PUBLIC WORKS
City of San Mateo

City of San Mateo

GREEN INFRASTRUCTURE PLAN

August 2, 2019

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

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EXECUTIVE SUMMARY

Urban development has traditionally involved replacing natural landscapes with impervious pavement and buildings. Typically combined with underground, piped conveyance storm drain systems this "gray infrastructure" approach has increased the volume and pollutant loads of stormwater runoff while simultaneously reducing groundwater recharge. As the runoff drains directly into local streams, it has caused erosion and impacts on riparian habitats and the Bay. Bay Area communities, such as the City of San Mateo, are now attempting to reverse this historic pattern by shifting to the use of Green Infrastructure (GI), reducing the impact of urban development on waterways with GI features.

GI features mimic nature, and use plants, soils, and/or pervious surfaces to collect stormwater, allowing it to soak into the ground, and be filtered by soil. This reduces the quantity of water and pollutants flowing into local creeks. The City of San Mateo has used GI in the public right-of-way on several projects over the last few years.

The City of San Mateo has prepared this GI Plan to guide the siting, implementation, tracking, and reporting of GI projects on City-owned land over the next several decades. Development of the GI Plan is required by the City's Municipal Regional Stormwater National Pollutant Discharge Elimination System Permit, also known as the MRP.

The GI Plan describes the City's methodology to identify and prioritize areas for implementing GI, and estimates targets for the extent of the City's area that will be addressed by GI through 2040. The Plan includes maps of the City's prioritized areas and potential project opportunities, and lays out the City's GI implementation strategy. Key elements of the strategy include: coordination with GI regulations for private development and opportunities in adjacent public rights-of-way; identification of GI opportunities in capital projects; and aligning GI goals and policies with other City planning documents to achieve multiple benefits and provide safe, sustainable, and attractive public streetscapes. The Plan contains guidance and standards for GI project design and construction, describes how the City will track and map constructed GI projects, and how the information will be made available to the public. Lastly, it explains existing legal mechanisms to implement the GI Plan, and identifies potential sources of funding for the design, construction, and maintenance of GI projects.

1.0 Introduction

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

1.1 Background

1.1.1 City Description

San Mateo, incorporated in 1894, is centrally located on the San Francisco Peninsula, in eastern San Mateo County, between San Francisco and San José. It is approximately 15.7 square miles in area, including some 3.2 square miles of San Francisco Bay water[1]. The significant natural resource areas in the City are the Bay Shoreline, Marina Lagoon, Sugarloaf Mountain, San Mateo creek and Laurel creek. Marina Lagoon is 185 acres in size and approximately 4.5 miles long. While the lagoon primarily serves a flood control purpose, it also has recreational, aesthetic and wildlife value.

The City's creeks have in large part been channelized, culverted, or subjected to development within their riparian corridors. Well vegetated sections do exist, however, and though non-contiguous do support wildlife. Almost 75% of San Mateo Creek's length is above ground and well vegetated. Other creeks in the City are Cherry Canyon Creek, which parallels Edgewood Road as it crosses along private yards, Borel Creek that runs from the Western Hills to the 19th Avenue Channel, and the small but relatively natural Beresford Creek, which flows from the canyons south of Campus Drive to the 19th Avenue Channel[2].

San Mateo is predominately residential neighborhoods. Residential single family homes account for approximately 34% of the land area. Multi-family low and high density units account for 14% of the land area. Retail is concentrated at Hillsdale Shopping Center, along El Camino Real, and the Downtown. Office uses are concentrated in office parks along the SR 92 corridor and Downtown[3]. The College of San Mateo is a 153 acre campus in the San Mateo hills that serves approximately 10,000 day, evening and weekend students[4].

Heritage trees and street trees are a significant urban resource to San Mateo. In 1968, the City adopted a Heritage Tree ordinance. The ordinance, which has been amended several times since 1968, established the intent of preserving as many of these significant trees as possible through the regulation of removal and pruning. A Heritage Tree is defined, in part, as one which is of historical significance or which has a trunk with a diameter of 10 inches or more, if indigenous, and 16 inches or more for all other trees, as measured at 48 inches above natural grade. The planting, maintenance care, and removal

[1] City of San Mateo General Plan Land Use (April 6, 2015)
[2] City of San Mateo General Plan Conservation Open Space, Parks and Recreation (April 18, 2011).
[3] City of San Mateo General Plan Land Use (April 6, 2015)
[4] College of San Mateo website: https://collegeofsanmateo.edu/aboutcsm/

of street trees is governed by the City's Municipal Code. The intent of the Street Trees Ordinance is to foster the planting of trees, to promote aesthetic value of streets, and to provide an orderly means of maintaining the trees. The Parks and Recreation Department is responsible for administering the street tree program, which includes over 20,000 trees on roadway medians in street-side planter strips, and in the public right-of-way behind monolithic sidewalks[5].

The City of San Mateo Zoning Code includes open space requirements for planned developments (residential and non-residential), projects in a variety of multi-family zones, and projects in the Central Business District. Open space plazas for public use are required for large buildings in the Central Business District. The Bay Meadows Phase I development provided approximately 4.6 acres of privately owned and maintained park space. In addition, there is significant open space within the Franklin Templeton Office Campus[6].

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 San Francisco Bay Regional Water Quality Control Board (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, the 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 it has encouraged the use of GI by municipal agencies as a prominent component of their MS4 programs[7].

The State and Regional Water Boards have followed suit in recognizing not only the water quality benefits of GI but the opportunity to augment local water supplies in response to the impacts of drought and climate change as well. The 2014 California Water Action Plan called for multiple 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' stated mission is to "lead the evolution of storm water management in California by advancing the perspective that storm water is a valuable resource, supporting policies for collaborative watershed-level storm water management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests."[8]

These Federal and State initiatives have influenced approaches in Bay Area municipal stormwater NPDES permits, as described in the Section below.

[5] City of San Mateo General Plan Conservation and Open Space Element (April 18, 2011)
[6] City of San Mateo General Plan Conservation and Open Space Element (April 18, 2011)
[7] See: https://www.epa.gov/green-infrastructure
[8] https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/

Municipal Regional Stormwater Permit

The City is subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I municipalities and agencies in the San Francisco Bay area (Order R2-2015-0049), which became effective on January 1, 2016. The MRP applies to 76 municipalities and flood control agencies that discharge stormwater to San Francisco Bay, collectively referred to as permittees.

Since 2005, 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 "Low Impact Development" (LID) measures, including site design, pollutant source control, stormwater treatment and flow control measures as appropriate. LID treatment measures, such as rainwater harvesting and use, infiltration, and biotreatment, have been required on most regulated projects since December 2011.

Provision C.3.j of the 2016 MRP requires the City to develop and implement a long-term GI Plan for the inclusion of LID measures into storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs, and other elements. The GI Plan must be completed and submitted to the Regional Water Board by September 30, 2019.

While Provision C.3.j of the MRP contains the GI program planning and analysis requirements, other provisions (C.11 and C.12) establish a linkage between public and private GI features and required reductions of pollutants in stormwater discharges. Permittees in San Mateo County (County), collectively, must implement GI on public and private property to achieve specified pollutant load reduction goals by the years 2020, 2030, and 2040. These efforts will be integrated and coordinated countywide for the most effective and resource-efficient program. As an indication as to whether these load reductions will be met, Permittees must include in their GI Plans estimated "targets" for the amounts of impervious surface to be "retrofitted" as part of public and private projects (i.e., redeveloped or changed such that runoff from those surfaces will be captured in a stormwater treatment system or GI measure) over the same timeframes (2020, 2030, and 2040).

A key component of the GI definition in the MRP is the inclusion of GI systems at both private and public property locations. 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 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 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 county-wide level as well as implement GI on a larger scale.

The City began the process of evaluating Capital Improvement Projects (CIP) for the inclusion of GI measures through the MRP Provision C.3.j.ii Early Implementation requirements with the goal of "no missed opportunities". The City has been assessing CIP projects for inclusion of green infrastructure since January 2016.

1.2 Purpose and Goals of the Plan

The purpose of the City's GI Plan is to demonstrate the City's commitment to gradually transform its traditional "gray" storm drainage infrastructure to include green stormwater infrastructure. The GI Plan will guide the identification, prioritization, implementation, tracking, and reporting of green stormwater

infrastructure projects within the City. The GI Plan will be coordinated with other City plans, such as stormwater, bicycle and pedestrian transportation, traffic, specific plans, and parks, to achieve multiple potential benefits to the community, including improved water and air quality, reduced local flooding, increased water supply, traffic calming, safer pedestrian and bicycle facilities, climate resiliency, improved wildlife habitat, and a more pleasant urban environment.

