Perspective** - Reasonable assurance is based on a detailed analysis of the TMDL WLAs and associated MRP targets themselves, and a determination of the feasibility of those requirements. The RAA may also assist in evaluating the financial resources needed to meet pollutant reductions based on schedules identified in the MRP.

The Phase I and Phase II Modeling Reports (SMCWPPP 2018; 2019) provide full documentation of the technical approaches and results of the RAA, which are consistent with the recommendations of the EPA RAA Guide and Bay Area RAA Guidance.

# 2 PRELIMINARY IDENTIFICATION OF OPPORTUNITIES FOR GI PROJECTS

To support the RAA and GI Plans, C/CAG has initiated a number of planning efforts that identify opportunities for GI implementation. The following is a summary of those efforts:

- **LID for New Development and Redevelopment** – The MRP includes a Provision (C.3) for the integration of LID within new development and redevelopment. As LID techniques are implemented as new development and redevelopment occurs throughout the County, the benefits of such practices in terms of reducing urban runoff flows and associated pollutant loads can be considered as part of the pollutant load reductions attributed to implementation of GI. C/CAG worked with San Mateo County Permittees to compile information on LID practices that have been implemented within new development and redevelopment since water year 2003 (baseline year for the TMDL). C/CAG also performed an analysis to project the number of acres of future new development and redevelopment to be addressed by the Provision C.3 regulated development by 2040. The RAA considers existing LID practices and projections of LID in future new development and redevelopment areas to estimate anticipated PCBs and mercury load reductions from 2003 to 2040.

- **Countywide Stormwater Resource Plan (SRP)** – The SRP is a comprehensive plan that identifies and prioritizes 1000's of GI project opportunities throughout San Mateo County and within each municipal jurisdiction. Prioritized project opportunities include: (1) large regional projects within publicly-owned parcels (e.g., public parks) that infiltrate or treat stormwater runoff generated from surrounding areas (e.g., diversion from neighborhood storm drain system; diversions from creeks draining large urban areas); (2) retrofit of publicly-owned parcels with GI that provide demonstration of onsite LID designs; and (3) retrofit of public street rights-of-way with GI, or "green streets." The SRP included a multi-benefit scoring and prioritization process that ranks GI project opportunities based on multiple factors beyond pollutant load reduction (e.g., proximity to flood prone channels, potential groundwater basin recharge). Figure 1-2 provides an example of green street opportunities identified, scored, and prioritized by the SRP throughout San Mateo County (SMCWPPP 2017).

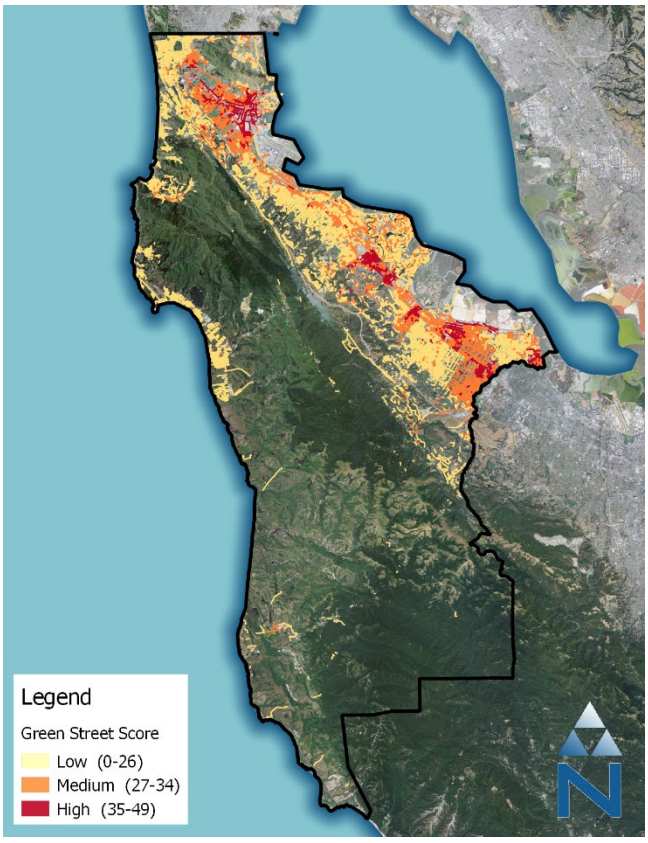



Figure 1-1. SRP Prioritized Green Street Opportunities.

The above efforts and resulting technical products provide preliminary identification of opportunities for GI projects. These GI project opportunities serve as the foundation for the RAA and GI Plans as strategies are developed for implementation plans to meet the PCBs and mercury load reduction goals.

# 3 DESCRIPTION OF THE RAA MODEL

C/CAG performed a comprehensive, countywide modeling effort to provide: (1) simulation of baseline loads of PCBs and mercury for each of the County's watersheds and municipal jurisdictions discharging to San Francisco Bay; (2) estimation of necessary load reduction goals to meet requirements of the MRP and TMDL WLAs; and (3) determination of the amount of GI needed to address load reduction goals based on project opportunities identified Section 2. The RAA also provides analysis of alternative implementation scenarios through cost-benefit optimization that can inform cost-effective GI implementation within each municipal jurisdiction. These results set goals for GI Plans developed by each Permittee.

The analytical framework selected to support the San Mateo Countywide RAA is based on a linked system of models (Figure 3-1). Component models of the linked system include:

- **Loading Simulation Program C++ (LSPC)** – The hydrologic and water quality model selected for the baseline model of San Mateo County watersheds was the Loading Simulation Program in C++ (LSPC) (Shen et al., 2004), a watershed modeling system that includes

Hydrologic Simulation Program – FORTRAN (HSPF) (Bicknell et al. 1997) algorithms for simulating watershed hydrology, erosion, water quality, and in-stream fate and transport processes. The model can simulate upland loading and transport of sediment, mercury, and PCBs. LSPC is built upon a relational database platform, making it easier to collate diverse datasets to produce robust representations of natural systems. LSPC integrates GIS outputs, comprehensive data storage and management capabilities, the original HSPF algorithms, and a data analysis/post-processing system into a convenient PC-based Windows environment. The algorithms of LSPC are identical to a subset of those in the HSPF model with selected additions, such as algorithms to address land use change over time. LSPC is an open-source public-domain watershed model available from EPA.

- **System for Urban Stormwater Treatment & Analysis Integration (SUSTAIN)** – Developed by EPA's Office of Research and Development, SUSTAIN was primarily designed as a decision-support system for selection and placement of GI projects at strategic locations in urban watersheds. It includes a process-based continuous project simulation module for representing flow and pollutant transport routing through various types of GI projects. A distinguishing feature of SUSTAIN is a robust cost-benefit optimization model that incorporates dynamic, user-specified project unit-cost functions to quantify the costs associated with project construction, operation, and maintenance. The cost-benefit optimization model runs iteratively to generate a cost-effectiveness curve that is sometimes comprised of millions of GI project scenarios representing different combinations of projects throughout a watershed. Those results are used to make cost-effective management recommendations by evaluating the trade-offs between different scenarios. The "benefit" component can be represented in several ways: (1) reduction in flow volume (2) reduction in load of a specific pollutant or (3) other conditions including numeric water quality targets, frequency of exceedances of numeric water quality targets, or minimizing the difference between developed and pre-developed flow-duration curves (USEPA 2009, Riverson et al. 2014).

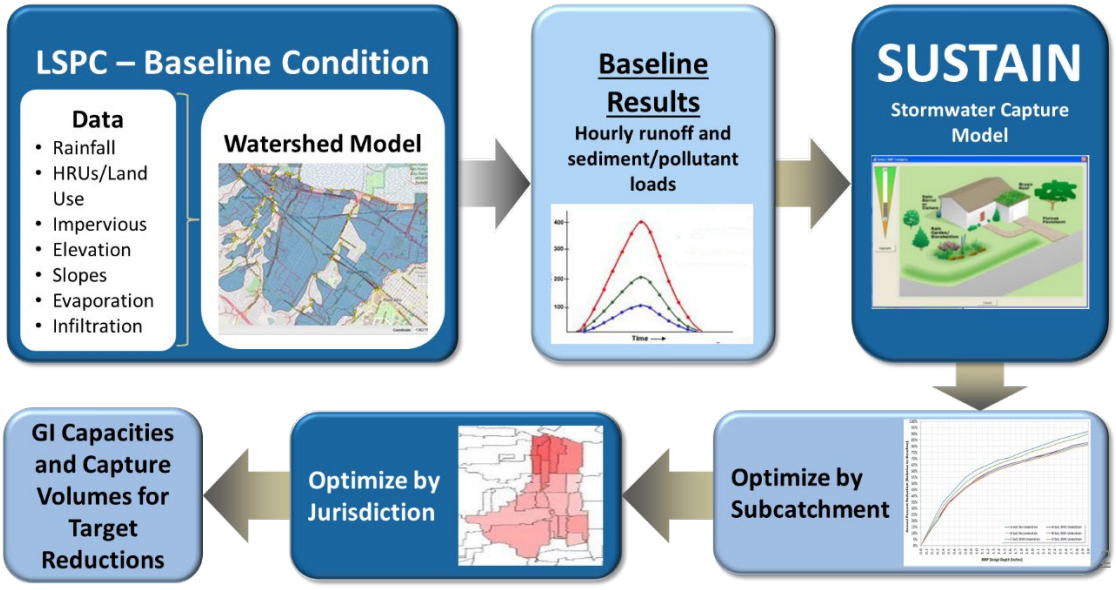



Figure 3-1. Modeling System Supporting the RAA.

The LSPC model provides a characterization of existing conditions and determination of necessary pollutant load reductions to meet requirements of TMDLs and the MRP. SUSTAIN provides analysis of the amount of GI needed to provide the portion of the load reduction assigned to GI by the MRP.

# 4 MODEL CONSIDERATIONS TO INFORM GI PLANS

An important consideration for the RAA was the ability to track costs and benefits of different categories of GI projects within the model. This tracking was performed for GI project categories within each model subwatershed and municipal jurisdiction, and supports the selection of the most cost-effective implementation strategy to attain pollutant reduction goals. The RAA builds upon the previous planning efforts and utilizes the following categories of GI projects for model representation:

1. **Existing Projects**: Stormwater treatment and GI projects that have been implemented since FY-2004/05. This primarily consists of all of the regulated projects that were mandated to treat runoff via Provision C.3 of the MRP, but also includes any public green street or other demonstration projects that were not subject to Provision C.3 requirements. For regulated projects in the early years of C.3 implementation, stormwater treatment may have been achieved through non-GI means, such as underground vault systems or media filters.
2. **Future New and Redevelopment:** All the regulated projects that will be subject to Provision C.3 requirements to treat runoff via LID and is based on spatial projections of future new and redevelopment tied to regional models for population and employment growth.
3. **Regional Projects (identified)**: C/CAG worked with agencies to identify five projects within public parks or Caltrans property to provide regional capture and infiltration/treatment of stormwater, and included conceptual designs to support further planning and designs.
4. **Green Streets**: The SRP identified and prioritized opportunities throughout San Mateo County for retrofitting existing streets with GI in public rights-of-way. Green streets were ranked as high, medium, and low priority based on a multiple-benefit prioritization process developed for the SRP.
5. **Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of either additional parcel-based GI or other Regional Projects. The SRP screened and prioritized public parcels for opportunities for onsite LID and Regional Projects. These opportunities need further investigation to determine the best potential projects.

The RAA considers the numerous GI project opportunities that exist within each municipal jurisdiction, and selects a suite or "recipe" of projects that can most cost-effectively address pollutant load reductions. The amount and combination of those GI projects can be determined through analysis of estimated load reductions and implementation costs. Figure 4-1 presents an example GI recipe showing the distribution of selected GI project categories versus incremental reductions in pollutant loading and increasing cost. To build upon preliminary C/CAG planning efforts above, and to properly inform

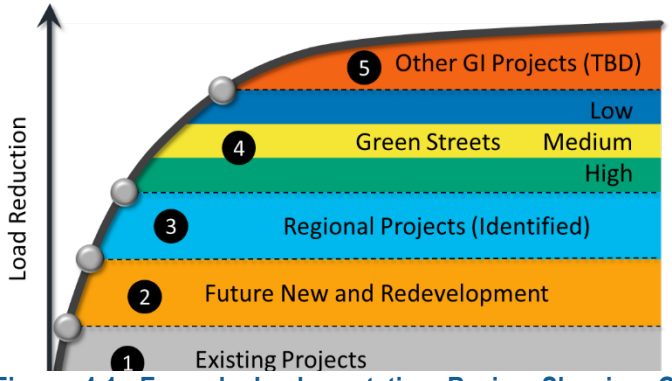



**Figure 4-1. Example Implementation Recipe Showing General Sequencing of GI Projects.**

and set meaningful goals for GI Plans, it was determined to be beneficial for the countywide RAA approach to include the capability of performing cost-benefit optimization of GI project opportunities. For multiple combinations of GI projects, SUSTAIN provides an estimate of pollutant load reduction and implementation costs, allowing for the comparison of various GI implementation scenarios and the selection of the most cost-effective implementation plan to address pollutant reduction goals.

# 5 GOALS FOR GREEN INFRASTRUCTURE IMPLEMENTATION

As discussed in Section 1, depending on the perspective of the regulators, stakeholders, or Permittees, the purpose and expectations of the RAA can vary in terms of how reasonable assurance is demonstrated. As a result, the output from the RAA must consider multiple perspectives and strike the right balance between detail and specificity while still leaving ample opportunity to allow for future adaptive management. The following are key considerations for the RAA output:

- **Demonstrate PCBs and Mercury Load Reductions** – The primary goal of the RAA is to quantitatively demonstrate that GI Plans and Control Measure Implementation Plans will result in load reductions of PCBs and mercury sufficient to attain their respective TMDL WLAs and stormwater improvement goals associated with GI. Based on the baseline hydrology and water quality model, the RAA determined that a 17.6% reduction in PCB loads is needed to meet the GI implementation goals established by the MRP. Zero reduction in mercury loads was determined to be needed based on GI, as baseline loads are predicted to be below the TMDL WLA for San Mateo County. As a result, a 17.6% reduction in PCB loads is established as the primary pollutant reduction goal for the GI Plan. However, there is some uncertainty in terms of how PCB source areas are represented in the model, which will require more monitoring and analysis in the future to gain an improved understanding of PCB source areas and the ability to target these areas with GI. Since PCBs are generally understood to be transported with cohesive sediment (e.g., silt and clay), sediment load can serve as a surrogate on which to base a load reduction target. The RAA considers a 17.6% reduction of sediment load as a more conservative surrogate until a better understanding is reached in terms of specific PCB source areas within the County. Once PCB source areas are confirmed, these areas can be targeted for GI implementation, likely resulting in greater effectiveness for GI to reduce PCB loads, and thus reducing the amount of GI needed to meet the load reduction target based on sediment load.
- **Develop Metrics to Support Implementation Tracking** – The MRP (Provision C.3.j) also requires tracking methods to provide reasonable assurance that TMDL WLAs are being met. Provision C.3.j states that the GI Plan "shall include means and methods to track the area within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area."
- **Support Adaptive Management** – Given the relatively small scale of most GI projects (e.g., LID on an individual parcel, a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction goals. All the GI projects will require site investigations to assess feasibility and costs. As a result, the RAA provides a preliminary investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction target. The RAA sets the GI Plan "goals" in terms of the amount of GI implementation over time to address pollutant load reductions. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans)

are performed, the adaptive management process will be key to ensuring that goals are met. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

The RAA output, or goals for GI implementation, attempt to identify the appropriate balance in terms of detail and specificity needed to address the above considerations. The RAA also considered multiple alternative scenarios that can inform implementation and the adaptive management process. These scenarios tested the underlining assumptions for GI implementation, and demonstrate the need for further research, collaboration among multiple Permittees, and incorporation of lessons learned in order to gain efficiencies and maximize the cost-effectiveness of GI to reduce pollutant loads over time. Four modeling scenarios were configured for this analysis (as summarized in Table 5-1):

**Table 5-1. Model scenarios objectives and cost-benefit evaluation.**

| Load Reduction Objective | Percent of Total GI Cost to Achieve Reduction Objective | | |
|---|---|---|---|
| | Jurisdictional | Countywide | *Total Savings (Jurisdictional vs. Countywide)* |
| **Cohesive Sediment** 17.6% Reduction | **Scenario 1** | **Scenario 2** | → *Savings* |
| **Total PCBs** 17.6% Reduction | **Scenario 3** | **Scenario 4** | → *Savings* |
| *Total Savings (Sediment vs. PCBs)* | ↓ *Savings* | ↓ *Savings* | ↘ *Overall Savings* |

The following factors are considered for each model scenario:

- **Load Reduction Objective** - With a cohesive sediment load reduction objective, Scenarios 1 and 2 represent the most conservative approaches. Those scenarios assume that given the uncertainties about PCB source areas, targeting an overall 17.6% load reduction of cohesive sediment in general (silts and clays) achieves the PCB load reduction objective for GI. Scenarios 3 and 4 assume that PCB sources are spatially distributed based on analysis of land use types. The cost-benefit optimization process targets those areas as having the highest likelihood of PCB sources. Scenarios 3 and 4 highlight the potential cost savings (relative to Scenarios 1 and 2) that could be realized if PCB sources are identified and targeted for GI implementation.
- **Jurisdictional verses Countywide** - There are many possible ways to achieve a 17.6% load reduction for all of San Mateo County. The "Jurisdictional" approach stipulates that each jurisdiction must individually achieve at least a 17.6% load reduction. On the other hand, the "Countywide" approach achieves the 17.6% load reduction countywide by allowing the management burden of GI implementation to vary freely across jurisdictional boundaries. The countywide approach can provide significant cost savings over the jurisdictional approach, especially where pollutant sources are spatially concentrated. Figure 5-1 conceptually illustrates the jurisdictional versus countywide optimization approaches. Where there is

cooperation among jurisdictions, results from these two scenarios can provide a useful analytical framework for cost-sharing and implementation of the most cost-effective management scenarios.