Specific goals of the GI Plan are to:

- Align the City's goals, policies and implementation strategies for GI with the General Plan and other related planning documents;
- Identify and prioritize GI opportunities throughout the City;
- Establish targets for the extent of City area to be addressed by GI over certain timeframes;
- Provide a workplan and legal and funding mechanisms to implement prioritized projects; and
- Establish a process for tracking, mapping, and reporting completed projects

1.3 What is Green Infrastructure?

In natural landscapes, most of the rainwater soaks into the soil or is taken up by plants and trees. However, in urban areas, building footprints and paved surfaces such as driveways, sidewalks, and streets prevent rain from soaking into the ground. As rainwater flows over and runs off these impervious surfaces, this "urban runoff" or "stormwater runoff" can pick up pollutants such as motor oil, metals, sediment, pesticides, pet waste, and litter. It then carries these pollutants into the City's storm drains, which flow directly to local creeks and San Francisco Bay, without any cleaning or filtering to remove pollutants. Stormwater runoff is therefore a major contributor to water pollution in urban areas.

As urban areas develop, the increase in impervious surface also results in increases in peak flows and volumes of stormwater runoff from rain events. Traditional "gray" stormwater infrastructure, like most of the City's storm drain system, is designed to convey stormwater flows quickly away from urban areas. However, the increased peak flows and volumes can cause erosion, flooding, and habitat degradation in downstream creeks to which stormwater is discharged, damaging habitat, property, and infrastructure.

1.3.1 Green Infrastructure

A new approach to managing stormwater is to implement green stormwater infrastructure. GI uses vegetation, soils, and other elements and practices to capture, treat, infiltrate and slow urban runoff and thereby restore some of the natural processes required to manage water and create healthier urban environments. GI facilities can also be designed to capture stormwater for uses such as irrigation and toilet flushing.

GI integrates building and roadway design, complete streets, drainage infrastructure, urban forestry, soil conservation and sustainable landscaping practices to achieve multiple benefits. At the city or county scale, GI is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, GI comprises stormwater management systems that mimic nature and soak up and store water.[9]

[9] https://www.epa.gov/green-infrastructure/what-green-infrastructure

1.3.2 Benefits of Green Infrastructure

GI can provide multiple benefits beyond just managing rainfall and runoff. These benefits include environmental, economic, and social improvements. GI can be an important way to increase a community's resilience to climate change.

GI measures can mitigate localized flooding and reduce erosive flows and quantities of pollutants being discharged to local creeks and the San Francisco Bay. Vegetated GI systems can beautify public places and help improve air quality by filtering and removing airborne contaminants from vehicle and industrial sources. Trees that treat stormwater runoff can also reduce urban heat island effects by providing shade and absorbing heat better than paved surfaces, and provide habitat for birds, butterflies, bees, and other local species. Pervious pavement can be quieter than conventional pavement and can be safer as faster infiltration of water on the pavement surface reduces hydroplaning. When GI facilities are integrated into traffic calming improvements such as curb extensions at intersections, they can help increase pedestrian and bicycle safety and promote active transportation, which in turn can result in improved human health and reduced carbon emissions.

GI facilities designed with extra storage can capture stormwater for later use as irrigation water or non-potable uses such as toilet flushing and cooling tower supply, thus conserving potable water supplies.

Widespread implementation of GI potentially offers significant economic benefits, such as deferring or eliminating the need for some gray infrastructure projects. By providing more storage within the watershed, GI can help reduce the costs of conveyance and pumping of stormwater. When cost-benefit life cycle cost analyses are performed, GI is often the preferred alternative due to the multiple benefits provided by GI as compared to conventional infrastructure.

1.3.3 Types of Green Infrastructure 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. 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 1-1. Stormwater curb extension North Central neighborhood, San Mateo (Source: City of San Mateo)

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 1-1) 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.

A stormwater planter (Figure 1-2) 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 that is available.

Figure 1-2. Stormwater planter, Hotel Nia, Menlo Park (Source: City of Menlo Park)

Stormwater Tree Well Filters and Suspended Pavement Systems

A stormwater tree well filter 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 pavements 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 1-3. 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 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 allows water to pass through the joint spacing between solid pavers, and PP allows 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 1-4. 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.

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

Figure 1-5. Infiltration trench covered with pervious pavement, Martha Gardens Alleys, San José (Source: City of San José)

example of an infiltration trench is shown in Figure 1-5. Infiltration trenches can have exposed gravel, landscaped surface or previous pavement surface.

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 is shown in Figure 1-6. 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.

***Figure 1-6. Subsurface infiltration system, generic example (Source:* Conteches.com)**

Green Roofs

Green roofs 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 (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 1-7. Green Roof, Casa Feliz Housing Project, San José (Source: First Community Housing)

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). 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.

Figure 1-8. Rainwater harvesting cistern, Environmental Innovation Center, San José (Source: City of San José)

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 1-9. 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

GI Plan Workplan Development and Adoption

The GI Plan development process began with the preparation of the City's GI Workplan describing the goals, approach, tasks, and schedule needed to complete the GI Plan. Development of the Workplan (or framework) was a regulatory requirement (Provision C.3.j.i(1) of the MRP) to demonstrate the City's commitment to completing the GI Plan by September 30, 2019. The City completed the Workplan and the City Council adopted a resolution approving the Workplan on June 5, 2017.

The overall approach to developing the GI Plan consisted of three main components:

1. Identifying the type, location, and priority of potential GI measures to meet pollutant reduction targets;
2. Reviewing City planning, policy, and ordinance documents for adequacy and consistency with GI Plan language, and updating them if needed to facilitate Plan implementation; and
3. Incorporating technical guidance and information on funding, tracking, and maintenance mechanisms to facilitate GI implementation.

Regional and Internal Collaboration

The City is a member of the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), a program of the City/County Association of Governments of San Mateo County (C/CAG). C/CAG is a Joint Powers Authority (JPA) that addresses issues of regional importance to San Mateo County jurisdictions such as congestion management and water quality. SMCWPPP's 22 member agencies include 15 cities, five towns, the County of San Mateo and the San Mateo County Flood Control District. SMCWPPP has developed guidance and templates to assist the member agencies with development of a GI Plan and facilitates and encourages coordination and collaboration on regional GI Projects. For example, SMCWPPP provided a GI Plan Workplan template. Other SMCWPPP products, including the Stormwater Resource Plan for San Mateo County (SRP) and San Mateo Countywide Green Infrastructure Design Guide, are discussed in more detail in relevant sections of the Plan.

The City worked with other SMCWPPP member agencies to review, approve and fund GI related products through participation in the SMCWPPP Stormwater Committee, New Development and Construction Subcommittee (NDS) and Green Infrastructure Technical Advisory Committee (GI TAC). The City, through SMCWPPP, also participated in the Bay Area Stormwater Management Agencies Association (BASMAA) on regional GI guidance. 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.

Adoption and Public Participation

The City established a GI Work Group, consisting of staff from the City's Public Works, Parks and Planning Departments. The GI Work Group worked with a consultant team to develop the GI Plan. The Plan was presented at a Sustainability and Infrastructure Commission Study Session meeting on June 12, 2019 and July 10, 2019, and to City Council on September 3, 2019.

1.4.2 GI Plan Sections

The remainder of the GI Plan is structured as follows:

Chapter 2 describes the relationship of the GI Plan to other planning documents and how those planning documents have been updated or modified, if needed, to support and incorporate GI requirements. For documents whose desired updates and modifications have not been accomplished by the completion of the GI Plan, a work plan and schedule are laid out to complete them.

Chapter 3 outlines the materials being developed by SMCWPPP and the City to provide guidelines, typical details, specifications and standards for municipal staff and others in the design, construction, and operation and maintenance of GI measures.

Chapter 4 presents the methodology and results for identifying and prioritizing areas for potential GI projects and for estimating targets for the amounts of impervious surface to be "retrofitted" as part of public and private projects by 2020, 2030, and 2040.

Chapter 5 outlines the City's strategy for implementing prioritized potential GI projects within the next ten years and through 2040.

Chapter 6 discusses the variety of mechanisms to be employed by the City in order to implement the GI Plan, including future planning, tracking, and funding.

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 4
C.3.j.i.(2)(b)	Prioritized Project Locations	Section 4.4.3
C.3.j.i.(2)(c)	Impervious Surface Targets	Section 5.7
C.3.j.i.(2)(d)	Completed Project Tracking System	Section 6.5
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 3.1.2
C.3.j.i.(2)(h,i)	Integration with Other Municipal Plans	Chapter 2

MRP Provision	GI Plan Elements	GI Plan Section
C.3.j.i.(2)(j)	Workplan to Complete Prioritized Projects	Section 6.1
C.3.j.i.(2)(k)	Evaluation of Funding Options	Section 6.2.2
C.3.j.i.(3)	Legal and Implementation Mechanisms	Section 6.2.1

2.0 Coordination with Other Planning Documents

To ensure effective implementation of the GI Plan, the City's planning documents and policies should include adequate wording to align with the Plan and ensure integration of the City's vision with respect to GI. The MRP requires Permittees to review municipal planning documents, update them as needed to appropriately incorporate GI elements, and summarize them within their GI Plans. For any updates not yet completed, the GI Plan must include a workplan identifying how GI and LID measures will be appropriately included in future plans. Consequently, relevant City planning documents were evaluated to determine to what extent they were aligned with the Plan.

2.1 Existing City Plans and Policies

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

- 2030 General Plan
- Downtown Specific Plan
- Climate Action Plan
- Bicycle Master Plan
- Citywide Pedestrian Master Plan
- Sustainable Streets Plan
- Central Park Master Plan

There are additional plans available on the City's Planning Resource Documents webpage. The City did not review these similar plans that are less-actively used with a low likelihood for future updates such as, El Camino Real Master Plan (September 2001), Hillsdale Station Area Plan (April 2011), Bay Meadows Specific Plan Amendment (November 2005), San Mateo Rail Corridor Transit-Oriented Development Plan (June 2005), Mariner's Island Specific Plan (1995), Shoreline Park Specific Plan (1990), Detroit Drive Specific Plan (1990) and North Central Community Baseline Transportation Plan (February 2011).

The following sections provide a brief discussion for each plan reviewed. A prioritized workplan for the integration of GI language into existing and future City planning documents is provided in Section 2.3.

2.1.1 General Plan

The General Plan is a State requirement to guide long-term land use and development. The Plan includes goals, policies, and programs to address land use, circulation, housing, conservation, open space, noise, and safety. Public Works staff is currently participating in the City's General Plan update, which will include a Complete Streets element. The Complete Streets element will include traffic development, bike and pedestrian, green infrastructure, and sustainable streets; and include revised language throughout which consistently supports GI. Examples of existing language supporting GI, and suggested revisions for the future are outlined for specific sections of the General Plan below including Land Use (LU), Urban Design (UD), Conservation, Open Space and Parks and Recreation (C/OS), and Safety (S):

- Investigate the feasibility of developing capacity to use recycled wastewater, stormwater runoff, graywater and ground water that will enable reuse of water for irrigation purposes, freeing comparable potable water supplies for other uses. (LU 4.4)
- Stormwater Treatment. Continue to implement the San Mateo Countywide Stormwater Pollution Prevention Program to ensure compliance with the National Pollutant Discharge Elimination System (NPDES) permit.
    1. Prevent water pollution from point and non-point sources.
    2. Minimize stormwater runoff and pollution by encouraging low-impact design features, such as pervious parking surfaces, bioswales and filter strips in new development.
    3. Encourage the use of drought-tolerant and native vegetation in landscaping. (LU 4.4.5)
- Since many goals and policies of the General Plan promote San Mateo as a sustainable city, it is important to recognize that site layout and the design of buildings are major factors in meeting the objectives of sustainable design. Sustainability starts in the early design stages of a development. The location and orientation of structures on a parcel are critical in order to take full advantage of solar opportunities and shading, and preserve natural resources such as mature vegetation. Construction materials should be chosen to maximize energy efficiency and use recycled materials whenever possible. High efficiency heating and cooling equipment and appliances can reduce water use, maximize energy efficiency, and improve indoor air quality. Drought tolerant landscaping and the use of pervious paving materials can also reduce water waste and runoff into the Bay. (UD Sustainable Design)
- The City has implemented the Stormwater Pollution Prevention Program (STOPPP) to increase the quality of runoff flowing into Marina Lagoon, and thus improve the quality of the lagoon for all users. (C/OS 1.1 – 1.4)
- These policies are implemented on a project by project basis as development adjacent to creeks and waterways is proposed. Compliance with San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP) is emphasized. (C/OS 2.1 – 2.3)
- Require that new Creekside development include… protection or enhancement of riparian vegetation and water (including stormwater) quality. (C/OS 2.4 b)
- Water Quality. Continue to strive for the highest possible level of water quality reasonable for an urban environment in City creeks, channels, Marina Lagoon, and the Bay through the provision of administrative, maintenance, and treatment measures. (C/OS 2.6)
- The City has implemented the Stormwater Pollution Prevention Program (STOPPP) and the Integrated Pest Management policy to increase the quality of runoff flowing into creeks, channels, Marina Lagoon, and the Bay which will improve the quality of these bodies of water for all users. (C.OS 2.6)
- Low Impact Development. Regulate the location, density, and design of development throughout the City in order to preserve topographic forms and to minimize adverse impacts on vegetation, water, and wildlife resources. (C.OS 3.2)
- New Development Street Trees**.** Require street tree planting as a condition of all new developments in accordance with the adopted Street Tree Master Plan, El Camino Real Master Plan, or Hillsdale Station Area Plan, as applicable. (C/OS 6.6)
- Street Tree Planting**.** Encourage the planting of new street trees throughout the City and especially in gateway areas such as Third Avenue, Fourth Avenue, El Camino Real (SR 82),

Hillsdale Boulevard, and 42nd Avenue; encourage neighborhood participation in tree planting programs; explore non-City funded tree planting programs. (C/OS 6.7)

- Public Open Space Design**.** Review planning applications for opportunities to promote exceptional design and use of public open spaces in new developments and new public buildings. (C/OS 10.1)
- Sustainability Practices**.** Establish management and operating practices that are environmentally, socially and economically sustainable. (C/OS 13.6)

The City will consider appropriate integration of GI language into the Land Use element on stormwater treatment, Urban Design element on sustainable design, C/OS element on creeks and channels, and Safety element on the stormwater drainage system when the plan is updated.

2.1.2 Downtown Specific Plan

San Mateo's Downtown has historically been viewed as the center of the City. This Downtown Plan provides a framework for future decision making. The policies provide an overall direction to be followed and will be used to evaluate private development projects. Specific implementation measures guide the City's and Redevelopment Agency's actions regarding public improvements, and the ultimate disposition of publicly owned land in downtown. The Downtown Area Plan was adopted by the City Council on May 19, 2009.

Examples of existing sections supporting GI, and suggested revisions for the future are outlined for specific sections of the Downtown Area Plan below.

- Support Sustainable Initiatives in Downtown. Downtown projects and operations should support the City's sustainability efforts…City-wide sustainable initiatives shall be incorporated and shall be used in the implementation of Downtown Plan policies. (Goal 8)
- Pedestrian Amenities. Enhance the sidewalk environment of primary pedestrian streets as indicated on the Pedestrian, Park and Open Space Policies map by providing improvements to the appearance, comfort, convenience and safety of pedestrian areas. (Goal III.2)
- Midblock Pedestrian Crossings. Enhance and extend the midblock pedestrian crossings in the Downtown Retail Core to provide safe and attractive pedestrian circulation. (Goal III.5)

The City will evaluate appropriate integration of GI language into these sections regarding how GI stormwater treatment measures can be incorporated into midblock pedestrian crossings and wider sidewalks.

2.1.3 Climate Action Plan

The City of San Mateo has a long-standing commitment to environmental stewardship and sustainability. The City Council adopted the Climate Action Plan (CAP) in April 2015. The CAP demonstrates the City's leadership to reduce greenhouse gas (GHG) emissions and exceed the California state target of 1990 emissions levels by 2020. The CAP provides a comprehensive list of community-wide actions that will help reduce GHG emissions originating in the City of San Mateo. The strategies in the CAP are implemented by all of the City departments, residents and businesses. The City of San Mateo is in the process of updating the existing CAP. An opportunity exists to discuss the use of GI measures to reduce energy consumption (e.g., through reducing stormwater volumes and associated energy consumption at pump stations, through use of green roofs to reduce local temperatures by

shading building surfaces, deflecting radiation from the sun, and releasing moisture into the atmosphere), or to combine with street trees and other types of landscaping.

2.1.4 Bicycle Master Plan

The City of San Mateo Bicycle Master Plan guides the future development of bicycle facilities and programs in the City. The recommendations in this Plan will help the City reach goals adopted in the General Plan as well as the Sustainable Initiatives Plan by creating an environment and programs that support bicycling for transportation and recreation, encourage fewer trips by car and support active lifestyles. The existing Bicycle Master Plan supports green infrastructure by referencing the General Plan, yet can be enhanced in the following ways:

- Supplement Safe Routes to Schools (SRTS) Funding Section, Design Guidelines and Toolkit with descriptions of how GI enhancements can work with safety bulbouts/crossings etc. to create multi-benefit projects.
- Incorporate GI into the planning and design of cycling facilities when possible. For example, buffered bike lanes or protected bikeways could incorporate GI in barrier/protection areas or with pervious pavement. This can be done by referencing GI directly or integrated "Sustainable Street" design solutions that achieve multiple benefits.