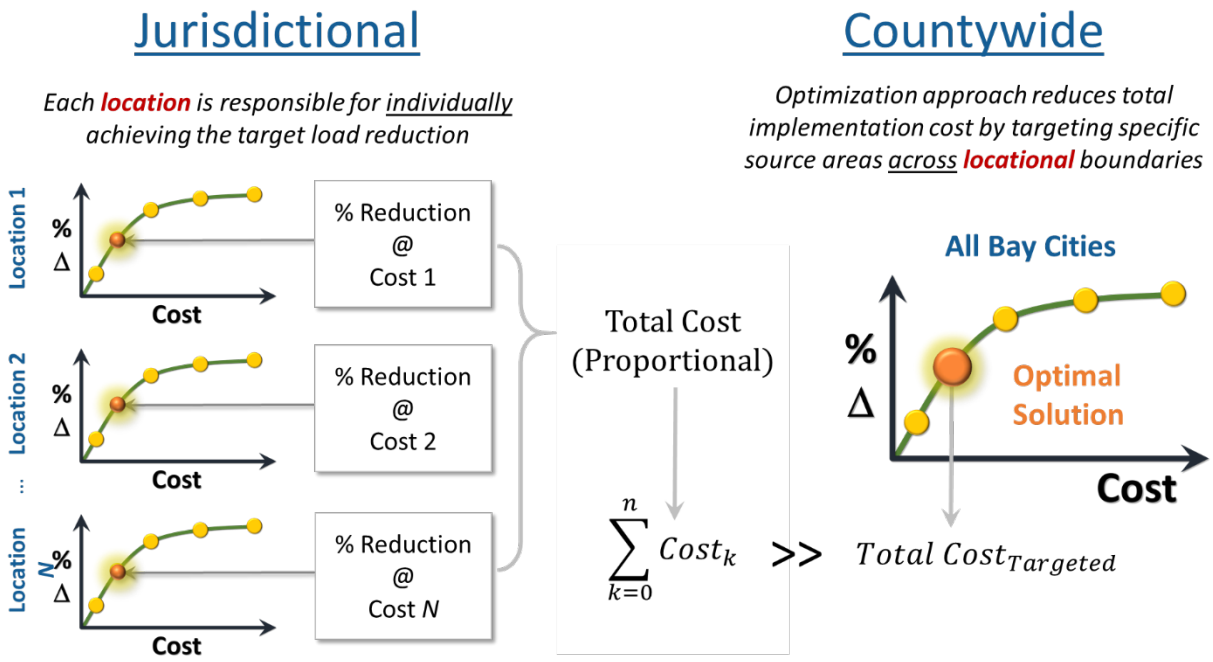



**Figure 5-1. Jurisdictional vs. countywide approaches for cost-benefit optimization**

Results of each of the four RAA scenarios are documented in the Phase II Modeling Report. These results can inform the adaptive management process for GI implementation, and help garner support for collaborative efforts for GI implementation or further research of PCB source areas that can seek more cost-effective implementation strategies over time. Figure 5-2, Table 5-2, and Figure 5-3 provide a summary of Scenario 1 RAA results for the County of San Mateo. The following steps outline how the process for formulating the scenario in the RAA model and utilizing results to set goals for GI implementation.

**First:** Based on GI project categories defined in Section 4, SUSTAIN was used to simulate effectiveness/load reductions and estimate planning-level costs for various combinations of GI projects within the County's jurisdiction (along the x-axis of Figure 5-2, from low pollutant reduction/effectiveness to high reduction/effectiveness). "Existing Projects" were locked in the model and included those GI projects included in the FY 2016-17 MRP Annual Report to the Water Board. "Future New & Redevelopment" is an estimation of the LID that will likely be implemented in the future in redevelopment areas (based on Provision C.3). "Green Streets" were based on prioritized and ranked (High, Medium, and Low) street retrofit opportunities reported in the SRP. For County of San Mateo, the "Regional Project (Identified)" refers to the four regional projects whose drainage areas overlap with unincorporated County area, currently under consideration by various cities. These projects include Orange Memorial Park in South San Francisco, Caltrans right-of-way at the junction of Interstate 280 and 380 in San Bruno, Cartan Field in Atherton, and Red Morton Community Park in Redwood City. "Other GI Projects" refer to additional GI projects needed, but specific locations for project opportunities within certain subwatersheds yet to be determined.

**Second:** As depicted in Figure 5-2, a 17.6% reduction of PCBs was identified as the target reduction to be attained through the implementation of GI (for Scenario 1, cohesive sediment reduction is used as a surrogate to represent load reduction of PCBs).

**Third:** SUSTAIN is used to provide cost-optimization and selection of the most cost-effective combination of GI projects to attain the target reduction. In the Figure 5-2, this solution can be viewed as the vertical slice that intersects the point on the x-axis at 17.6% reduction. The combination of GI structural capacities in that slice at the 17.6% load reduction represents the proposed GI implementation plan for County of San Mateo. Table 5-2 provides details on that implementation plan for the 56 subwatersheds within the County's jurisdiction (represented by each row in table). Optimization results recommend that varying amounts of GI capacity in different subwatersheds (different rows) are needed to achieve the most cost-effective solution, but the overall PCBs load reduction addresses 17.6% (bottom row of table). The relative amount of GI capacities (normalized by area) for each subwatershed are shown in the map in Figure 5-3.

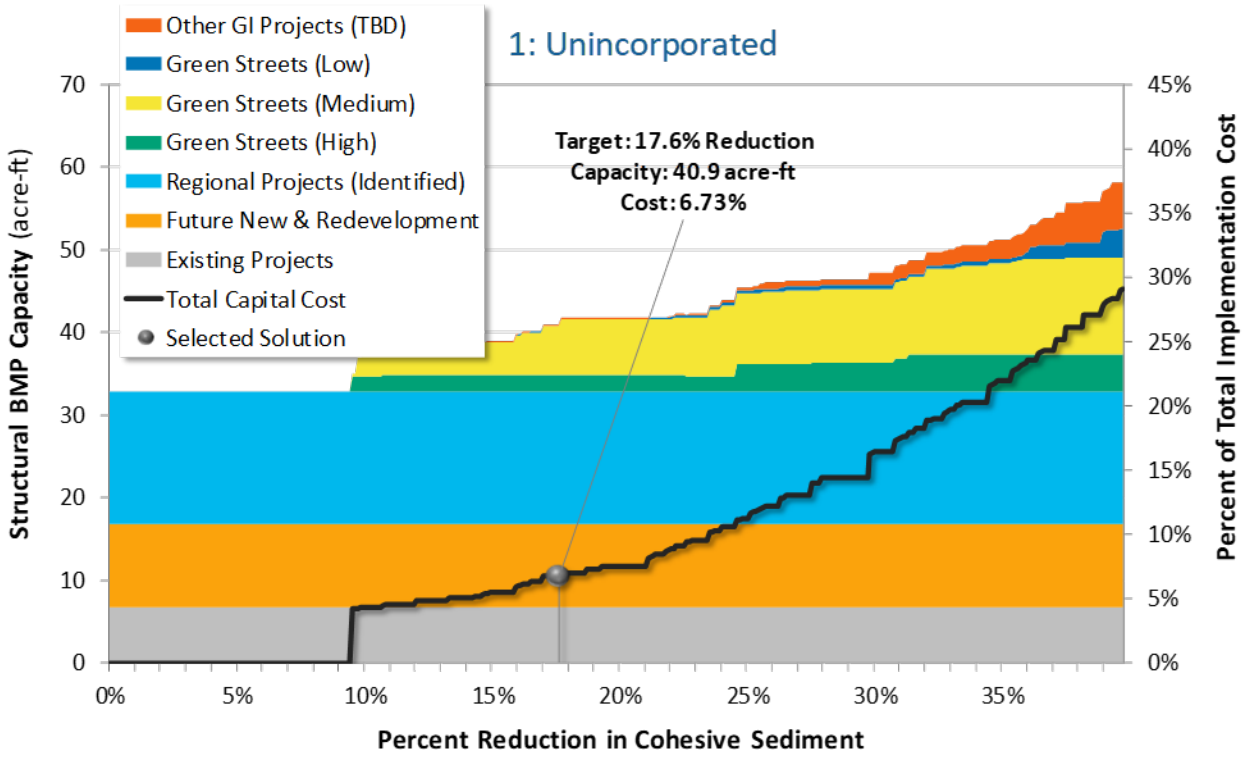



**Figure 5-2. Scenario 1: Optimization summary for Unincorporated County (sediment target, with regional identified project).**

## Table 5-2. Scenario 1: GI implementation strategy for Unincorporated County (sediment target, with identified regional project)

| Subwatershed ID | Management Metrics for GI | | | Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing/Planned | | | Green Streets | | | | |
| | % Load Reduction PCBs (Annual) | Annual Volume Managed (acre-ft) | Impervious Area Treated (acres) | Existing Projects | Future New & Redevelopment | Regional Projects (Identified) | High | Medium | Low | Other GI Projects (TBD) | Total BMP Capacity (acre-ft) |
| 220121 | 17% | 0.18 | 0.39 | 0.00 | -- | 0.01 | -- | -- | -- | -- | **0.0** |
| 220321 | 0% | 0.00 | -- | -- | -- | -- | -- | -- | -- | -- | **0.0** |
| 220421 | 12% | 0.21 | 0.05 | -- | 0.01 | -- | -- | 0.01 | -- | -- | **0.0** |
| 220821 | 5% | 1.62 | 0.49 | 0.22 | 0.07 | -- | 0.01 | -- | -- | -- | **0.3** |
| 221121 | 2% | 0.10 | 0.00 | -- | 0.01 | -- | -- | -- | -- | 0.00 | **0.0** |
| 221221 | 17% | 0.15 | 9.35 | 5.17 | 1.14 | 0.01 | -- | -- | -- | -- | **6.3** |
| 221321 | 15% | 0.37 | 0.92 | -- | 0.04 | 0.02 | -- | -- | -- | -- | **0.1** |
| 221421 | 49% | 0.01 | 0.02 | -- | 0.01 | 0.00 | -- | 0.01 | -- | 0.00 | **0.0** |
| 221821 | 6% | 0.00 | 0.00 | -- | 0.00 | -- | -- | -- | -- | -- | **0.0** |
| 222221 | 22% | 4.54 | 0.04 | -- | 0.11 | -- | -- | 0.10 | -- | -- | **0.2** |
| 222321 | 27% | 0.89 | 0.00 | -- | 0.10 | -- | -- | 0.00 | -- | 0.02 | **0.1** |
| 222521 | 16% | 1.14 | 0.00 | -- | 0.14 | -- | -- | -- | -- | 0.03 | **0.2** |
| 222621 | 4% | 0.63 | 0.00 | -- | 0.08 | -- | -- | -- | -- | -- | **0.1** |
| 222721 | 1% | 0.22 | 0.00 | -- | 0.03 | -- | -- | -- | -- | -- | **0.0** |
| 223021 | 7% | 2.29 | 0.01 | -- | 0.42 | -- | -- | -- | -- | -- | **0.4** |
| 223121 | 5% | 0.98 | 0.05 | -- | 0.30 | -- | -- | -- | -- | -- | **0.3** |
| 223221 | 86% | 0.22 | 0.02 | -- | 0.16 | -- | -- | -- | -- | -- | **0.2** |
| 223421 | 0% | 0.00 | 0.00 | -- | 0.00 | -- | -- | -- | -- | -- | **0.0** |
| 223521 | 7% | 0.03 | 0.00 | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 223621 | 1% | 0.14 | 0.00 | -- | 0.02 | -- | -- | -- | -- | 0.00 | **0.0** |
| 223721 | 4% | 0.05 | 0.00 | -- | 0.01 | -- | -- | -- | -- | 0.00 | **0.0** |
| 223821 | 8% | 0.01 | -- | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 223921 | 9% | 0.00 | -- | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 224021 | 7% | 0.00 | 0.00 | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 224121 | 11% | 0.19 | 0.00 | -- | 0.01 | -- | -- | -- | -- | -- | **0.0** |
| 224421 | 10% | 0.00 | -- | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 224521 | 10% | 0.00 | -- | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 224621 | 3% | 0.78 | 0.05 | -- | 0.23 | -- | -- | -- | -- | -- | **0.2** |
| 230121 | 1% | 0.07 | 0.08 | 0.10 | 0.00 | -- | -- | -- | -- | -- | **0.1** |
| 230221 | 15% | 37.75 | 92.83 | 0.51 | 4.61 | 1.74 | 1.89 | -- | -- | -- | **8.8** |