2.1.5 Citywide Pedestrian Master Plan

The City of San Mateo recognizes the value of walking and developed the Citywide Pedestrian Master Plan to improve the pedestrian environment and to establish itself as a more walkable, livable, and healthy city. The Plan provides a broad vision, strategies, and actions for improving the pedestrian environment in San Mateo. The planning and design of public pedestrian facilities presents an opportunity for the City to incorporate GI into the public right of way and provide additional benefits. Examples of existing sections supporting GI are as follows:

- Work with property owners of vacant land adjacent to public walkways to identify and implement beatification opportunities on the vacant property, such as landscaping, fencing and/or art installations. (Policy 3.B.2)
- Adopt a Green Streets policy that facilitates environmentally sensitive design of the public right of way. (Objective 3.C)
- This Plan recommends the City of San Mateo implement green street design where feasible on projects identified in this Plan. The San Mateo Countywide Water Pollution Prevention Program published the San Mateo County Sustainable Green Streets and Parking Lot Design Guidebook (2009) and can serve as a valuable reference for the City. (Section 5.2.2 Green Streets)
- This Plan recommends the City institute a policy to install curb extensions at uncontrolled marked crosswalks citywide. It is also recommended the City prioritize installation of curb extensions at the locations presented in Table 5-4. (Section 5.3.1 Curb Extensions)
- A number of the existing midblock crosswalks are not located in the pedestrian desired path of travel which may result in pedestrian activity outside the marked crosswalks. Others were identified by the community as having poor visibility. Table 5-10 presents the recommend midblock crossing improvements. (Section 5.3.5 Midblock Crossing Improvements). This Plan recommends a study to improve access and pedestrian circulation at the intersection. Possible improvements include a marked crosswalk on south leg of the intersection and installation of a sidewalk on the unpaved southeast corner. Opportunities to incorporate stormwater treatment and drought-tolerant landscaping could also be explored. (Section 5.5.14 Peninsula Ave and Bayshore Blvd Intersection Improvement Study).

In the next update, the references to Green Streets and SMCWPPP guidance such as the new Green Infrastructure Design Guide (2019) can be updated and GI can be added to the planning and design of curb extensions, midblock crosswalks and pedestrian pathways.

2.1.6 Sustainable Streets Plan

In 2012, the City of San Mateo received a Caltrans' Community-Based Transportation Planning Grant to develop a Sustainable Streets Plan. The Sustainable Streets Plan comprehensively plans for and enhances the mobility of pedestrians, bicyclists and transit passengers of all ages and abilities, as well as, trucks, buses and automobiles. Additionally, the Sustainable Streets Plan is classified as a citywide Complete Streets Plan, but also includes Green Streets concepts including stormwater runoff improvements that capture, slow, filter, and potentially infiltrate stormwater runoff. The Plan remains in draft form, as it was never CEQA approved; therefore the entire draft plan will be revised and incorporated into the Complete Streets element of the revised General Plan.

2.1.7 Central Park Master Plan

The City of San Mateo Parks and Recreation Department updated the Central Park Master Plan in March of 2018. While the plan respects and enhances the historic character and qualities of Central Park, it also proposes new features, and refinements to some key elements and facilities. The proposed master plan is anticipated to exceed 10,000 square feet of new and redeveloped impervious area and will likely be a C.3 Regulated Project under the Municipal Regional Stormwater NPDES Permit (MRP). The master plan has taken this into consideration and designed proposed improvements using a Low-Impact-Development approach.

Site Design measures include preserving existing open space and trees, planting interceptor trees, minimizing new impervious area, and disconnecting impervious areas. Stormwater treatment will be provided through a number of permanent Best Management Practices (BMPs). The proposed plaza/parking structure will be designed as a green roof with hardscape areas directed to bioretention planters. New paths in the park will be a combination of permeable materials and pavement. The paved paths will direct runoff to adjacent bio retention planters. The proposed tennis courts will direct flows to adjacent bio retention planters.

2.2 Regional Plans

The City 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 City's GI Plan builds upon previous planning efforts and incorporates lessons learned with an awareness of other regional priorities. The City recognizes that meeting its own GI implementation goals is related to its coordinated planning efforts. Regional planning efforts that the City participated in include the San Mateo County Stormwater Resource Plan (SRP), the C/CAG Sustainable Streets Master Plan, the Bay Area Integrated Regional Water Management Plan (IRWMP), and others.

2.2.1 San Mateo County Stormwater Resource Plan

The San Mateo County Stormwater Resource Plan (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 of San Mateo County and its Countywide Water Pollution Prevention Program, SMCWPPP. 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 San Mateo-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 City (see Chapter 4 for more details).

2.2.2 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. This tool will be used 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.

2.2.3 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.

2.3 Work Plan for Integration of GI Language in Plan Updates and Future Plans

2.3.1 Recommended Updates to Existing Plans

Although current City plans are generally aligned with and support the GI Plan, several City plans could benefit from additional GI-related language. Green infrastructure language will be utilized when updating and informing the revisions of these plans in accordance with each document's scheduled update in the table below. It is the City's current intent that the future General Plan updates will include a consolidation of the Bicycle Master Plan and Pedestrian Master Plan as part of a Circulation Element; the Climate Action Plan; and a Complete Streets Element that will include Green Infrastructure, Sustainable Streets, and reference to the County's Sustainable Streets Master Plan.

Title	Last Approved/Updated	*Projected Update	Includes Language to Support GI
General Plan Vision 2030	October 2010	2023	Yes
Climate Action Plan	April 2015	2020 (incorporated into General Plan)	Yes
Bicycle Master Plan	October 2011	2019	Yes
Downtown Plan	May 2009	2023	Yes
Pedestrian Master Plan	April 2016	2023 (incorporated into General Plan)	Yes

[a]All dates are tentative and subject to change pending schedules set forth by the appropriate authorizing body (City Council, etc.)

While the Downtown Specific Plan update is a separate process from the General Plan Update, its outcomes will be incorporated into the final General Plan.

2.3.2 GI Language Inclusion in Future Plans

The City 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 City plans, as described in Section 2.1 above, and in references such as SMCWPPP's *Planning Document Update – Model Language* (December 2016). When the General Plan is updated it will be the overarching policy document that will direct staff to follow GI requirements and policies when developing new planning documents.

3.0 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 City's jurisdiction. These guidelines, details, and specifications should address the different street and project types within the City, 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 City's specific requirements, standard details, and/or site conditions; and identified modifications to current City standard detail drawings to align with the Typical GI Details.

3.1 Development Process

The City of San Mateo worked with the other member agencies of C/CAG, which administers SMCWPPP, to develop the GI Design Guide. The GI Design Guide provides comprehensive design guidance and covers a broad range of 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 for MRP regulated projects are included in a companion document, the C.3 Regulated Projects Guide (C.3 Guide). The two documents, the GI Design Guide and the C.3 Guide, are commonly referred to as the "GreenSuite" and constitute design and sizing templates for the City's GI Plan.

3.1.1 Green Infrastructure Design Guide

The GI Design Guide addresses the requirements of the MRP, fulfilling Section C.3.j.i.(2)(e) requiring design and construction guidelines for streets and projects and C.3.j.i.(2)(f) for developing typical design details and specifications for different street and project types.

The GI Design Guide includes a range of information related to green infrastructure, such as provision of policies and definitions; identification of different types of treatment and site design measures; summation of various benefits including a range of community benefits provided beyond stormwater management; presentation of before and after images of integrating green infrastructure into projects; introduction of complete streets concepts and design; discussion regarding BASMAA's regional approach for alternative sizing for non-regulated and constrained green street projects; design and implementation considerations; operations and maintenance; and provision of typical construction details and specifications. The GI Design Guide explains how these concepts, considerations, and guidance can be used to effectively integrate green infrastructure into communities in new and redevelopment projects whether they are C.3 regulated or not.

General guidelines for overall streetscape and project design, construction, and maintenance have been developed so that projects have a unified, complete design and implement the range of functions associated with the projects. The MRP emphasizes the need for guidance related to green streets functions. The GI Design Guide includes implementation guidance specifically for stormwater

management and treatment within streets. The guidance supports safe and effective multimodal travel with a focus on the comfort of people walking and cycling; shared use as public space and an attractive and functional public realm; use of appropriate measures for different street and land use contexts and types; and the achievement of urban forestry goals and benefits. The GI Design Guide defines practices to identify GI opportunities and the efficient and effective coordination, review, and implementation in public and private projects.

The City will use the GI Design Guide and future amended versions to provide support and guidance in implementing GI within the City. The GI Design Guide can be found on SMCWPPP's website at https://www.flowstobay.org/gidesignguide. Due to local context and existing policies, however, some elements of the GI Design Guide are not consistent with all City policies, standards and/or guidelines. As part of the GI Plan development, the City has identified changes, deletions, and additions to the Typical GI Details and Specifications included within the Appendices of the Design Guide that are needed to customize them for the San Mateo community. Refer to Section 3.2 for further information on these changes and additional details.

3.1.2 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 Methodology criteria are further described in Appendix A.

GI measures in public right-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 Methodology due to constraints in the public right-of-way such as lack of space, utility conflicts, or other factors, the City 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[10] for use by the City of San Mateo and other Permittees in their GI Plans. This Alternative Sizing Methodology is described in Appendix A.

3.2 Typical GI Details and Specifications

The Typical GI Details included within the Appendix A-3 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, pervious pavement and bioretention systems, but also includes details for subsurface infiltration systems and general components that apply to various types of GI systems. Although the GI Design Guide includes a few updated versions of single detail sheets and four new details, the full set of SFPUC GI Details have not yet been modified for SMCWPPP. For example, the Typical GI Details still

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

include references to San Francisco-specific codes, requirements, and street conditions. 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. An example of a typical detail included in the SMCWPPP GI Design Guide is shown in Figure 3-1.

The City has reviewed the entire set of Typical GI Details and has identified where updates are needed to customize them to projects within the City of San Mateo. Recommended updates were developed in the form of redlines on PDF details. The City plans to update this set of details at a later date. A table of recommended changes to the set of details is included in Appendix B.

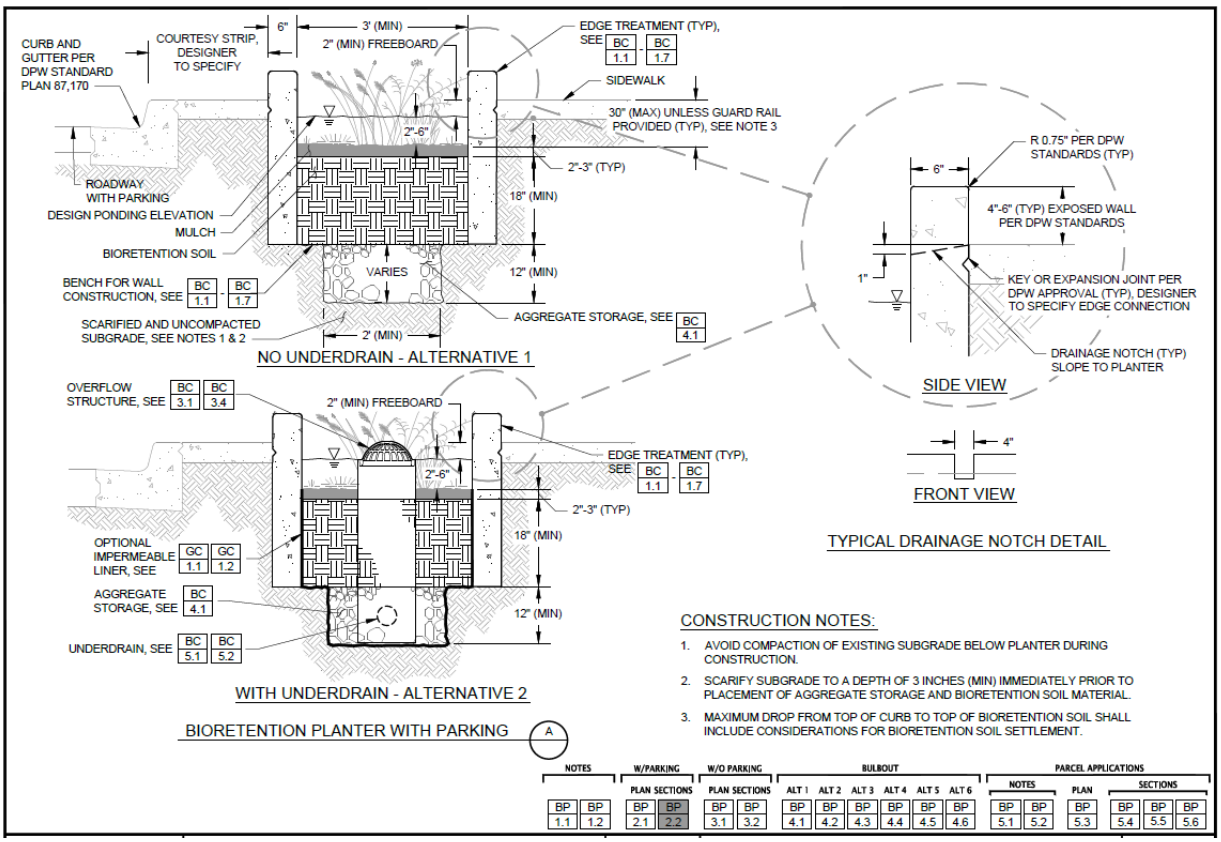


Figure 3-1. Example of Typical GI Detail in SMCWPPP GI Design Guide

In addition to the list of modifications in Appendix B, the City developed new details to supplement the set of Typical GI Details. The following details were determined to be the highest priority to support upcoming GI projects within the City:

1. Connected Tree Wells within a Street with Parallel Parking
2. Trash Capture Devices within Bioretention Planter Inlets

These new details are also provided in Appendix B of the GI Plan.

3.3 Utility Protection Guidance

During this process, the City also identified a need for more specific utility setback and protection guidance related to green infrastructure than the high-level guidance provided in the GI Design Guide.

The City of San Mateo reviewed the SFPUC Asset Protection Standards[11] that provide specific requirements for the avoidance or protection of water and combined sewer facilities for various streetscape improvements. This document includes requirements for the protection of utilities that cross under, though, and/or near bioretention planters, pervious pavement systems, and stormwater curb extensions. These specific conditions are not addressed directly in any of San Mateo's existing codes or standards. To address this need, the City developed new guidance regarding the protection of public utility assets near and/or under GI facilities. This document, also provided in Appendix B, will need to be reviewed further with, and approved by, outside utility providers before it can be formally adopted into the City's utility standards and specifications. In parallel to the completion of the utility protection standards, the utility protection and crossing details included within the Typical GI Details should be modified to align with the new utility protection standards.

3.4 Existing City Standard Details and Specifications

The City reviewed its standard detail drawings for streetscape, parking, storm drain, sanitary sewer, street lighting, and street tree improvements and identified items that may need to be updated to coordinate with the GI Typical Details. These items are noted in the form of redlines on the City of San Mateo Standard Details included at the end of Appendix B. An example of the revisions to the Standard Details include the addition of different types of pervious pavement within their standard sidewalk, driveway, and roadway section details.

The comparison of the City Standard Details to the Typical GI Details revealed instances where it might be advantageous to adopt new GI standards in the public right-of-way. Because varying site conditions impact the overall layout, form, and design of GI facilities, it is more practical to make certain key components of the GI facilities into standard designs. Examples of Typical GI Details in which the City may consider converting into standard detail drawings include the following:

- Permeable pavement sections and specifications;
- Bioretention outlet structure;
- Bioretention planter curb cut inlet and outlet; and
- Bioretention planter trench drain inlet/outlet.

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

4.0 GI Project Prioritization Methodology

4.1 Introduction and Background

The GI Plan builds upon methods used in the SRP to identify, evaluate, and prioritize potential opportunities for GI. Through the development of the GI Plan, the metrics and methods used in the SRP were revised to consider the specific planning priorities of the City resulting in a prioritized list of GI project opportunities. The prioritized list does not necessarily imply an order of implementation but is instead intended to be used as a tool to help identify near-term projects for further evaluation. This section summarizes both the identification and prioritization of GI opportunities from the SRP and updates to the prioritization methods for the GI Plan.

4.2 Project Types

The GI Plan adopts methods of the SRP as a basis for identifying and prioritizing GI projects. In the SRP, project opportunities were organized into three categories due to the differences in scale, GI types, and measures of effectiveness. Project opportunities were then evaluated and prioritized only in comparison to other opportunities within the same category. The same three categories are used in the GI Plan and are described below:

- ***Category 1: Regional Stormwater Capture Projects***. Regional projects are defined as facilities that capture, treat and/or use stormwater draining from onsite and offsite areas. They are typically centralized facilities that capture, treat, and/or use stormwater from a large drainage area by diverting runoff from a nearby storm drain or channel.
- ***Category 2: Low Impact Development (LID) Projects***. LID projects mitigate stormwater impacts by reducing runoff through capture and/or infiltration and treating stormwater from on-site areas before it enters the storm drain system. LID techniques are intended to imitate pre-urbanization (natural) hydrologic conditions. Examples include bioretention, pervious pavement, infiltration systems, green roofs, etc.
- ***Category 3: Green Street Projects***. Green Streets use treatment measures similar to LID but are typically implemented linearly in the public right-of-way.

All GI projects 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, non-potable use, or returned to the storm drain system after treatment. Example photographs of each category are shown in Figure 4-1 below.

Example 1: Regional Stormwater Capture (subsurface infiltration) (*Source: Conteches.com*)

Example 2: LID (Pervious paving in a parking lot) (*Source: SMCWPPP GI Design Guide*)

Example 3: Green Street (Delaware St, San Mateo) (*Source: City of San Mateo*)

Figure 4-1. Examples of GI Projects by Category

4.3 Stormwater Resource Plan Prioritization

The SRP utilized a two-step process to 1) identify project opportunities and screen out sites infeasible for GI implementation, and 2) prioritize the identified GI opportunities based on a quantitative multi-benefit scoring process. These two steps are detailed in the following sections.