| Subwatershed ID | Management Metrics for GI | | | Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing/Planned | | | Green Streets | | | | |
| | % Load Reduction PCBs (Annual) | Annual Volume Managed (acre-ft) | Impervious Area Treated (acres) | Existing Projects | Future New & Redevelopment | Regional Projects (Identified) | High | Medium | Low | Other GI Projects (TBD) | Total BMP Capacity (acre-ft) |
| 230321 | 31% | 125.87 | 46.24 | 0.04 | 0.18 | 9.26 | 0.01 | 3.86 | -- | -- | **13.3** |
| 230421 | 42% | 5.13 | 15.80 | 0.11 | 0.17 | 0.29 | -- | 0.16 | 0.09 | -- | **0.8** |
| 230521 | 2% | 0.27 | 0.15 | -- | 0.08 | -- | -- | -- | -- | -- | **0.1** |
| 230721 | 5% | 3.59 | 5.88 | 0.11 | 0.23 | -- | -- | -- | -- | -- | **0.3** |
| 230921 | 1% | 0.02 | 0.03 | -- | 0.01 | -- | -- | -- | -- | -- | **0.0** |
| 231221 | 34% | 0.60 | 0.31 | 0.04 | 0.03 | -- | -- | 0.01 | -- | -- | **0.1** |
| 231521 | 1% | 2.61 | 2.73 | 0.22 | 0.29 | -- | -- | -- | -- | -- | **0.5** |
| 231821 | 12% | 0.00 | 0.00 | -- | 0.00 | -- | -- | -- | -- | 0.00 | **0.0** |
| 232121 | 9% | 1.96 | 1.70 | -- | 0.00 | -- | -- | 0.08 | -- | -- | **0.1** |
| 232221 | 0% | 0.01 | 0.01 | -- | 0.01 | -- | -- | -- | -- | -- | **0.0** |
| 232321 | 0% | 0.00 | 0.00 | -- | 0.00 | -- | -- | -- | -- | -- | **0.0** |
| 232421 | 4% | 0.72 | 0.70 | -- | 0.27 | -- | -- | -- | -- | -- | **0.3** |
| 232521 | 20% | 50.03 | 30.96 | -- | 0.53 | 4.35 | 0.00 | -- | -- | -- | **4.9** |
| 232621 | 0% | 0.01 | 0.02 | -- | 0.00 | -- | -- | -- | -- | -- | **0.0** |
| 232721 | 7% | 0.76 | 0.21 | -- | -- | -- | -- | -- | -- | 0.03 | **0.0** |
| 232821 | 42% | 0.71 | 18.35 | -- | 0.17 | 0.04 | -- | 2.40 | -- | -- | **2.6** |
| 232921 | 3% | 4.00 | 0.21 | -- | 0.06 | -- | -- | 0.08 | -- | -- | **0.1** |
| 240121 | 12% | 2.16 | 1.80 | -- | 0.07 | 0.01 | 0.07 | -- | -- | -- | **0.1** |
| 240221 | 12% | 9.44 | 1.74 | -- | 0.01 | 0.05 | -- | -- | -- | -- | **0.1** |
| 240321 | 8% | 1.15 | 0.30 | -- | 0.07 | 0.01 | -- | -- | -- | -- | **0.1** |
| 240421 | 12% | 9.09 | 1.67 | -- | 0.05 | 0.04 | -- | -- | -- | -- | **0.1** |
| 240621 | 12% | 2.38 | 2.72 | 0.20 | 0.03 | 0.01 | -- | -- | -- | -- | **0.2** |
| 240721 | 12% | 33.25 | 6.12 | -- | 0.14 | 0.16 | 0.02 | -- | -- | -- | **0.3** |
| 250221 | 0% | 0.00 | 0.04 | -- | 0.07 | -- | -- | -- | -- | -- | **0.1** |
| 250421 | 12% | 0.03 | 0.16 | -- | 0.06 | 0.00 | -- | -- | -- | -- | **0.1** |
| 250521 | 16% | 0.36 | 0.05 | -- | 0.01 | 0.00 | -- | -- | -- | -- | **0.0** |
| **Total** | **17.7%** | **306.7** | **242.2** | **6.7** | **10.0** | **16.0** | **2.0** | **6.7** | **0.1** | **0.1** | **41.7** |

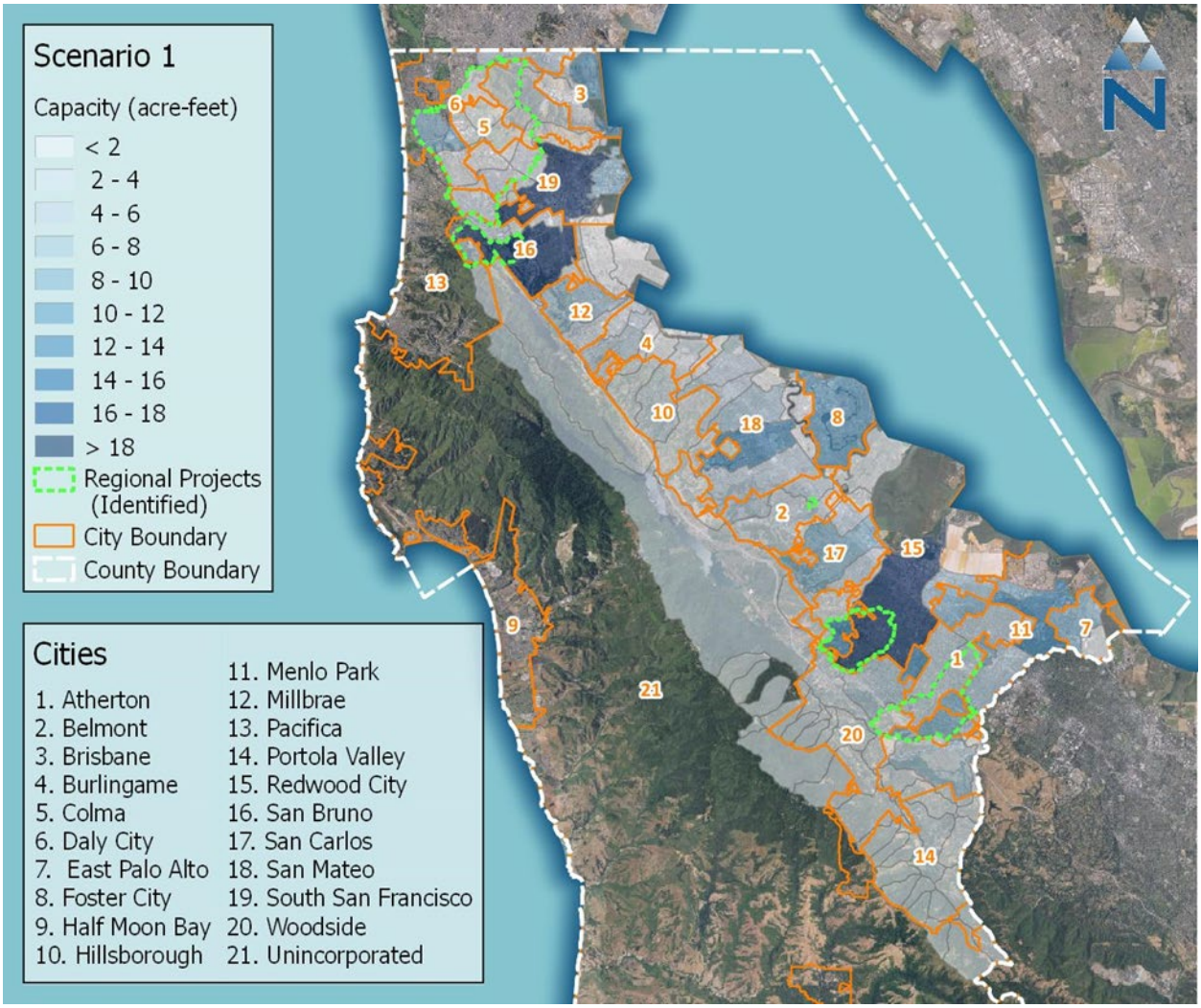



**Figure 5-3. Scenario 1: Map of GI capacities within each subwatershed of the County (sediment target, with regional identified project).**

As can be seen in the above results, the cost-optimization favored implementation of different combinations of GI projects within each subwatershed. These combinations were based on: (1) number and type of GI project opportunities identified within each subwatershed, and (2) cost-effectiveness given various characteristics associated with GI control measure efficiency (typically governed by infiltration rates), higher sediment (or PCBs) generation in upstream areas, etc. During implementation, it is almost certain that the actual implementation of GI will not follow the RAA output exactly. Dimensions and location of GI projects will vary based on on-the-ground feasibility and site-specific constraints. At the same time, all GI project capacity is not created equal in terms of effectiveness. For these reasons, it is not recommended that *GI capacity* serve as the focus for stormwater improvement goals for the GI Plan.

The RAA recommends management metrics for the GI Plan that are based on metrics that can be easily measured and tracked throughout implementation. At the left side of the table in Table 5-2 are columns under the header "Management Metrics for GI," which include performance metrics for "% Load Reduction PCBs (Annual)," "Annual Volume Managed (acre-ft)," and "Impervious Area

Treated (acres)." The "% Load Reduction PCBs (Annual)" and "Annual Volume Managed (acre-ft)" metrics are based on annualized results represented in the RAA modeling system that are directly comparable to TMDL WLAs. The "% Load Reduction PCBs (Annual)" provides a relative comparison of the load reduction to be achieved within each subwatershed. The "Annual Volume Managed (acre-ft)" shows the acre-feet of water captured and infiltrated and/or treated within each subwatershed, resulting in a total annual volume of 306.7 acre-feet of stormwater managed in Unincorporated County for an average year. This 306.7 acre-feet of stormwater managed could serve as the primary metric to be tracked for GI implementation. In other words, stormwater volume managed is being used as a unifying metric to evaluate GI effectiveness. "Impervious Area Treated (acres)"is an additional metric suggested by the MRP for implementation tracking. As a result of adaptive management, the implementation plan may change over time and alternative GI projects can be substituted without having to re-run the RAA, as long as the "Management Metrics for GI," representing the goals for the GI Plan, remain on track.

# 6 REFERENCES


BASMAA (Bay Area Stormwater Management Agencies Association). 2017. *Bay Area Reasonable Assurance Analysis Guidance Document*. Bay Area Stormwater Management Agencies Association, Oakland, CA.

Bicknell, B. R., , J. C. Imhoff, A. S. Donigian, R. C. Johanson. 1997. *Hydrological Simulation Program – FORTRAN (HSPF), User's Manual For Release 11*. EPA – 600/R-97/080. U.S. Environmental Protection Agency, Athens, GA.

Riverson, J., K. Alvi, J. Zhen, R. Murphy. 2014. *SUSTAIN Application User's Guide for EPA Region 10*. U.S. Environmental Protection Agency Region 10, Office of Water and Watersheds, Seattle, WA.

Shen, J., A. Parker, and J. Riverson. 2004. A New Approach for a Windows-based Watershed Modeling System Based on a Database-supporting Architecture. *Environmental Modeling and Software*, July 2004.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2006. *Mercury in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report for Revised Total Maximum Daily Load (TMDL) and Proposed Mercury Water Quality Objectives*. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2008. *Total Maximum Daily Load for PCBs in San Francisco Bay: Final Staff Report for Proposed Basin Plan Amendment*. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2015. *NPDES Phase I MS4 Municipal Regional Stormwater Permit (MRP) for San Francisco Bay Region*. Order No. R2-2015-0049. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2017. *Stormwater Resource Plan for San Mateo County*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2018. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report*.

Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

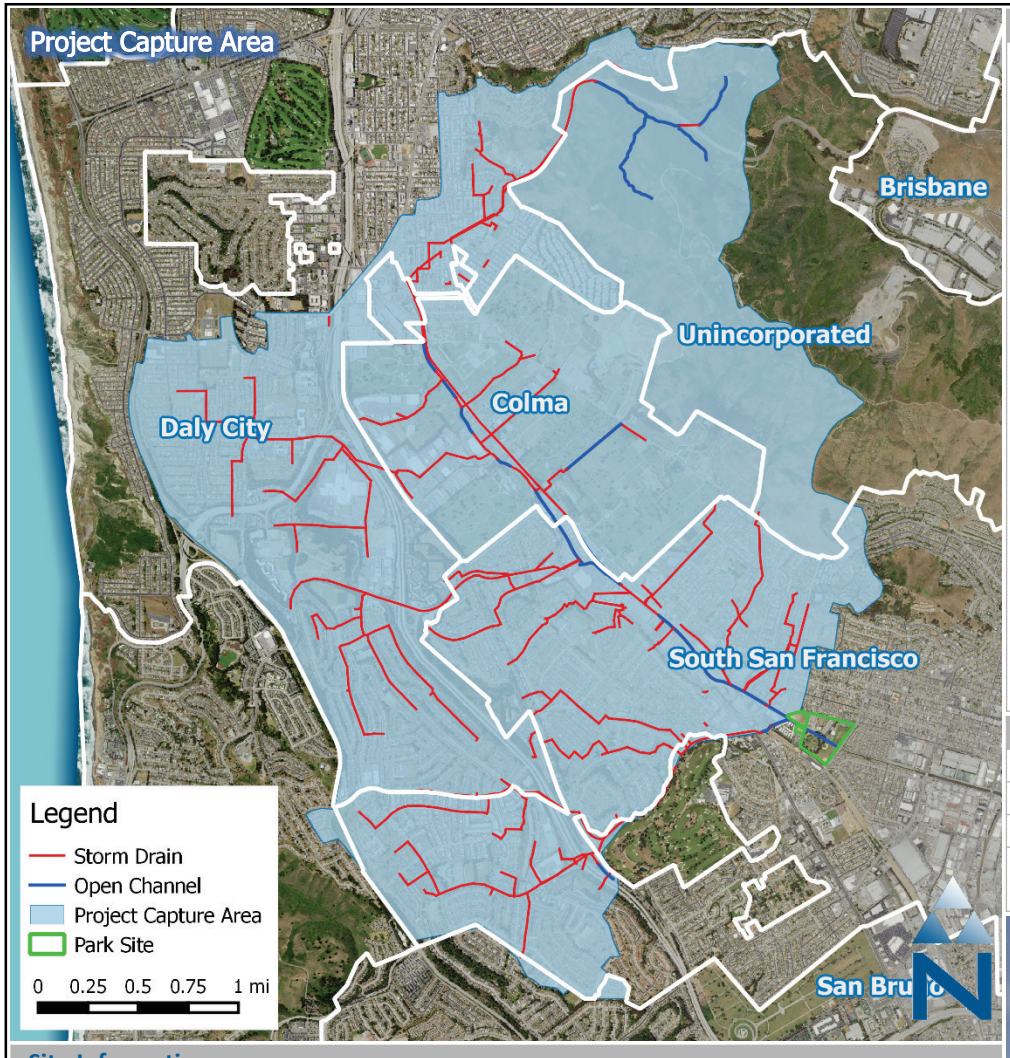
SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2019. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase II Green Infrastructure Modeling Report*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

USEPA (U.S. Environmental Protection Agency). 2009. *SUSTAIN—A Framework for Placement of Best Management Practices in Urban Watersheds to Protect Water Quality*. EPA/600/R-09/095. U.S. Environmental Protection Agency, Office of Research and Development, Edison, NJ.

USEPA (U.S. Environmental Protection Agency). 2017. *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning*. U.S. Environmental Protection Agency Region 9, San Francisco, CA.

# APPENDIX B

## PROJECT CONCEPTS




## 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 |

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

## Site Information

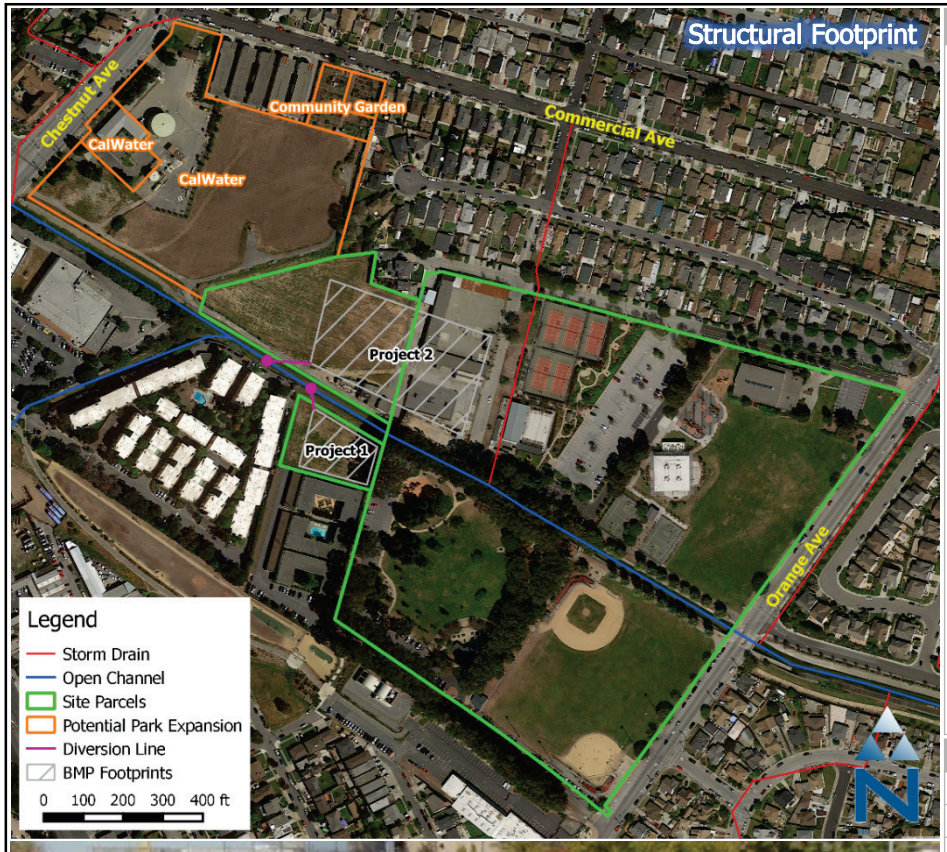
| | |
|---|---|
| Land Owner | City of South San Francisco |
| Street Address | Orange Ave, South San Francisco, CA 94080 |
| Latitude/Longitude | 37° 39’ 13.1” N / 122° 25’ 35.4” W |
| Watershed | Colma Creek |

# Concept for a Multi-jurisdictional Regional Stormwater Capture Project

**Site:** Orange Memorial Park (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL




**Example concrete infiltration chamber**

## Site Description:

Two subsurface infiltration chambers will be considered on parcels owned by the City of South San Francisco to the west of Orange Memorial Park. Both parcels were acquired by the City of South San Francisco in 1996 and, while vacant, are included in plans for future park expansion. The first chamber (Project 1) will be located in the vacant parcel to the south of the Colma Creek channel. The second chamber (Project 2) will be located in portions of the vacant parcel to the north of the channel and the current park parcel. The Project 2 site represents the location of the future little league baseball fields according to the Master Plan. Runoff would be diverted directly from Colma Creek and details of the diversion structures will be determined during the design phase through coordination with the San Mateo County Flood Control District. A pretreatment unit (e.g. hydrodynamic separator) will be implemented to provide trash and sediment capture. Two projects are proposed to maximize the amount of available space used for the design and to provide an option for the City of South San Francisco to implement the design in two separate phases. This would allow the City to move forward with each phase separately as funding is acquired. The Master Plan also accounts for the possible purchase of the CalWater parcels along Chestnut Avenue for future park expansion, which could be used to expand Project 2 if that land becomes available. The proposed design (both chambers) would allow for the treatment of 26% of the 85$^{th}$ percentile, 24-hour runoff volume (36.4 of 142.4 ac-ft) for the Colma Creek watershed. As these volumes are completely removed via storage and infiltration, this provides an equivalent 26% reduction of pollutant loads for the storm event.

**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.

## Design Criteria

| | |
|---|---|
| Precipitation, 85$^{th}$ percentile, 24-hr storm (in) | 0.83 |
| Colma Creek Runoff Volume, 85$^{th}$ percentile, 24-hr storm (ac-ft) | 142.4 |
| Colma Creek Peak Discharge, 85$^{th}$ percentile, 24-hr storm (cfs) | 309 |
| Infiltration Rate (in/hr) | 0.5 |

| Project Characteristics | Project 1 | Project 2 |
|---|---|---|
| Stormwater Capture Process | Subsurface Infiltration Chamber | |
| Footprint (acres) | 0.5 | 2.3 |
| Design Height (ft) | 12 | 12 |
| Depth of Excavation (ft) | 15 | 15 |
| Pumping Requirements | Dependent on Geotechnical Investigation | |
| Design Volume (ac-ft) | 6 | 27.6 |
| 24-hr Infiltration Volume (ac-ft) | 0.5 | 2.3 |
| **Total Treatment Volume (ac-ft) [1]** | **6.5** | **29.9** |
| **Percent Treated [2]** | **5%** | **21%** |

1 – sum of the Design Volume and 24-hr Infiltration Volume
2 – percentage the 85$^{th}$ percentile 24-hr storm Runoff Volume that is treated

# Concept for a Multi-jurisdictional Regional Stormwater Capture Project

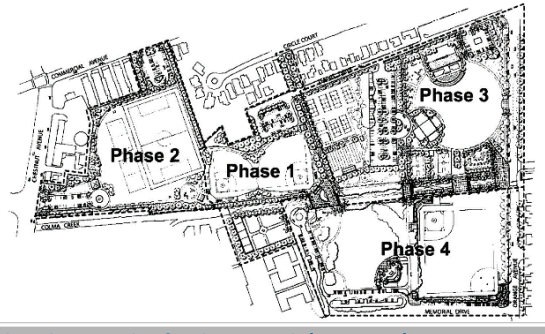
**Site:** Orange Memorial Park (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL


## Project Implementation:

The figure to the left depicts the layout for the two subsurface infiltration chambers in relation to the planned improvements in the Orange Memorial Park Master Plan 2007. The figure below depicts the phased implementation of various areas of the park according to the Master Plan. The proposed infiltration chambers would coincide with Phase 1. Adding a stormwater component to the first phase of park improvements would likely garner enthusiasm for park enhancements and open avenues for funding. Phase 1 of the Master Plan can be further split into two sub-phases. The first sub-phase of park improvements would include Project 1 in the location of the future community gardens. The second sub-phase would include Project 2 at the little league baseball fields.

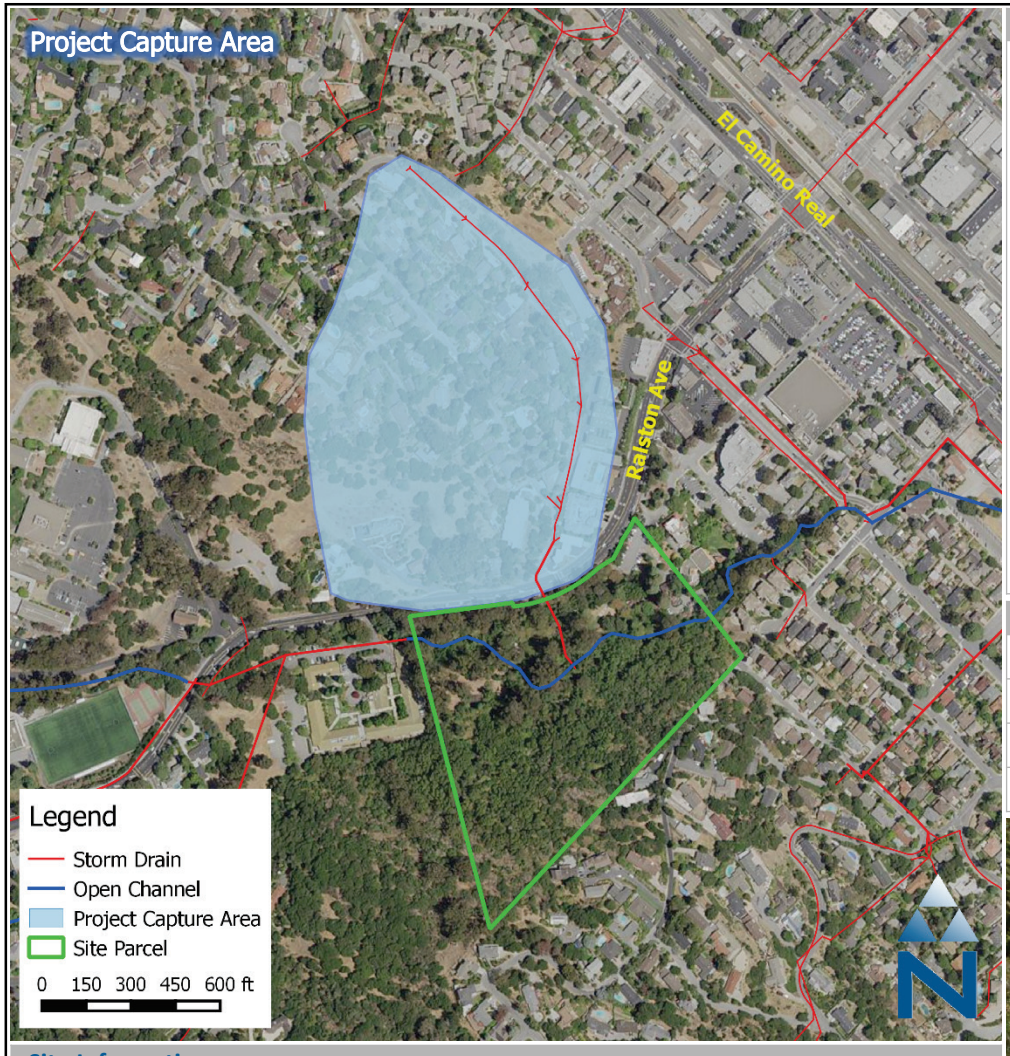



### Cost Estimate for Infiltration Chamber south of Colma Creek (Project 1)

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Excavation/Removal | 14,520 | CY | $50.00 | $726,000 |
| Rubber Dam System | 1 | LS | $80,000.00 | $80,000 |
| Diversion Structure | 1 | LS | $100,000.00 | $80,000 |
| Hydrodynamic Separator Device | 1 | LS | $90,000.00 | $100,000 |
| Pump Structure | 1 | LS | $1,000,000.00 | $1,000,000 |
| Diversion Pipe (24" RCP) | 100 | LF | $200.00 | $20,000 |
| Infiltration Structure | 9,680 | CY | $300.00 | $2,904,000 |
| Restoration | 21,780 | SF | $2.00 | $44,000 |
| | | | CONSTRUCTION SUBTOTAL | $4,954,000 |
| Mobilization (10% construction) | | | | $495,000 |
| Contingency (25% construction) | | | | $1,239,000 |
| Design (10% total) | | | | $669,000 |
| | | | **TOTAL COST** | **$7,357,000** |

### Cost Estimate for Infiltration Chamber north of Colma Creek (Project 2)

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Excavation/Removal | 55,660 | CY | $50.00 | $2,783,000 |
| Rubber Dam System (dam from Project 1 can be utilized by both projects) | | | | N/A |
| Diversion Structure | 1 | LS | $150,000.00 | $150,000 |
| Hydrodynamic Separator | 1 | LS | $150,000.00 | $150,000 |
| Pump Structure | 1 | LS | $1,750,000.00 | $1,750,000 |
| Diversion Pipe (24" RCP) | 150 | LF | $200.00 | $30,000 |
| Infiltration Structure | 44,528 | CY | $300.00 | $13,358,000 |
| Restoration | 100,188 | SF | $2.00 | $200,000 |
| | | | CONSTRUCTION SUBTOTAL | $18,421,000 |
| Mobilization (10% construction) | | | | $1,842,000 |
| Contingency (25% construction) | | | | $4,605,000 |
| Design (10% total) | | | | $2,487,000 |
| | | | **TOTAL COST** | **$27,355,000** |




## 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

## Site Information

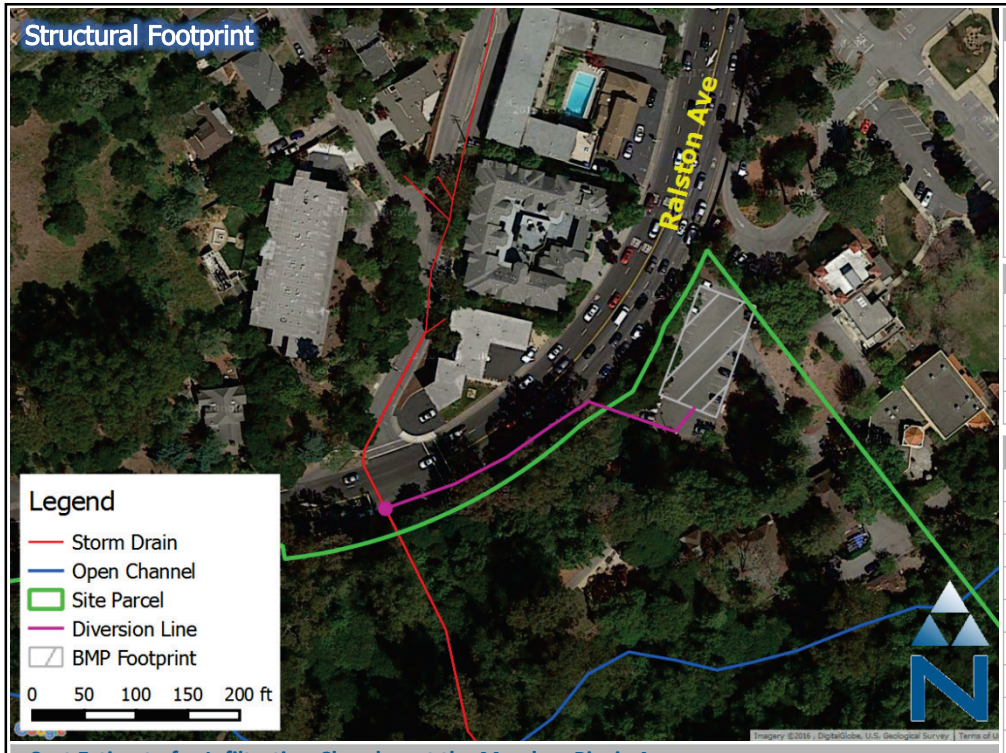
| | |
|---|---|
| Land Owner | City of Belmont |
| Street Address | 30 Twin Pines Ln, Belmont, CA 94002 |
| Latitude/Longitude | 37° 31’ 02.3” N / 122° 16’ 40.4” W |
| Watershed | Belmont Creek |

# Concept for a Multi-jurisdictional Regional Stormwater Capture Project

**Site:** Twin Pines Park (City of Belmont)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL




## Project Description:

A subsurface infiltration chamber will be considered in the parking lot to the west of the Twin Pines Manor. The project would require a 350-foot diversion from the storm drain that crosses Ralston Avenue at the South Road intersection. A subsurface facility would preserve functional use of the parking lot after construction and would prevent disturbance of other recreational areas of the park. The proposed design would allow for the treatment of over 100% of the 85th percentile, 24-hr runoff volume (0.47 ac-ft) from the 30-acre area.

## Design Criteria

| | |
|---|---|
| Precipitation, 85th percentile, 24-hr storm (in) | 0.75 |
| Runoff Volume, 85th percentile, 24-hr storm (ac-ft) | 0.47 |
| Peak Discharge, 85th percentile, 24-hr storm (cfs) | 1.0 |
| Infiltration Rate (in/hr) | 0.5 |

## Project Characteristics

| | |
|---|---|
| Stormwater Capture Process | Subsurface Infiltration Chamber |
| Footprint (acres) | 0.15 |
| Design Height (ft) | 3 |
| Depth of Excavation (ft) | 6 |
| Pumping Requirements | Dependent on Geotechnical Investigation |
| Design Volume (ac-ft) | 0.45 |
| 24-hr Infiltration Volume (ac-ft) | 0.15 |
| **Total Treatment Volume (ac-ft) [1]** | **0.6** |
| **Percent Treated [2]** | **100%** |

1 – sum of the Design Volume and 24-hr Infiltration Volume
2 – percentage of the 85th percentile 24-hr storm Runoff Volume that is treated

## Cost Estimate for Infiltration Chamber at the Meadow Picnic Area

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Excavation/Removal | 1,614 | CY | $50.00 | $81,000 |
| Diversion Structure | 1 | LS | $20,000.00 | $20,000 |
| Hydrodynamic Separator | 1 | LS | $15,000.00 | $15,000 |
| Pump Structure (450 GPM) | 1 | LS | $50,000.00 | $50,000 |
| Diversion Pipe (12" RCP) | 350 | LF | $150.00 | $53,000 |
| Infiltration Structure | 726 | CY | $300.00 | $218,000 |
| Restoration/Pavement | 8,712 | SF | $10.00 | $87,000 |
| | | | CONSTRUCTION SUBTOTAL | $524,000 |
| Mobilization (10% construction) | | | | $52,000 |
| Contingency (25% construction) | | | | $131,000 |
| Design (10% total) | | | | $71,000 |
| | | | **TOTAL COST** | **$778,000** |

***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. Cost estimates are based on available data. Actual costs will vary.