4.3.1. Opportunity Identification and Screening

This step consists of screening GI opportunities countywide based on factors that may be considered prohibitive constraints for implementing GI, such as parcel type and slope. Figure 4-2 provides a flow chart of the screening process.

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. Parcel size was also used to determine whether a project opportunity is considered an

opportunity for both LID and regional projects or an opportunity for LID projects only. Sites greater than or equal to 0.25 acres were considered large enough to support a regional project footprint and were considered an opportunity for both LID and regional projects. Parcels less than 0.25 acres were considered an opportunity for LID only. The resulting list of regional project opportunities is a subset of the LID project opportunities. The remaining parcels in the selection comprise the list of opportunities for regional and LID projects used in the prioritization step.

Green street opportunities were defined as street segments (divided at intersections) using the County street centerline dataset. Public right-of-way, street functional class, and slope were used to screen street segments suitable for green street projects. 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[12]. This excludes highways and other street classes that typically exhibit higher traffic volume/speeds and make the implementation of GI less ideal. Site slope is also an important consideration in green streets, since it may affect project feasibility and effectiveness. Street slopes greater than 5 percent present challenges with design and maintenance of GI. Street segments with an average slope greater than 5 percent were screened out. The remaining street segments in the selection comprise the list of green street opportunities used in the prioritization step.

No changes were made to the opportunity screening process used in the SRP; therefore, the GI Plan consist of the same opportunities identified in the SRP for San Mateo. However, for the purpose of the GI Plan, these project opportunities were scored and prioritized using the updated GI Plan prioritization process, described in Chapter 4. As a result, the ranking of project opportunities may differ from those in the SRP. Figure 4-2 shows the process and criteria used to screen both parcel and street-based opportunities.

[12] The 2018 TIGER roads dataset was examined for the GI Plan analysis to identify any changes to street classification or geometry since the Stormwater Resource Plan was developed.

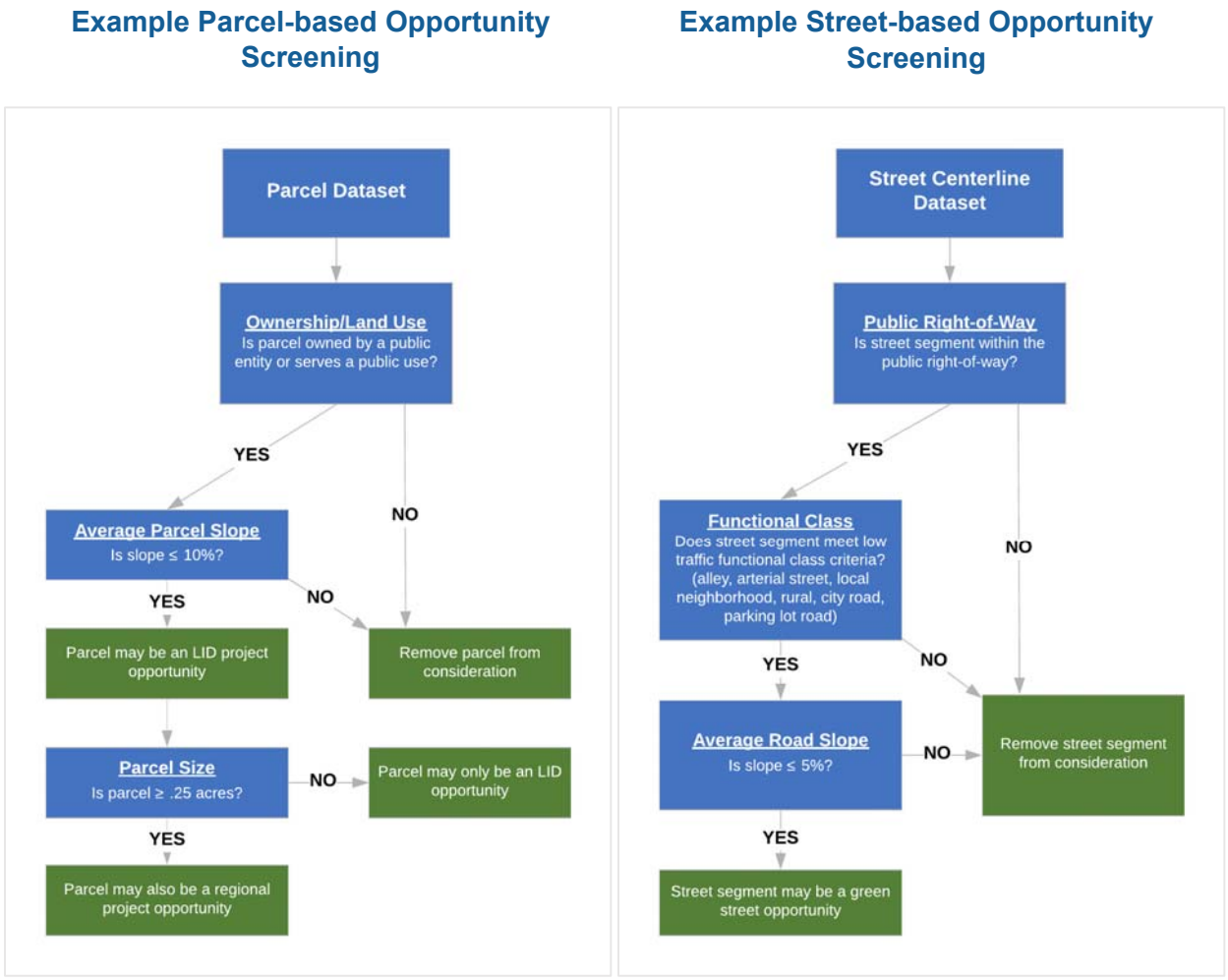


Figure 4-2. Flow chart of project opportunity screening process.

4.3.2. Metrics and Opportunity Scoring

After opportunities are identified during the screening process, a series of quantitative metrics was used to prioritize project opportunities by their potential to achieve multiple benefits outlined in the *Storm Water Resource Plan Guidelines* (Guidelines) by the State Water Resources Control Board (SWRCB 2015). These opportunities must demonstrate the ability to achieve multiple benefits related to water supply, water quality source control, reestablishing natural hydrology, creating or enhancing natural habitat, and providing community enhancement. Furthermore, the City provided additional considerations to tailor the analysis to projects and policies in San Mateo. A detailed analysis of these prioritization metrics from the SRP and City are further defined in Sections 4.4.1 and 4.4.2 respectively.

Prioritization metrics were selected for the SRP that were considered surrogate indicators of one of three things: the available stormwater capture opportunity, project effectiveness, and expected co-benefits. For example, imperviousness, parcel size, and land use are indicators of available opportunity (e.g., runoff-generating potential, available footprint, compatibility with current site use). Hydrologic soil group and slope are indicators of project effectiveness (e.g., infiltration capacity, prohibitive constraints, design challenges). Proximity to flood-prone streams, PCB interest areas, and other co-located projects are indicators of expected co-benefits (e.g., flood attenuation, source control, cost synergies).

An opportunity received a score for each metric based on specified ranges of values. Total scores for a project opportunity were derived by summing the score for each metric and, for some metrics, applying a weighting factor. Each project type (i.e., regional, LID, green street) was evaluated using its own table of metrics and ranked independently of each other. The following metrics were used in the SRP prioritization.

Parcel Land Use

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

Street Type

Street type, evaluated for green street projects only, was used to prioritize streets associated with lower traffic volume. Heavily-used streets may require increased maintenance and reduce system performance. Higher scores were given to local neighborhood roads, city streets, parking lot roads, and alleys, while lower scores were given to major arterials, collector roads, and highways.

Imperviousness

Imperviousness was evaluated for all three project types because of the relationship between high impervious areas and greater runoff potential. Because the primary goal of the SRP was to treat runoff via stormwater capture projects, opportunities with potential to produce more runoff were prioritized.

Parcel Size

Parcel size, considered for regional projects only, was evaluated to prioritize sites that have sufficient available area for a regional project footprint to treat runoff from larger drainage areas. Only parcels over 0.25 acres were considered for regional project opportunities. Higher scores were given to larger parcels.

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, higher scores were given to Soil Group A, with each subsequent group assigned fewer points. In many areas throughout the County, the dominant soil type is unknown due to lack of adequate soils data in highly urbanized areas. 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.

Slope

Slope was evaluated for all three GI categories. Sites with mild slopes often provide the most feasible opportunities for stormwater capture. Construction on steep slopes presents challenges with design, effectiveness, and maintenance of most GI projects.

Proximity to Flood-prone Streams

Proximity to flood-prone streams was evaluated for all three project types using a list of flood-prone streams throughout the County 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 slow the conveyance of runoff through detention and slow release; or remove the captured runoff through infiltration and 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 scores were given to sites that were closer to the stream with the assumption that greater upstream area is available to be treated.