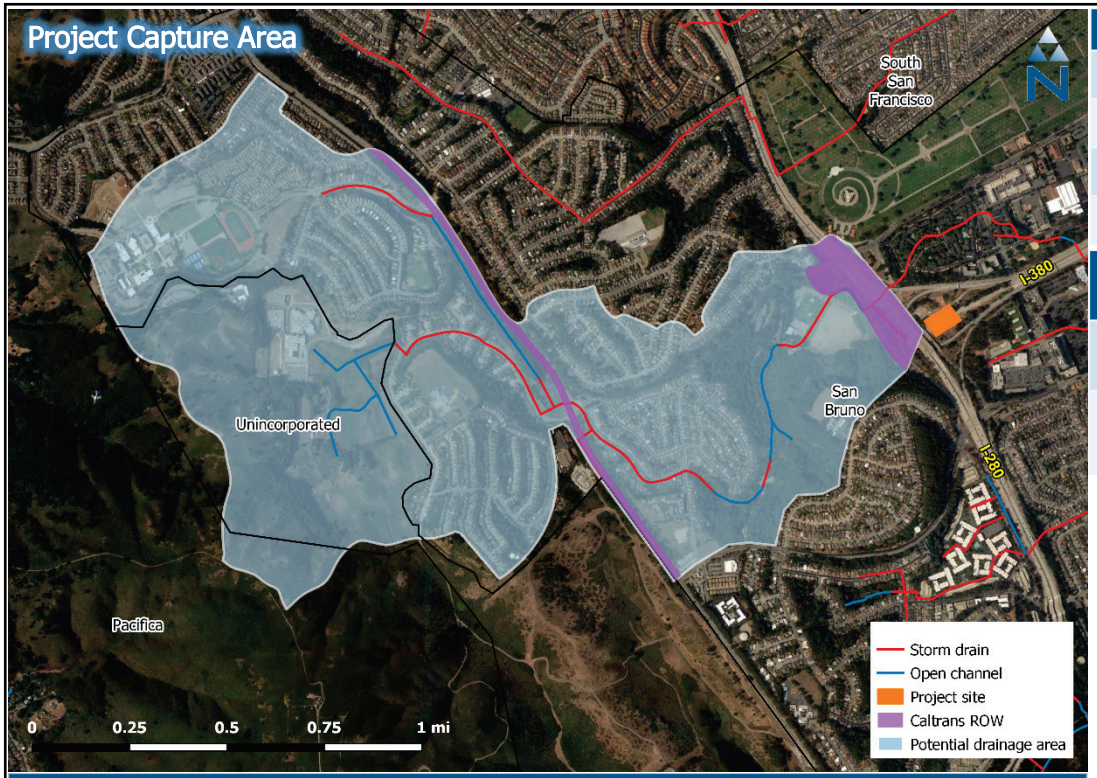

Example plastic infiltration chamber beneath a future parking lot

# Concept for a Multi-jurisdictional Regional Stormwater Capture Project

**Site:** Twin Pines Park (City of Belmont)

San Mateo Countywide Water Pollution Prevention Program

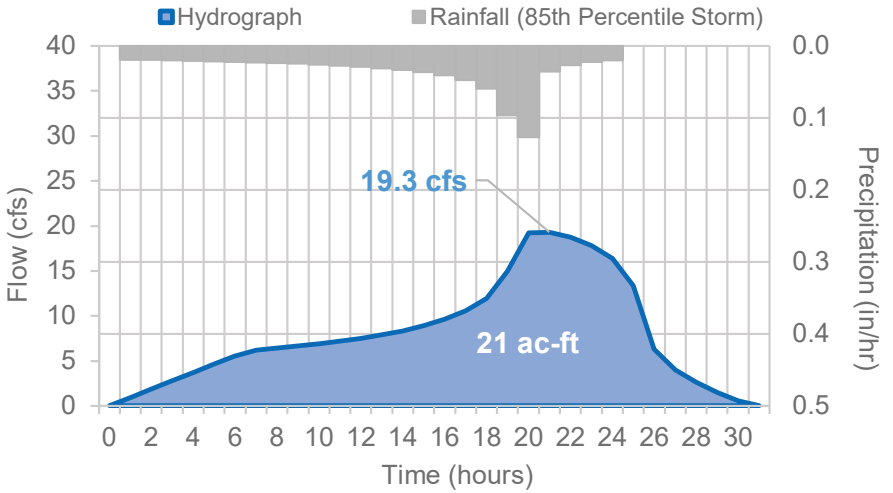
PARADIGM ENVIRONMENTAL




## Site Information

| | |
|---|---|
| **Project Lead** | San Bruno |
| **Location** | Caltrans Right-of-Way @ I-280 and I-380 |
| **Land Owner** | Caltrans |
| **Receiving Water** | San Bruno Creek |

| Jurisdiction | San Bruno | San Mateo County | Pacifica | Caltrans ROW |
|---|---|---|---|---|
| Capture Area (acres) | 660 | 220 | 22 | 40 |
| Percent of Capture Area | 70.0% | 23.4% | 2.3% | 4.3% |




## Project Overview

This concept describes a regional stormwater capture project for San Bruno. The project is designed to be a subsurface infiltration gallery located at open space in the Caltrans right-of-way between the I-280/I-380 interchange (see map above). This project has the potential to supplement groundwater supplies, alleviate downstream flooding, and improve water quality in San Bruno Creek. The project will treat runoff from a total of 942 acres. Approximately 700 acres is in San Bruno (40 acres in Caltrans right-of-way), 220 acres is in unincorporated county, and 22 acres is in Pacifica. Residential impervious area in western San Bruno is the largest contributor of runoff. The project is sized to capture 21 ac-ft, 100% of the 85$^{th}$ percentile, 24-hour runoff volume that is typically used to meet water quality targets. This volume reduces the detention capacity needed in the Crestmoor Canyon to address flooding from the 25-year storm, according to the 2014 San Bruno Storm Drain Master Plan, by one-third. The project can reduce the PCBs load in the drainage area by 69%. This benefit may offset the amount of green streets that would otherwise need to be implemented to meet permit and TMDL requirements, reducing San Bruno's green street requirement by 84%. Project details and costs are outlined in the subsequent pages.

## Wet Weather Drainage Characteristics

| | | |
|---|---|---|
| **Sizing Criteria** | | 85$^{th}$ percentile, 24-hour storm |
| **Total Capture Area** | | 942 acres |
| **Imperviousness** | | 27% |
| **Design Conditions for 85$^{th}$ %-ile storm** | ***Rainfall Depth:*** | 0.85 inches |
| | ***Total Runoff Volume:*** | 21.0 ac-ft |
| | ***Peak Flow Rate:*** | 19.3 cfs |

# Regional Stormwater Capture Project at I-280 and I-380

## Project Overview and Drainage Area Map

(Sheet 1 of 3)

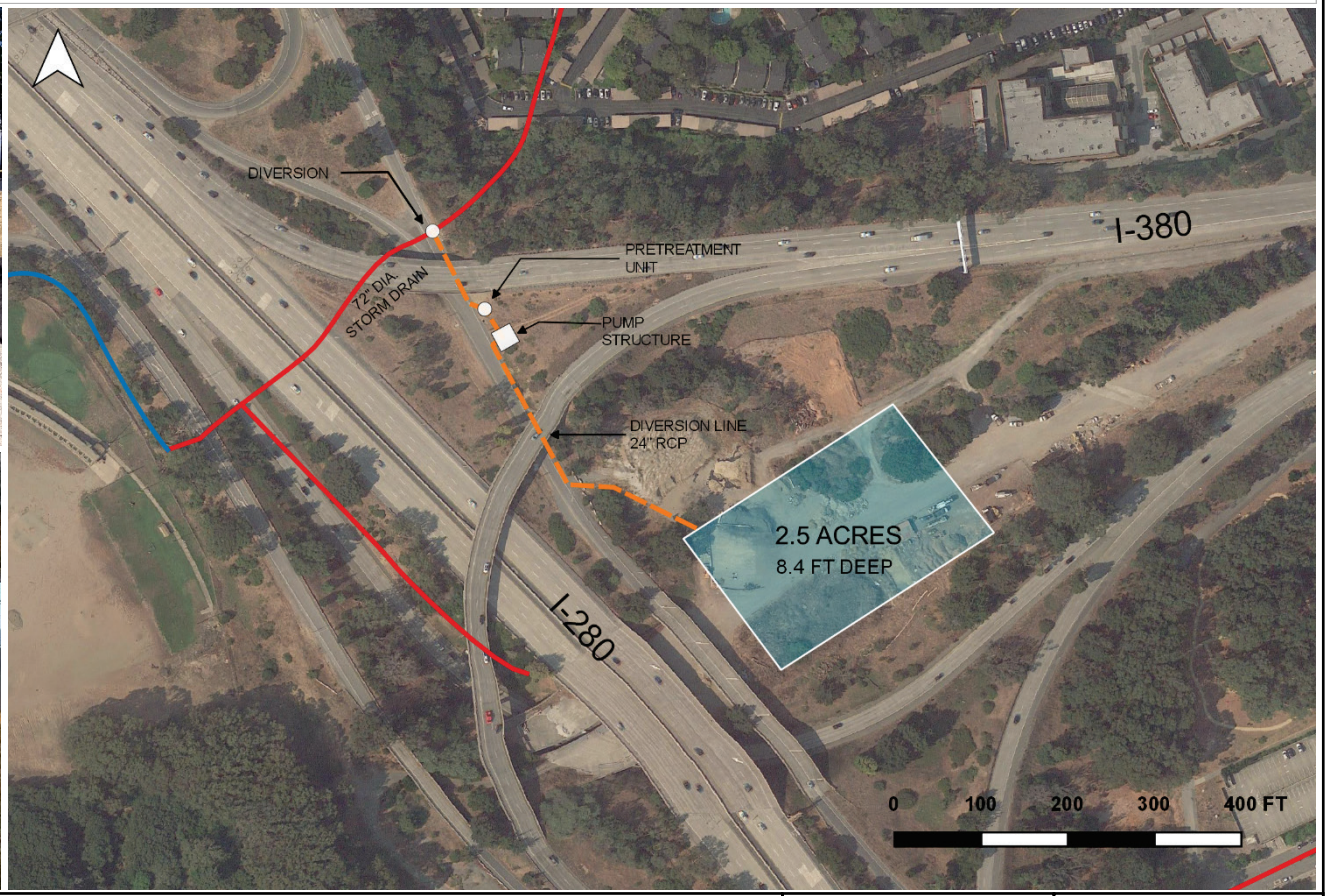
SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

## Site Plan Description

The project consists of a subsurface concrete gallery that will be located beneath vacant space in the Caltrans right-of-way between the I-280 and I-380 interchange. The project would divert from a storm drain that serves portions of the Rollingwood, Crestmoor, Portola Highlands, and Pacific Heights neighborhoods of San Bruno. The storm drain eventually discharges to San Bruno Creek, which flows to the Bay. The drain runs underneath I-280 and crosses the frontage road along the northbound side of the freeway. The diversion structure will be constructed in the section of the drain that runs beneath the frontage road to minimize disruption to highway traffic while providing accessibility. A 650-foot length of diversion pipe will be required to route runoff to the facility. Captured runoff will be routed through a pretreatment system, such as a hydrodynamic separator, to remove solids and sediment, then routed to the facility. Due to the length of the required diversion line, a pump structure will likely be necessary to move captured runoff to the facility. However, a geotechnical analysis may show that a gravity-flow diversion alternative is feasible. A gravity diversion may increase excavation costs but will eliminate capital and O&M costs associated with operating a pump station. A pump system may also be beneficial for flood control downstream since diversions can be timed to manage the peak of storms. A passive system may potentially fill the facility before the peak occurs, effectively eliminating potential flood control benefits. Cost-benefit analysis should be performed to select a diversion alternative. The subsurface concrete gallery is designed to capture 21 ac-ft and will be 8.4-ft deep with a 2.5-acre footprint. Captured runoff will be removed from the storm drain system and treated through infiltration. Soil testing will need to confirm infiltration rates greater than 1.4 inches per hour in order to drain the facility within 72-hours, in compliance with local design standards. A shallower structure with greater footprint may be needed if a lower infiltration rate is found. All conceptual design details should be explored in greater detail during a feasibility analysis.

**Disclaimer:** Utilities were evaluated through GIS analysis using best available data. A utilities survey should be performed prior to construction to confirm the location of all utilities on site.




# Regional Stormwater Capture Project at I-280 and I-380

## Site Plan and Description



SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

## Budget-level Cost Estimates

| DESCRIPTION | UNIT COST | UNIT | QUANTITY | SUBTOTAL |
|---|---|---|---|---|
| Excavation/Removal | $50 | CY | 40,000 | $2,000,000 |
| Diversion Structure | - | LS | 1 | $150,000 |
| Pretreatment | $6,000 | CFS | 20 | $120,000 |
| Diversion Pump Structure | $56,000 | CFS | 20 | $1,120,000 |
| Diversion Pipe (24" RCP) | $200 | LF | 650 | $130,000 |
| Subsurface Gallery | $300 | CY | 34,000 | $10,200,000 |
| Restoration | $5 | SF | 109,000 | $545,000 |
| CONSTRUCTION SUBTOTAL | | | | $14,265,000 |
| Mobilization (10% construction) | | | | $1,427,000 |
| Contingency (15% construction) | | | | $2,140,000 |
| Design (10% total) | | | | $1,783,000 |
| **TOTAL COST** | | | | **$19,615,000** |

## Subsurface Structure Design Values

| Item Description | Value | Units |
|---|---|---|
| Footprint | 2.5 | acres |
| Design Height | 8.4 | ft |
| Depth of Excavation | 10 | ft |
| Pumping Requirements | 20 | cfs |
| Infiltration Rate | Needs further investigation | |
| Drawdown Time | Needs further investigation | |
| Infiltration Rate Needed for 72-hr Drawdown Time* | 1.4 | in/hr |
| **Capacity** | **21** | **ac-ft** |
| **Annual Capture Volume** | **226** | **ac-ft** |
| **% Design Storm Managed** | **100** | **%** |

*Maximum 72-hr drawdown time is recommended in the SMCWPPP C.3 Stormwater Technical Guidance. Using a larger footprint and a smaller design height, while keeping storage capacity constant, will lower the infiltration requirement for 72-hr drawdown.

| | FY 21/22 | | | | FY 22/23 | | | | FY 23/24 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2021 | | 2022 | | 2022 | | 2023 | | 2023 | | 2024 | |
| **Proposed Schedule** | JAS | OND | JFM | AMJ | JAS | OND | JFM | AMJ | JAS | OND | JFM | AMJ |
| Design | | X | X | X | X | X | X | | | | | |
| Environmental Documentation | | | | | | | | X | | | | |
| Bid & Award | | | | | | | | X | | | | |
| Construction | | | | | | | | | X | X | X | X |

## Additional Considerations

**This project concept is planning-level and subject to review and revision during project design.** A variety of confounding factors, including geotechnical and environmental considerations, will need to be further investigated to inform project design. Factors to be considered include but are not limited to the following:

- **Drainage delineation**: the drainage was delineated using best available data in GIS analysis. Field examinations of the upstream storm drain network should be performed to confirm drainage area.
- **Utilities**: a utilities survey along the frontage road should be performed to minimize the disruption of utilities during construction.
- **Groundwater levels**: the distance between the bottom of the infiltrating structure and the seasonal high groundwater level should be at least 10 feet apart to allow for adequate infiltration. This should be confirmed during a feasibility study.
- **Pumping Requirements:** pumping is generally assumed for large-scale regional projects. However, gravity-flow diversion alternatives may be possible, reducing capital and O&M costs associated with pumping. Gravity diversions would require the structure to be placed below the storm drain invert, increasing the required excavation depth. As-builts for the storm drain will need to be examined to determine this depth. A break-even analysis should be performed to determine if a gravity-flow alternative is more cost-effective. All cost estimates are preliminary and will need to be reevaluated during a feasibility analysis when project details are developed further.
- **Infiltration rates**: the NRCS Soil Survey did not contain an infiltration rate estimate for the project area. Infiltration tests should be performed during a feasibility study to ensure the structure is sized appropriately. It is recommended that infiltrating structures drain within 72 hours. The infiltration rate may determine design components, such as structure depth and capacity.
- **Environmental factors**: with the exception of a voluntary cleanup at The Crossings over 0.5 miles away, the California Envirostor database shows no active cleanup sites near the project site. Additional investigation should be performed at the project site to assess the possibility of existing contamination interfering with stormwater infiltration.

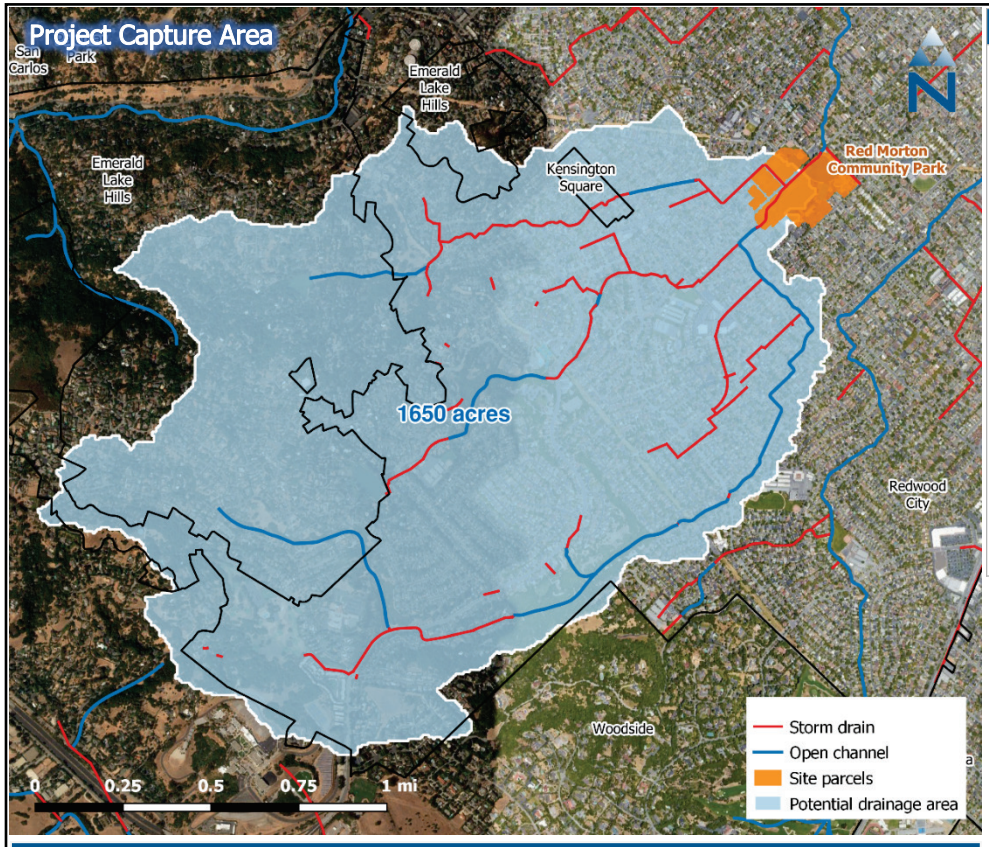
# Regional Stormwater Capture Project at I-280 and I-380

## Design Details and Itemized Cost Estimate



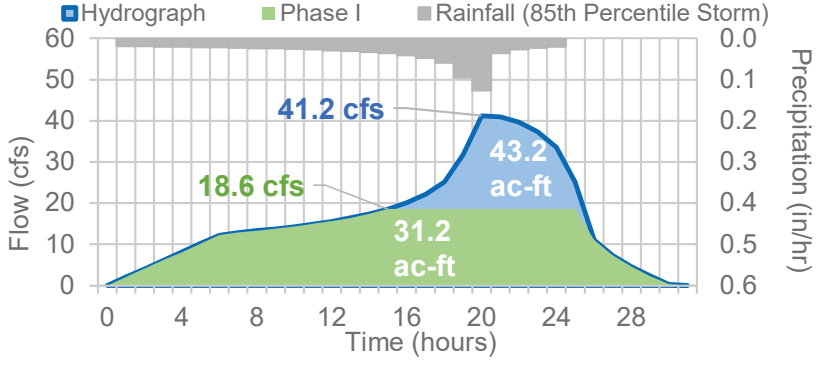
SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL




## Project Overview

This concept describes a regional stormwater capture project for Redwood City. The project, which would serve as the cornerstone for the City's MRP compliance and water resiliency efforts, is envisioned as a subsurface infiltration gallery located at Red Morton Park (see map to left). This project has the potential to supplement groundwater supplies, alleviate flooding, offset water use at the park, and improve downstream water quality in the Arroyo Ojo and downstream Redwood Creek. The project has potential to treat runoff from a total of 1,650 acres, approximately 70% of which is in Redwood City. The remaining 30% of the potential drainage area is from Woodside and the unincorporated communities, Emerald Lake Hills and Kensington Square. This may present an opportunity to explore co-funding options with Woodside and the County. The project is envisioned as a single subsurface gallery with potential for additional phases to be considered in the future. A multi-phase approach will allow for flexibility in procuring funding and coordinating with scheduled park improvements (e.g. resurfacing of turf fields). The first phase of the project has potential to capture and treat approximately 31.2 ac-ft, 72% of the 85th percentile, 24-hour runoff volume (43.2 ac-ft). The project can potentially reduce PCBs load by 16.7%. This benefit may offset the amount of green streets that would otherwise need to be implemented to meet permit and TMDL requirements, reducing Redwood City's green street requirement by 92.6%. Project details and costs are outlined in further detail in the subsequent pages.




## Site Information

| | |
|---|---|
| **Project Lead** | Redwood City |
| **Location** | Red Morton Community Park – McGarvey Field |
| **Land Owner** | Redwood City |
| **Receiving Water** | Arroyo Ojo (tributary to Redwood Creek) |

| Jurisdiction | Redwood City | San Mateo County | Woodside |
|---|---|---|---|
| **Capture Area (acres)** | 1,142 | 467 | 41 |
| **Percent of Capture Area** | 69.2% | 28.3% | 2.5% |

## Wet Weather Drainage Characteristics

| | | |
|---|---|---|
| **Sizing Criteria** | | 85th percentile, 24-hour storm |
| **Total Capture Area** | | 1,650 acres |
| **Imperviousness** | | 34% |
| **Design Conditions for 85th %-ile storm** | ***Rainfall Depth:*** | 0.85 inches |
| | ***Total Runoff Volume:*** | 43.2 ac-ft |
| | ***Peak Flow Rate:*** | 41 cfs |

# Regional Stormwater Capture Project at Red Morton Community Park

## Project Overview and Drainage Area Map

(Sheet 1 of 3)

San Mateo Countywide Water Pollution Prevention Program

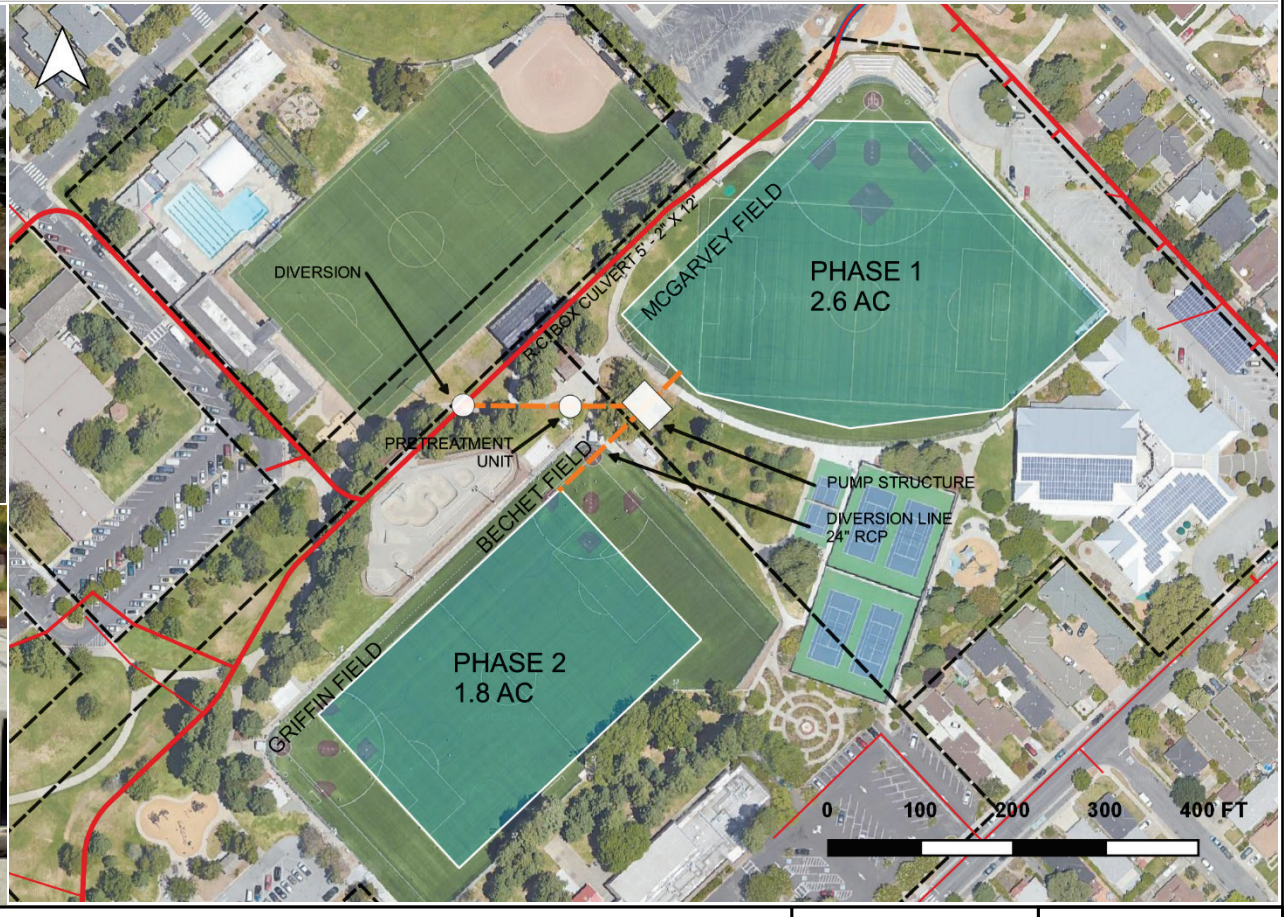
PARADIGM ENVIRONMENTAL

## Site Plan Description

The project consists of a subsurface concrete gallery that will be located beneath McGarvey Field at Red Morton Community Park. The structure has potential to capture 31.2 acre-feet of runoff from Arroyo Ojo, a tributary of Redwood Creek that flows to the Bay. Storage capacity is capped at 31.2 acre-feet due to available area at McGarvey Field and a reasonable structure depth of 12 feet. The section of Arroyo Ojo just west of the park is an open channel that is routed underneath the park through a large reinforced concrete drain before daylighting to an open channel east of the park. The project will divert from the 5-ft 2-in by 12-ft drain using a rubber dam system and intake basin. Runoff will be routed through a pretreatment system, such as a hydrodynamic separator, to remove solids and sediment, then pumped to the gallery. The total storage (31.2 ac-ft) will account for approximately 72% of the 85$^{th}$ percentile, 24-hour runoff volume (43.2 ac-ft). Captured runoff will be treated through infiltration. Stormwater reuse elements (irrigation, greywater, etc.) may be incorporated if infiltration rates are deemed too low at the site.

A second phase may be considered to capture the remaining 12 ac-ft of the design volume uncaptured by the McGarvey Field structure (Phase I). Phase II would likely be located on Griffin and Bechet Fields just west of the Phase I structure to minimize disruption of utilities on the northern half of the park. The Phase II facility can be constructed at a later date but may still be able to utilize some of the diversion infrastructure from Phase I. For example, it may be possible for the diversion components to be built in parallel to make use of the same pump housing and intake structure. These design aspects should be explored in greater detail during a feasibility analysis.

**Disclaimer:** Utilities were evaluated through GIS analysis using best available data. A utilities survey should be performed prior to construction to confirm the location of all utilities on site.




# Regional Stormwater Capture Project at Red Morton Community Park

## Site Plan and Description

(Sheet 2 of 3)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

| Budget-level Cost Estimates | | | Phase I (McGarvey Field) | | Phase II (Griffin-Bechet Fields) | |
|---|---|---|---|---|---|---|
| DESCRIPTION | UNIT COST | UNIT | QUANTITY | SUBTOTAL | QUANTITY | SUBTOTAL |
| Excavation/Removal | $50 | CY | 63,000 | $3,150,000 | 29,000 | $1,450,000 |
| Rubber Dam System | - | LS | 1 | $80,000 | - | - |
| Diversion Structure | - | LS | 1 | $150,000 | 1 | $150,000 |
| Pretreatment | $6,000 | CFS | 20 | $120,000 | 23 | $138,000 |
| Diversion Pump Structure | $56,000 | CFS | 20 | $1,120,000 | 23 | $1,288,000 |
| Diversion Pipe (24" RCP) | $200 | LF | 100 | $20,000 | 100 | $20,000 |
| Subsurface Gallery | $300 | CY | 50,000 | $15,000,000 | 20,000 | $6,000,000 |
| Restoration | $5 | SF | 113,000 | $565,000 | 78,000 | $390,000 |
| CONSTRUCTION SUBTOTAL | | | | $20,475,000 | | $9,436,000 |
| Mobilization (10% construction) | | | | $2,048,000 | | $944,000 |
| Contingency (15% construction) | | | | $3,071,000 | | $1,415,000 |
| Design (10% total) | | | | $2,559,000 | | $1,180,000 |
| **TOTAL COST** | | | | **$28,153,000** | | **$12,975,000** |

## Additional Considerations

**This project concept is planning-level and subject to review and revision during project design.** A variety of confounding factors, including geotechnical and environmental considerations, will need to be further investigated to inform project design. Factors to be considered include but are not limited to the following:

- **Drainage delineation**: the drainage was delineated using best available data in GIS analysis. Field examinations of the upstream storm drain network should be performed to confirm drainage area.
- **Utilities**: a utilities survey at the park should be performed to minimize the disruption of utilities during construction.
- **Groundwater levels**: the distance between the bottom of the infiltrating structure and the seasonal high groundwater level should be at least 10 feet apart to allow for adequate infiltration.
- **Pumping Requirements:** pumping is generally assumed for large-scale regional projects. However, gravity-flow diversion alternatives may be possible, reducing O&M costs associated with pumping. Gravity diversions would require the structure to be placed below the storm drain invert, increasing the required excavation depth. As-builts for the storm drain will need to be obtained from the City to determine this depth. For a 2.6-acre footprint, capital cost may increase $300,000 per foot of additional excavation. In comparison, the O&M associated with a pump diversion may be around $50,000 annually ($1.4 million projected over 20 years with 2.5% inflation). A break-even analysis should be performed to determine if a gravity-flow alternative is more cost-effective. All cost estimates are preliminary and will need to be reevaluated during a feasibility analysis when project details are developed further.
- **Infiltration rates**: the NRCS Soil Survey did not contain an infiltration rate estimate for the Red Morton Community Park area. Infiltration tests should be performed during a feasibility study to ensure the structure is sized appropriately. It is recommended that infiltrating structures drain within 72 hours. The infiltration rate may determine design components, such as structure depth and capacity. Additional uses of captured runoff, such as irrigation or greywater, may contribute to 72-hr drawdown requirement.
- **Environmental factors**: with the exception of an active environmental investigation from renovations/redevelopment at nearby John Gill Elementary School, the California Envirostor database shows no active cleanup sites near the project site. Additional investigation should be performed at the project site to assess the possibility of existing contamination interfering with stormwater infiltration.

## Phase I – McGarvey Field design values

| Item Description | Value | Units |
|---|---|---|
| Footprint | 2.6 | acres |
| Design Height | 12 | ft |
| Depth of Excavation | 15 | ft |
| Pumping Requirements | 18.6 | cfs |
| Infiltration Rate | Needs further investigation | |
| Drawdown Time | Needs further investigation | |
| Infiltration Rate Needed for 72-hr Drawdown Time* | 2 | in/hr |
| **Phase I Capacity** | **31.2** | **ac-ft** |
| **% Design Storm Managed** | **72** | **%** |

## Phase II – Griffin-Bechet Fields design values

| Item Description | Value | Units |
|---|---|---|
| Footprint | 1.8 | acres |
| Design Height | 6.67 | ft |
| Depth of Excavation | 10 | ft |
| Pumping Requirements | 22.6 | cfs |
| Infiltration Rate | Needs further investigation | |
| Drawdown Time | Needs further investigation | |
| Infiltration Rate Needed for 72-hr Drawdown Time* | 1.10 | in/hr |
| **Phase II Capacity** | **12** | **ac-ft** |
| **% Design Storm Managed** | **28** | **%** |

*Maximum 72-hr drawdown time is recommended in the SMCWPPP C.3 Stormwater Technical Guidance. Using a larger footprint and a smaller design height, while keeping storage capacity constant, will lower the infiltration requirement for 72-hr drawdown.