PCB Interest Areas

PCB interest areas were used in the prioritization to give higher scores 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 PCB interest areas can potentially address water quality issues. The PCB 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 4-1. Areas with High interest were given higher scores than Moderate interest, while areas that were of low or no interest for generating PCBs received zero points. Projects received points in this category if a PCB interest area was within the project's representative drainage area or the project parcel itself is a PCB interest area.

Table 4-1. PCB interest areas

Category	Description
High	• Parcels associated with land uses 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). • Most commonly old industrial, electrical, recycling, railroad, and military. • These areas generally have not been redeveloped and do not contain stormwater treatment facilities.
Moderate	• Parcels associated with land uses that have limited risk factors associated with PCBs. • Typically older non-industrial urban land uses. • These areas generally have not been redeveloped and do not contain stormwater treatment facilities. • Less likely to have elevated concentrations of PCBs.

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 and redevelopment projects or other municipal capital improvement projects currently in the planning phase were given higher scores. 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[13] the County and cities submitted planned projects with the project description, contact information, and multiple benefits expected to be achieved by each project. Three projects were submitted by the City of San Mateo during development of the SRP and are listed in Table 4-2. Parcels and street segments that were located near one of the submitted projects were given higher scores. A project opportunity was considered co-located with another project if it was within 500 feet of a submitted project location.

The Safe Routes to School Program

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 pervious 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 Total Maximum Daily Load Waters

Project opportunities that drain to Total Maximum Daily Load (TMDL) waters, i.e., San Francisco Bay, are given higher scores. All projects in the SRP contain some element of stormwater capture resulting in volumetric reductions of runoff. The Bay is subject to several TMDLs, including PCBs and mercury TMDLs that require reductions in pollutant loads over the next several decades. Since stormwater is identified as the primary contribution of these pollutants to the Bay (SFBRWQCB 2013), volume reduction from stormwater capture projects will also result in reduction of these pollutants.

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 were assumed to include infiltration since it is a major element in restoring natural watershed processes. These metrics fall under the Water Supply category of the Guidelines.

[13] e-mail from Matt Fabry to C/CAG Stormwater Committee, February 29, 2016

- ***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.

Weighting Factor

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*, *PCB interest areas*, *co-located planned projects*, and the *Safe Routes to School Program*.

4.4 City-Specific Prioritization

Because no changes were proposed to the screening process, the opportunities evaluated in the GI Plan are the same as those identified in the SRP. However, the metrics used in the SRP prioritization were reevaluated for the GI Plan. As a result, project opportunities are scored differently and may have different rankings reflective of City priorities.

The metrics utilized in the SRP were intended to evaluate 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 City-specific

focus of the GI Plan allowed for reevaluation of the metrics utilized in the SRP and tailoring of the methodology with local considerations and datasets. The resulting prioritized list can serve as a tool for identifying near-term GI projects and form the basis for the City's implementation strategy. The subsequent sections outline City-specific metrics that were incorporated into the GI Plan prioritization.

4.4.1. Adjustment of SRP Metrics to City Priorities

Metrics that were originally included in the SRP but modified for the GI Plan are described below.

Hydrologic Soil Group

Hydrologic soil group is considered a proxy for infiltrative capacity. This designation categorizes soils into either poorly-drained (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 may impact aspects 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 considered in a separate metric considering both soil group and distance to nearest storm drain and dropped from the LID and green street metric tables. Regional projects, however, consider hydrologic soil group separately from proximity to storm drain like the SRP prioritization analysis. This is discussed in greater detail in the subsection titled "Adequate Infiltration/Available Connection 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 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.

Revised Co-located Projects List

The list of co-located projects that was originally submitted by the City during development of the SRP was revisited for the GI Plan prioritization update. Many of these projects were from the City's Capital Improvement Program (CIP). Projects that were identified after SRP development were added to the list. These projects consist of proposed private development projects in the pre-application phase. The City intends to look for opportunities in the public right-of-way near these development projects. Table 4-2 lists the projects that were included in the SRP analysis and those that were added to the GI Plan analysis.

Table 4-2. Projects submitted by San Mateo for SRP and projects to be added for GI Plan

Project Title	Location	Description
Identified in the Stormwater Resource Plan		
San Mateo Drive Pedestrian and Bicycle Improvements Project	San Mateo Drive from Peninsula Ave to Baldwin Ave	Enhance Green Infrastructure in an Existing Road Diet Project
East Poplar Improvements	East Poplar from Bayshore to Cavanaugh	Green Infrastructure
Central Park Improvements	Central Park, City of San Mateo 30 South El Camino Real	Include Groundwater Recharge and Green Infrastructure elements to Central Park Rehabilitation
Identified in the GI Plan		
Pre-Application Development Projects		
PA19-005	Hayward Park	A 3.18-ac parcel currently serving as a 225-space surface parking lot for CalTrain. The project proposes 189 apartment units to be located in two five-story residential buildings and includes 251 parking spaces on two levels of podium garage parking.
PA19-008	Monte Diablo Ave & Kingston St	Demolish the existing structures to construct 35 townhomes. The project site consists of four parcels totaling 1.23 acres. The townhomes would range from three to four stories tall and would total 80,526 sf. The site would include 85 parking spaces and a children's play area.
PA 18-038	1600-1620 S. El Camino Real & 1541-1543 Jasmine St	61,356-sf mixed-use building. 6 parcels totaling 32,500 sf. The mixed-use building would consist of office use on the ground floor, 44 residential units through 4 stories above, and 81 parking spaces.
PA 18-077	480 E. 4th Ave & 400 E. 5th Ave	Two city-owned parcels with a total of 235 surface parking stalls. Redevelop into affordable housing consisting of 164 units (148,355 sf) and an above-ground parking garage with a minimum of 164 private and 535 public parking stalls. 2,000 sf community serving space and long-term bicycle storage for 196 bikes.

Project Title	Location	Description
PA 18-036	940 S. Claremont St	17,002 sf three-story office building. Remodel of two historic buildings.
PA 17-030	1495 S. El Camino Real	0.68-acre site. Demolish existing 5,188 sf office building and replace with 27,025 sf office and retail building.
PA 16-064	477 E. Hillsdale Blvd Hillsdale Inn	Demolition of the Hillsdale Inn motel and self-service car wash, development of new 151-unit apartment complex on 3.06 acres.
PA18-052	Concar Passage	A mixed-use project with 961 residential units and 35,000 sf of retail space on approximately 14.5 acres. The project proposes five podium buildings that are three to four levels each, subterranean parking, and over 3 acres of public and private parks. 1,340 residential and 256 non-residential parking stalls are proposed.

Drains to TMDL Waters

Project opportunities that drain to Total Maximum Daily Load (TMDL[14]) waters, i.e., San Francisco Bay, were given higher scores in the SRP. Since stormwater is identified as the primary contribution of the TMDL-regulated pollutants to the Bay (SFBRWQCB 2013), project opportunities that are in watersheds that drain to the Bay were given higher scores. However, because this encompasses all the City of San Mateo, this metric would not be a differentiator if left unmodified. While the entire City is subject to the San Francisco Bay PCBs and Mercury TMDLs, only a portion of the City is covered by the San Francisco Bay Beaches Bacteria TMDL (Bacteria TMDL). The area draining to Marina Lagoon, subject to the Bacteria TMDL, covers approximately 75 percent of the City (Figure 4-3). Project opportunities in the watershed of Marina Lagoon, covered by the Bacteria TMDL, were given higher scores than opportunities in other areas of the City.

[14] A TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as a planning tool for restoring water quality (https://www.epa.gov/tmdl).