# Regional Stormwater Capture Project at Red Morton Community Park

## Design Details and Itemized Cost Estimate

# APPENDIX C

## COUNTY GREEN INFRASTRUCTURE DESIGN GUIDANCE

*Table C-1 Recommended Modifications to the SFPUC Typical GI Details and Specifications*

| Recommended Modification | Applicable Typical GI Detail |
|---|---|
| • Replace SFPUC logo with County of San Mateo logo; update cover sheet | All pages |
| • Exchange all references to San Francisco-specific codes, requirements, standard drawings, policies, etc. to applicable County/SMCWPPP/utility provider references. | In multiple locations throughout the document, but in particular on Designer Notes pages. |
| • Modify all GI terminology to match terms provided in SMCWPPP glossary, e.g. change "bioretention soil" to "biotreatment soil." | In multiple locations throughout the document, but GEN 0.1 includes redline note that lists all recommended terminology changes required to align details with GI Design Guide. |
| • Remove all references and details that are specific to combined sewer systems, e.g. the following:<br>o Revise callout "connection to sewer" to "connection to storm drain"<br>o Remove overflow structure detail that contains sand trap and water trap and all other references to sand trap requirements | Bioretention Planter Layout and Overflow Structure Details: BP 2.1, BP 3.1, BP 4.1, BP 4.2, BP 4.3, BP 4.4, BP 4.5, BP 4.6, BC 3.4<br>Permeable Pavement Subsurface Overflows Designer Notes PC 3.1 |
| • Modify bioretention/stormwater planter and subsurface infiltration system design criteria to be consistent with C.3 Technical Guide/Regulated Projects Guide, e.g. the following:<br>o 12-inch minimum depth of Class 2 Permeable Material under biotreatment soil within stormwater planters; modify all sections that show a choking layer below soil.<br>o 3-inch minimum depth of mulch.<br>o 12-inch maximum depth of ponded water.<br>o Different freeboard requirements for different drainage conditions per C.3.<br>o 72-hour maximum (48-hour preferred) facility drawdown time; remove lesser drawdown times for surface and water and soil layer.<br>o Reference to plant list provided in C.3 manual.<br>o Underdrain placement of 6" above bottom of drain rock. | Bioretention Planter/Bioretention Basin Designer Notes and Section Details: BP 1.1, BB 1.1, BP 2.2, BP 3.2, BP 5.5, BP 5.6, BP 5.7, BB 2.2, BC 1.2, BC 1.2.1, BC 1.4, BC 1.5, BC 4.1, BC 5.1,<br><br>Subsurface Infiltration System Designer Notes: SI 1.1, SI 1.2, SI 2.2 |

| Recommended Modification | Applicable Typical GI Detail |
|---|---|
| ○ Subsurface infiltration system setbacks. | |
| • Modify all curbs, gutters and sidewalks and references to County standard details for streetscape elements to align with Public Works Standard Drawings, e.g. replace keys between concrete curbs and adjacent sidewalk with expansion gaps and dowels. | In multiple bioretention and permeable pavement section and edge treatment details throughout the set. |
| • Add edge conditions that address County road standards that are not represented in detail set, e.g. roads with valley gutters along edges of travel way | In multiple bioretention and permeable pavement section and edge treatment details throughout the set. |
| • Revise utility setback and protection requirements to be consistent with the County of San Mateo and local utility provider requirements; Remove all references to SFPUC Asset Protection Standards. Remove any utility crossing details for utility mains and/or services that show conditions that are not allowed by the County. | All Designer Note sheets and Utility Crossing and Conflict Details: GC 2.1, GC 2.2, GC 2.3, GC 2.4, GC 2.5, GC 2.6, GC 2.7, GC 2,8, GC 3.1 |
| • Remove all detail sheets for outlet and end of block monitoring that were specifically developed for San Francisco capital projects in which flow rates (not water quality) are being monitored post-construction | BC 7.1, BC 7.2, BC 7.3, GC 6.1, GC 6.2 |

*Table C-2 GI Suitability by County Road Types*

| County Road Types/ Categories | Typical Characteristics | Potential GI Opportunities | | | | | | Pre-treatment/ Conveyance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Stormwater Planter (Sidewalk Zone)[1] | Stormwater Curb Extension (Parking Zone) | Rain Gardens | Pervious Pavement (Sidewalk Zone)[2] | Pervious Pavement (Parking Zone, Driveway, Alley) | Tree Well | Vegetated Swale | Green Gutter | Stormwater Tree |
| Arterial, Commercial and Industrial | • 64' roadway width<br>• Parking on both sides<br>• 5.5' - 8' monolithic sidewalk<br>• Concrete curb and gutter<br>• May include bike lanes | ✓ | ✓ | X | ✓ | X | ✓ | X | X | ✓ |
| Two-Level Urban Residential Street | • Travel lanes split with earthen slope<br>• 22' width for each lane<br>• No parking<br>• Sidewalks on one side of each lane<br>• May include bike lanes<br>• Concrete curb and gutter | ✓ | X | X | ✓ | X | ✓ | X | X | ✓ |
| Urban Residential and Minor Commercial Street with Sidewalks and Parking | • 32' - 40' roadway width<br>• Parking on both sides<br>• 4.5' - 5.5' monolithic sidewalk on both sides with adjacent planting strip<br>• Concrete curb and gutter<br>• May include bike lanes | Yes[3] | ✓ | X | ✓ | ✓ | Yes[3] | X | X | Yes[3] |

| County Road Types/ Categories | Typical Characteristics | Potential GI Opportunities | | | | | | Pre-treatment/ Conveyance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Stormwater Planter (Sidewalk Zone)[1] | Stormwater Curb Extension (Parking Zone) | Rain Gardens | Pervious Pavement (Sidewalk Zone)[2] | Pervious Pavement (Parking Zone, Driveway, Alley) | Tree Well | Vegetated Swale | Green Gutter | Stormwater Tree |
| Residential Roads with Valley Gutters | • 18' - 22' roadway width<br>• Valley gutter separates travel way with parking lane or shoulder<br>• Raised sidewalk provided in some cases | X | Yes[4] | X | Yes[5] | Yes[4] | Yes[4] | X | X | X |
| Menlo Oaks & Devonshire Roads | • Varying road widths<br>• No formal parking<br>• No sidewalks<br>• No curbs | X | X | ✓ | X | X | X | ✓ | ✓ | X |
| Rural One-Way Road and Loop Street Section | • 15' roadway width<br>• No parking<br>• AC path on one side<br>• AC Dikes | X | X | X | ✓ | X | X | ✓ | X | X |
| Cul-de-sac, Minor Roads, and Rural Collectors | • 20' -22' roadway width w/o parking<br>• 28' roadway width w/ parking on one side<br>• 5' AC sidewalk on one side<br>• AC Dikes | X | Yes[4] | X | Yes[5] | Yes[4] | X | Yes[6] | Yes[6] | X |
| Rural Major Collector Street | • 34' min roadway width<br>• 5' paved shoulders<br>• No sidewalk<br>• AC Dikes | X | ✓ | X | X | X | X | X | X | X |

| County Road Types/ Categories | Typical Characteristics | Potential GI Opportunities | | | | | | Pre-treatment/ Conveyance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Stormwater Planter (Sidewalk Zone)[1] | Stormwater Curb Extension (Parking Zone) | Rain Gardens | Pervious Pavement (Sidewalk Zone)[2] | Pervious Pavement (Parking Zone, Driveway, Alley) | Tree Well | Vegetated Swale | Green Gutter | Stormwater Tree |
| Private Residential and Urban Access Roads /Driveways /Alleys | • 16' min roadway width<br>• No street parking<br>• No sidewalks<br>• AC dikes or shoulders at road edges | X | X | X | X | ✓ | X | Yes[6] | Yes[6] | X |

[1] Assumes sidewalk can be widened to right-of-way and/or separated from curb to provide 3' (min) width planter behind curb and 5' (min) width sidewalk.
[2] Where sidewalk is adjacent to sloped landscape, assumes ditch along toe of slope will prevent runoff from draining onto sidewalk.
[3] If sidewalk can be extended to right-of-way.
[4] If parking lane present.
[5] If sidewalk present and no landscape run-on.
[6] If no curb present.

# APPENDIX D

## SUPPORTING INFORMATION FOR EVALUATION OF FUTURE FUNDING OPTIONS

# Supporting Information for Evaluation of Future Funding Options

This appendix provides more detailed information on the various funding sources mentioned in Section 7.2.2 of the County's GI Plan. The information was primarily obtained from the SMCWPPP *Green Infrastructure Funding Nexus Evaluation* (GI Funding Report)[1].

**Balloted Funding Approaches**

Stormwater Fee

The municipalities within San Mateo County are currently considering joining together to create a new countywide agency. The Flood and Sea Level Rise Resiliency District[2] would be created by modifying the existing San Mateo County Flood Control District through state legislation. The agency could, in the future, provide funding for GI to the County and the other SMCWPPP Permittees. One step in that process is establishing a nexus to support implementation of a stormwater infrastructure impact fee (stormwater fee). A stormwater fee must be reasonably related to the cost of the service provided by the local agency. This approach requires that a nexus be drawn between the fee and the impact on the payer of the fee in order to not be considered a tax. Therefore, a nexus study or cost of service analysis needs to be developed.

A Proposition 218-compliant, property owner balloted, property-related fee is a very viable revenue mechanism to fund stormwater programs. Property-related fees are decided by a mailed vote of the property owners with a simple majority (50%) threshold required for approval, with each parcel getting one vote. The property-related fee process is generally not as well known, and it is more time consuming and is more expensive than the special tax process, but it is much more common for funding stormwater management, and in many communities, more suitable to meet the voter approval threshold. One of the more successful municipalities to implement a property-related fee for stormwater services is Palo Alto, where they have succeeded twice.

As they pertain to GI, property-related fees remain a flexible and stout funding source. However, under Proposition 218, property-related fees must apply to defined services within a defined service area, and the costs of providing those services must be spread equitably over the properties that receive the services. The scope of GI is stretching the traditional boundaries of stormwater services, and great care must be taken when crafting a property-related stormwater fee structure. But just as water agencies have embraced conservation efforts and watershed habitat protections, so, too, can stormwater agencies carefully expand into the area of GI.

Challenges with Balloted Approaches

Ballot measures are inherently political and are often outside of the areas of experience and expertise of most stormwater managers. For any measure to have a fair chance, the community must be well informed, and their preferences and expectations must be woven into the measure. This requires significant outreach and research, which is something best handled by specialized consultants, and can take considerable time and resources.

Over the past 15 years, there have been fewer than two dozen community-wide measures attempted for stormwater throughout California, and the success rate is just over 50%. Very few attempts have been made to pass a stormwater ballot measure even though there may be over

[1] SMCWPPP, January 2017.
[2] Flood and Sea Level Rise Resiliency District: https://resilientsanmateo.org/

500 agencies with stormwater needs, because success is not assured. Clearly this is a high bar to clear, and any agency considering a balloted approach must carefully weigh the pros and cons before proceeding.

Funding strategies are discussed in greater detail in the GI Funding Report, which also includes a list of balloted efforts throughout the State along with a discussion on why they succeeded or failed.

Impacts of Senate Bill 231 on Stormwater Fees

Water and sewer fees are exempt from the voter approval requirements of Proposition 218. Senate Bill (SB) 231[3], signed by Governor Brown on October 6, 2017, provides a definition for sewer that includes storm drainage. This clarification would give stormwater management fees the same exemption from the balloting requirement that applies to sewer, water, and refuse collection fees, and would make stormwater property-related fees a non-balloted option – something very attractive to municipalities. Unfortunately, the Howard Jarvis Taxpayers Association, who authored and sponsored Proposition 218, is expected to file a lawsuit against any municipality that adopts a stormwater fee without a ballot proceeding. Therefore, the SB 231 approach must be given a very cautionary recommendation at this time. Any agency considering moving in that direction should consult with other agencies and industry groups to coordinate their efforts in a strategic manner and avoid setting an unfavorable legal precedent. C/CAG staff is keeping abreast of developments in this area and would be a good first point of contact.

**Special Financing Districts**

Special financing districts are not the same as special districts, which are a form of governance with their own elected board and scope of services. Special financing districts are simply financial structures created by local governments for the purpose of levying taxes, fees, or assessments for specific improvements and/or services provided. These include benefit assessments, community facilities districts (CFDs), business improvement districts, and infrastructure financing districts.

Most special financing districts require a balloting of affected property owners, but these are typically either a very small area (like a business district) or are applied to single land owners such as a developer in the process of a new development.

As a tax, the structure of the charges and the use of the funding is much more flexible than for a benefit assessment. For instance, publicly-owned property can be exempted as well as other classes of properties (such as commercial properties in a school-based CFD). In addition, general benefit does not need to be considered or funded from other sources. Finally, CFD taxes are easily structured to allow for future expansion to other properties that are developed in the future. They need not be contiguous to the original (or seed) development.

As they pertain to GI, the flexibility inherent in a CFD tax would allow flexibility in the types of improvements or services that are funded. However, as a tool primarily used for new development, the proceeds may be restricted to improvements and services for those new developments only.

[3] For more information on SB 231 see https://www.casqa.org/resources/funding-resources/overview-and-background

## APPENDIX D: SUPPORTING INFORMATION FOR EVALUATION OF FUTURE FUNDING OPTIONS

### Business Improvement Districts

A Business Improvement District (BID) is a mechanism in which businesses and property owners tax themselves and manage the funds to build or maintain certain assets. The BID can be set up and administered by the community members. For example, the Dogpatch and Northwest Potrero Hill Green Benefit District (http://dnwph-gbd.org) is a Green Business Improvement District in San Francisco developed to fund and maintain the public-realm landscaping in the area. The landscape staff used to maintain this landscaping can be trained in GI maintenance practices and qualified in sustainable landscaping services.

The County could work in the following areas to form small improvement districts: business districts in need of aesthetic or pedestrian improvements; industrial districts in need of pollution reduction and aesthetic improvements; and high traffic residential areas where there is public support for speed bumps or flooding measures.

### Community Facilities Districts (Mello-Roos)

Community Facilities Districts, more commonly known as “CFDs” or “Mello-Roos Districts”, are a form of special tax, and must be approved by property owners or registered voters. Similar to benefit assessments, these are often formed during the development process for a finite set of parcels owned by a single entity, and thus there would only be a single ballot. Oftentimes, formation of a CFD will be included in the conditions of approval for a development, so the balloting is more of a formality.

### Enhanced Infrastructure Financing Districts

In 2014, the California Legislature approved the Enhanced Infrastructure Financing District (EIFD) structure. EIFDs have emerged as a potential replacement for Redevelopment Agencies which were eliminated in 2012. Cities and counties may create EIFDs to capture *ad valorem* tax increments, similar to the now-defunct Redevelopment Agencies, to invest within the specific District boundaries or out-of-area projects that have a tangible benefit to the District. EIFDs are not limited to blighted areas and can directly, or through bond financing, fund local infrastructure including highways, transit, water systems, sewer projects, flood control, libraries, parks, and solid waste facilities. However, similar to grant funding and certain bond financing, EIFD funding cannot be used for ongoing operations and maintenance of facilities.

The tax increment is defined as the increase in ad valorem property taxes due to increases in assessed value associated with improvements. However, the one percent ad valorem tax is split amongst many local agencies with school districts typically receiving approximately 50% of that revenue – a share that is not eligible for EIFD participation. Other tax-sharing agencies can participate in an EIFD, but that participation is strictly voluntary. As a result, the revenue potential of an EIFD is estimated to be about 20% of a comparable redevelopment agency.

The formation of an EIFD requires consent from all the participating local agencies through a Joint Powers Authority but does not require voter approval unless bonds are to be issued. Other requirements include the preparation of an Infrastructure Financing Plan and formation of a Public Finance Authority. If an EIFD is proposed for an area that had been a redevelopment agency, the successor agency must have a Finding of Completion for all redevelopment obligations prior to receiving any new tax increment. An EIFD can run for up to 45 years, which provides flexibility in the issuance of bonded debt.

This financing structure may be a good fit for localized areas where stormwater infrastructure and water quality are major concerns – particularly environmental clean-up on private properties. An EIFD can be created with multiple municipalities, so it can span political boundaries making it a good fit for a watershed approach to GI funding. However, no EIFDs are known to include multiple jurisdictions at this time.

EIFDs also present a few challenges. Very few EIFDs have been formed in the State, and GI has not been highlighted in any of the plans to date. The EIFD concept is aimed at funding improvements that spur development in a district, which in turn increases the assessed property value (and thus the property tax revenues). The improvements are therefore seen as an economic engine that generates its own revenue (increased property taxes, or tax increment). Whether GI can be viewed as a viable "economic engine" has not yet been demonstrated, but the case could possibly be made.

Another drawback for EIFDs is the pace of revenues. Because the "economic engine" must come before the properties increase in value, funding is typically provided through bonds (or debt of some sort). This requires a revenue stream of substance and reliable pace in order to qualify for reasonable bond rates. For this reason, EIFDs are typically structured around major, transformative community infrastructure projects such as transportation (e.g., rail station, new freeway access) or primary infrastructure such as streets, sidewalks, parks, water, sewer and other utilities. While GI may fit well within a suite of infrastructure projects, it may be a weak "economic engine" on its own. Furthermore, any agency contemplating the formation of an EIFD (a cumbersome and expensive task) is likely to favor the more high-powered engines. In addition, EIFDs typically rely on other revenue sources such as grants, bonds, assessments, taxes and private sources in order to help cover revenue gaps with the tax increment revenues.

One possible example of a GI-based EIFD could be an industrial area that requires mitigation for PCBs, mercury or other pollutants where the mitigation measure may lie outside the area (e.g., a regional GI project). Since EIFD proceeds may be spent outside the district when there is a tangible benefit to the district, the EIFD may fund part or all of the GI project. Furthermore, if there are fewer than 12 registered voters in the EIFD, the approval for bonds would be a landowner (not registered voter) election – oftentimes more politically viable. Finally, the EIFD may also impose other taxes (subject to voter approval) that could serve as seed-money funding until the tax increment revenues are mature enough to support bonds.

<u>Development of an In-lieu Fee as part of an Alternative Compliance Program</u>
Establishment of an alternative compliance program with an in-lieu fee is a type of non-balloted approach to stormwater funding, which can be implemented without voter approval. (See the next section for more discussion of in-lieu fees.)

**Alternative Compliance Approaches**
Provision C.3 of the MRP requires new development and redevelopment projects above certain size thresholds to comply with stormwater regulations. One of the regulations requires low-impact development (LID) measures to be constructed and maintained in perpetuity for the management of on-site stormwater runoff. In some situations, on-site stormwater management can be difficult to design, expensive to construct, and/or costly to maintain. One option for the developer is the consideration of off-site alternative compliance with approval of the regulating municipality.

## APPENDIX D: SUPPORTING INFORMATION FOR EVALUATION OF FUTURE FUNDING OPTIONS

Provision C.3.e.i. of the MRP allows the following alternative compliance options:

- Construction of a joint stormwater treatment facility for multiple developments;
- Construction of a stormwater treatment system off-site (on public or other private property) that treats runoff from an equivalent amount of impervious surface;
- Payment of an in-lieu fee for a regional project (on another public or private property).

Each option comes with obligations for municipal staff in addition to other pros and cons for the municipality and developer. Currently, qualified urban infill redevelopment projects in the Bay Area that have site constraints that limit use of LID treatment measures often take advantage of the Special Project option in MRP Provision C.3.e.ii.[4] However, the Special Project option may not be included in future MRPs, and the County may leverage alternative compliance as an option to fund and/or construct municipal GI projects. The County may also consider updating the stormwater section of its municipal code to allow for one or more of these alternative compliance options.

In-Lieu Fee Approaches and Challenges

In-lieu fees are attractive in the GI arena as they could be a source of funding for regional projects that help an agency meet their GI Plan goals. There are two basic ways to collect in-lieu fees for alternative compliance: ad hoc approach; and structured approach.

The ad hoc approach is done on a case-by-case basis and is usually negotiated with an individual developer depending on the financial and logistical circumstances. The City of Emeryville project is an example of this approach. This approach presents challenges and opportunities, but the agency's leverage is limited to its discretionary authority and compliance with local regulations and the MRP 2.0. One advantage is that the outcome can be customized to the project. For instance, compliance could be severed into any (or all) of three options: on-site construction; off-site construction; and in-lieu fee contribution. In the Emeryville example, all three of the options were utilized: on-site LID for the majority of the site, off-site LID for five selected locations, and an in-lieu fee for the estimated 30-year O&M costs of the project. An ad hoc approach allows for out-of-the-box thinking. This is often the course followed for agencies that have few and sporadic development projects. But for agencies with a steady stream of development, it can be laborious to the point of overwhelming.

A structured approach would typically follow the developer fee model (AB 1600[5]). This would end up with a set of in-lieu fees adopted and published in the agency's master fee schedule. The San Francisco Public Utilities Commission (SFPUC) is exploring this approach and it appears that they have made a calculation of the amount of their in-lieu fee[6]. The SFPUC recently announced a GI Grant program[7] that may use future revenue from developer in-lieu fees, among other funding sources.

---

[4] Special Projects are urban in-fill, transit-oriented development projects that meet certain criteria in the MRP and are allowed to use certain types of non-LID treatment measures (high flow rate media filters) to treat a portion of the site's runoff.

[5] Development impact fee program requirements are set forth in Government Code §§ 66000-66025 (the "Mitigation Fee Act"), the bulk of which were adopted as 1987's AB 1600.

[6] $765,000 per acre of impervious surface managed (based on the GI grant program and previous presentations.) Note that the basis for this fee may be not be applicable to municipalities with separate storm sewer systems.

[7] https://sfwater.org/index.aspx?page=1260

However, for MRP permittees, the path to set up a structured approach must include a comprehensive nexus study complete with goals, objectives, project lists, and a reasoned methodology linking development impacts or compliance needs to projects – possibly by geographic or watershed zones – and options for variations. If the County is anticipating numerous development projects (particularly small to midsized projects) in the near future, the effort to adopt in-lieu fees would be worthwhile. It allows staff to simply apply the scheduled fees to each project as it comes around. At the same time, for larger projects that enter into a developer agreement, those adopted fees could be set aside for a more creative or appropriate ad hoc approach.

One key element to an in-lieu fee program is the identification of in-lieu projects. The development of the list of prioritized projects for the County's GI Plan coupled with the identification of GI opportunities in the County's CIP projects will go a long way toward meeting this challenge.

Credit Trading Program

Another type of alternative compliance program is a credit trading program. Credits are created by one property owner whose project has the capacity to overbuild the on-site LID, which is then traded to other property owners who may not be able to meet their MRP 2.0 requirements. The program is typically managed by a government agency and can create incentives to treat stormwater in excess of the NDPES permit requirements on regulated sites, while also creating incentives to install systems that treat stormwater on non-regulated sites. One example of a credit trading program is the one developed by Washington D.C.'s Department of Energy and the Environment[8]. The MRP does not specifically mention credit trading programs, but such a program could be developed in consultation with the Regional Water Board as a form of alternative compliance[9].

As this applies to GI, the public agency could become more than just the broker of credits and become a creator or consumer of credits to be applied toward its GI goals. These credits would be a form of currency, analogous to the in-lieu fees described in the previous section.

**Grants**

Federal, state, and regional grant programs have funding available to local governments to support GI efforts. These grant programs include:

- California Proposition 1 (Water Quantity, Supply, and Infrastructure Improvement Act of 2014) Stormwater Implementation Grant Program;
- California Natural Resources Agency Trails and Greenways and River Parkways Grant Programs (Proposition 68);
- California Coastal Conservancy Grant Programs (e.g., Prop 1 and Prop 68);
- California Water Resources Control Board: 319(h) Non-Point Source Implementation Program;[10]

[8] https://doee.dc.gov/src

[9] Source: SCVURPPP Green Infrastructure Funding Options technical memorandum dated February 13, 2018.

[10] Projects or activities required by or that implement a National Pollutant Discharge Elimination System permit, including urban, area-wide stormwater programs covering discharges from a MS4, are not eligible for funding under Section 319(h) grants.

- California Department of Water Resources: Integrated Regional Water Management Program Implementation Grants;
- California State Parks: Land & Water Conservation Fund and Rails-to-Trails Programs;
- California Department of Forestry and Fire Protection: Urban and Community Program;
- California Strategic Growth Council: Urban Greening Program;
- California Office of Emergency Services (OES) 404 Hazard Mitigation Grant Program;
- US Environmental Protection Agency: San Francisco Bay Water Quality Improvement Fund;
- Caltrans Cooperative Implementation Agreements or Grants Program;
- One Bay Area Grant Program (transportation projects);
- Plan Bay Area 2040 Priority Conservation Area Grants; and
- San Francisco Bay Restoration Authority Grants.

Other potential grant resources that may be tapped in the future to support GI include Greenhouse Gas Reduction Funds derived from the California Cap and Trade Program.

As a result of Senate Bill 985, now incorporated into the California Water Code, stormwater capture and use projects must be part of a prioritized list of projects in a Stormwater Resource Plan in order to compete for state grant funds from any voter-approved bond measures. Since many of the County's GI opportunities and potential regional projects are included in the San Mateo County Stormwater Resource Plan (2017)[11], the County is well positioned to apply for grant funds from sources such as the Proposition 1 Stormwater Grants.

Advantages of using grant funding may include the following:

- Grants can fund programs or systems that would otherwise take up significant general fund revenues;
- Grants often fund new and innovative ideas that a local agency might otherwise be reluctant to take on using general funds;
- Grants can be leveraged with other sources of funding increasing the viability, benefits, and/or size of a project; and
- Successful implementation of a grant-funded project can establish a record that can lead to other grants.

Challenges with using grants as a funding approach typically include:

- Grants are opportunistic in that local governments have no control over when grant monies will become available. However, in some cases opportunities to apply for grants and the anticipated level and timeline of the funding are scheduled well in advance;
- Grants are often available only once for the same purpose, which can lead to agencies creating ever "new" programs to qualify for funds. Other "strings" can be attached to the grant creating implementation or maintenance complexities;
- Grants are competitive. Considerable resources may be required to apply for a grant with no guarantee of success;
- Some level of matching funds is usually required. Some types of funds cannot be matched with other types. For example, Caltrans transportation grants are not eligible as a match with other State grant funds; and

[11] http://ccag.ca.gov/srp/

- Grants can also be resource intensive to manage and some require significant reporting throughout the project to maintain/receive funding.

While grant funding can help propel a GI program forward, it typically requires another source of funding to cover grant obligations such as matching funds or post-project maintenance. This understanding helps to underscore the importance of an underlying, dedicated and sustainable revenue source such as a stormwater fee or tax.

**Partnerships**

By teaming up with other entities, an agency may not generate additional funding directly, but partnerships offer many other benefits that can aid in the overall resources needed to deliver projects such as GI improvements. These can come in the form of economy-of-scale savings or multi-benefit projects that can achieve multiple goals for a single price. Several such strategies, as well as some other beneficial strategies, are discussed below.

Multi-Agency Partnership

Some resources and project opportunities do not match agency boundaries, and multi-agency partnerships can take advantage of those situations. For example, regional projects are a natural fit for multi-agency partnerships. Every agency tends to have strengths and weaknesses: Some are excellent at grant writing and obtaining grants but lack in project delivery capacity or local environmental conditions that fit certain grants (such as GI opportunities), while other agencies may have complementary strengths. By sharing resources and funding, regional projects can be delivered more efficiently – "more bang for the buck." Economy-of-scale savings can help cut costs – in some cases substantially – and GI projects and programs are no exception.

Challenges and opportunities abound in such partnerships. For example, developing mechanisms for sharing the planning, capital, operations and maintenance and administrative chores can be challenging. On the other hand, these types of projects can be an opportunity to be either a generator of trading credits or a way to invest trading credits (as described in an earlier section). In addition, such partnerships can be a source of multi-benefit projects – projects that can achieve GI goals as well as other important public and private goals.

Caltrans Mitigation Collaboration

Caltrans operates under its own statewide NPDES permit in parallel with municipal permittees. In many cases, Caltrans and local agencies operate along the same drainage system with one discharging into the other's facilities. Thus, NPDES requirements are sometimes a shared obligation. In some cases, Caltrans has funding available to mitigate various pollutant loading that can be shared with local agencies through Cooperative Implementation Agreements to pursue local or regional GI projects. In this way, Caltrans can often meet its pollutant load mitigation requirements outside their limited rights of way while benefiting local watershed objectives using Caltrans funding in partnership with the local agencies.

Public-Private Partnership (P3)[12]

Public-Private Partnerships (P3s) have the potential to help many communities optimize their limited resources through agreements with private parties to help build and maintain their public

[12] Source: SCVURPPP Green Infrastructure Funding Options technical memorandum dated February 13, 2018.

infrastructure. P3s have successfully designed, built, and maintained many types of public infrastructure such as roads and drinking water/wastewater utilities across the U.S. Until a few years ago, there were no efforts to develop P3s specifically for stormwater management or Clean Water Act requirements.

The EPA Region 3 Water Protection Division (WPD), in the mid-Atlantic region, has been researching, benchmarking, and evaluating P3s for their potential adaptation and use in the Chesapeake Bay watershed. On December 6, 2012, the EPA Region 3 WPD hosted a P3 Experts Roundtable in Philadelphia, PA. The goal of the P3 Roundtable was to provide a forum for a targeted group of private sector representatives to discuss in detail the feasibility, practicality, and benefits of using P3s to assist jurisdictions in the finance, design, construction, and O&M of an urban stormwater retrofit program. The results of this Roundtable were published in "A Guide for Local Governments," the foundation and approach for applying a stormwater P3 model across the Chesapeake Bay watershed. This guide provides communities with an opportunity to review the capacity and potential to develop a P3 program to help “close the gap” between current resources and the funding that will be required to meet stormwater regulatory commitments and community stormwater management needs. In addition, this guide and the tools presented (fees/rebates, credit/offset trades, and grants/subsidies) are a continuing effort, commitment, and partnership between EPA Region 3 and communities in the Chesapeake Bay region. EPA believes it will help to raise the bar and further advance the restoration goals and objectives for the Chesapeake Bay (EPA 2015).

In California, P3-enabling legislation was enacted by the state in 2007, and since then several agencies have used P3s for public infrastructure projects, such as Caltrans with the Presidio Parkway (Doyle Drive) approach to the Golden Gate Bridge in San Francisco, and the State of California judicial system with a courthouse in Long Beach. However, to date, there are no known P3s that have been developed in the state for the explicit purpose of implementing GI. Prince George’s County in the Chesapeake Bay watershed is the most often cited example of a GI program using a P3; however, they are able to use their stormwater fee for their program.

In California there is a scarcity of agencies that have stormwater fees that can be leveraged in a P3 program – this is related to the historically difficult Proposition 218 process of establishing dedicated stormwater funding. California stands alone in that regard – all the other states make it easier to establish such funding streams. However, under SB 231, this may be changing in the near future as a select group of municipalities begin to navigate the new options allowed under that legislation.

The non-profit organization, WCX (the West Coast Infrastructure Exchange), has promoted Prince George’s P3 model in California and the west coast and released a report on water resiliency projects in 2016. WCX is involved at the state and regional levels to increase awareness of P3s and other infrastructure tools.

Advantages of using P3s include:

- Leveraging public funds while minimizing impacts to a municipality’s debt capacity;
- Accessing advanced technologies;
- Improved asset management;
- Drawing on private sector expertise and financing;
- Benefits to the local economic development and “green jobs;” and
- Relieving pressure on internal local government resources.