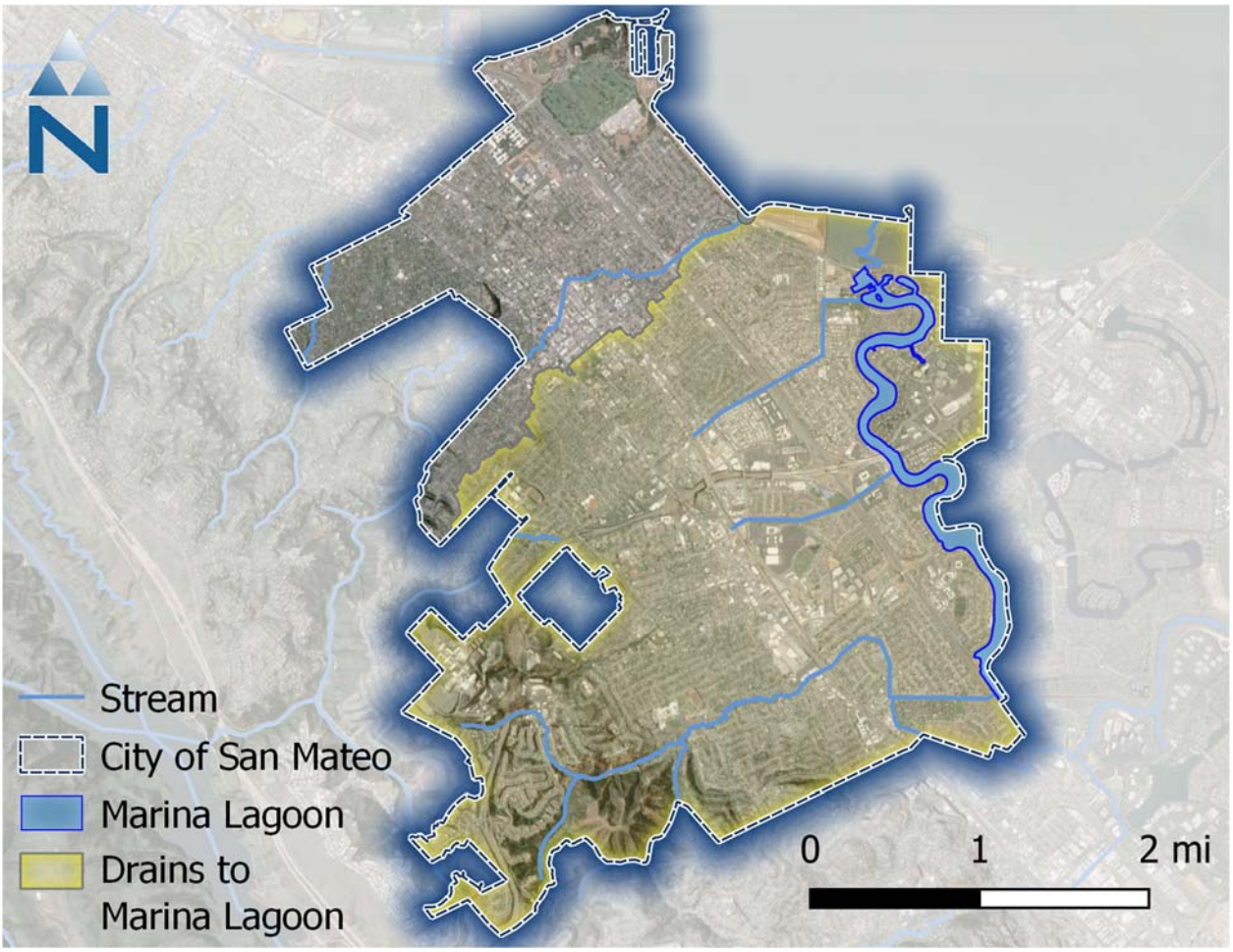


Figure 4-3 Marina Lagoon Watershed

Revisions to the "Above Groundwater Basin" and "Augments Water Supply" Metrics

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, the County of San Mateo Office of Sustainability has collected extensive groundwater data, including within the City of San Mateo, through its San Mateo Plain Groundwater Basin Assessment (San Mateo County 2018). Well sample data containing groundwater levels at over 100 locations within the City were available through the County's open GIS data portal. Project sites near wells with groundwater table measurements of less than 20 feet below the surface were given lower scores. 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 are those that are considered the most burdened from health, economic, and environmental factors. For the GI Plan, higher scores were assigned if an opportunity was located within a "Community of Concern," from the Metropolitan Transportation Commission (MTC), or a "Disadvantaged Community," determined by identifying all communities below 80% of the American Community Survey (ACS)-calculated median household income.

Modifications to the SRP metrics are outlined in Table 4-3 through Table 4-5.

4.4.2. 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 City. These metrics were used to augment the prioritization analysis with local data that were not 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 county-wide 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 San Francisco Bay Municipal Regional Stormwater Permit (MRP) (SFBRWQCB 2015). The RAA quantitatively demonstrates that 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. . RAA cost optimization was based on: (1) the number and type of GI project opportunities identified within each subwatershed from the Countywide SRP and (2) cost-effectiveness given various characteristics associated with GI measures, including infiltration rates and higher pollutant generation from upstream land uses. The GI Plan prioritization includes an RAA metric that prioritizes opportunities in subwatersheds where the RAA suggests greater amounts of GI can cost-effectively meet permit requirements. The amount of GI in each subwatershed varies across the different project types and is reflected in each project type's respective prioritization. Projects in subwatersheds where greater investment in GI may be more cost-effective were given a higher score in the prioritization. Figure 4--4 shows the distribution of GI project capacities across the City's subwatersheds that may cost-effectively meet the required load reductions specified in the MRP. The darker blue subwatersheds represent areas where more GI may be cost-effective, while lighter blue subwatersheds are areas where less GI may be needed. The figure represents amount of GI in terms of total storage capacity – the maximum volume of stormwater runoff that can be stored in a 24-hour period – across all projects in a given subwatershed. The RAA results should be used as a guide to inform GI implementation goals, but the City's actual implementation may differ. Refer to Appendix C for additional discussion of the RAA modeling process and a detailed explanation of results.

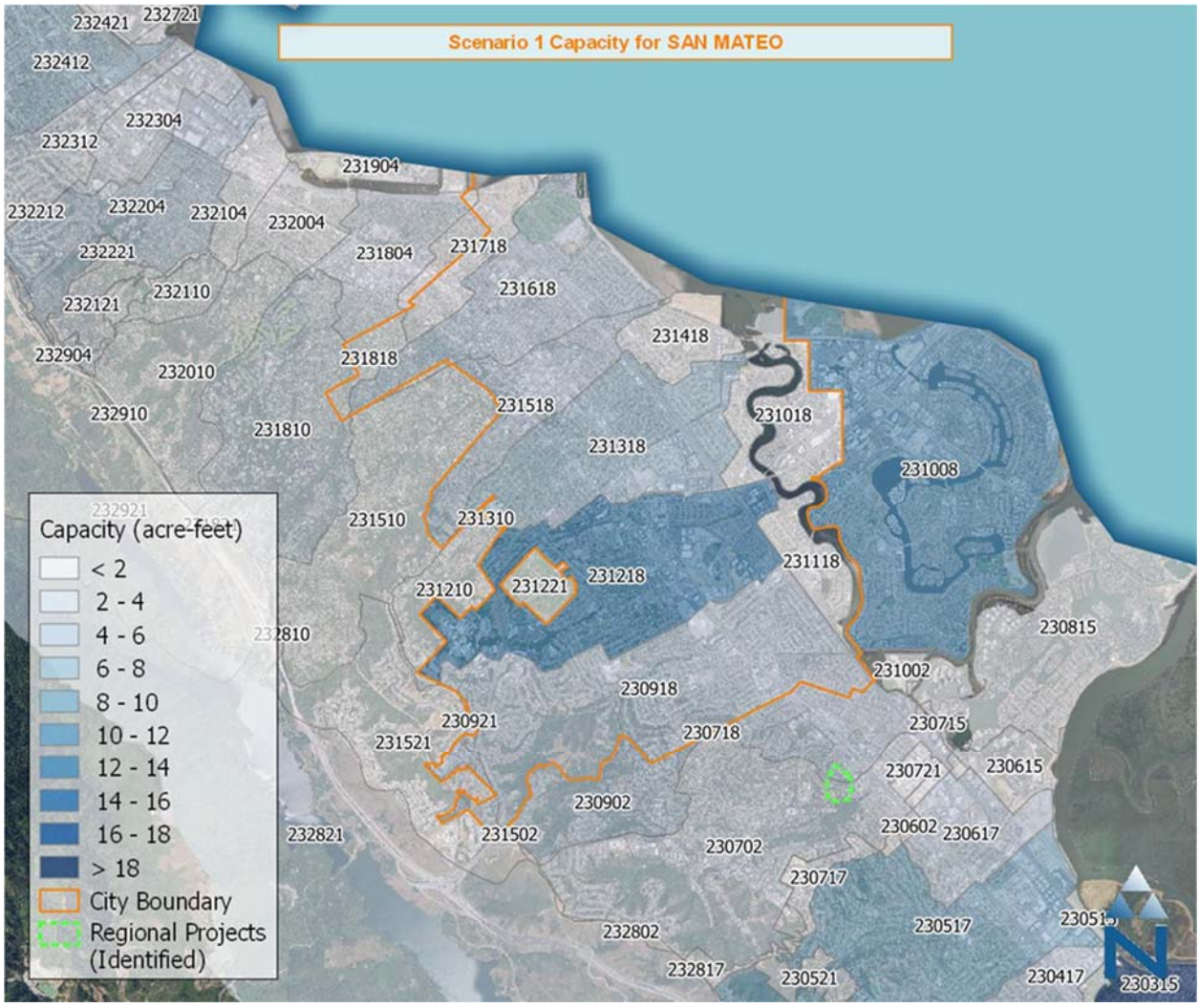


Figure 4-4. Spatial distribution of GI Capacity Needs by Subwatershed

Adequate Infiltration/Available Connection to Storm Drain

Many types of GI depend on connection to existing storm drain infrastructure. In order to treat runoff from the greatest drainage area possible, regional stormwater capture projects must often divert runoff directly from a nearby storm drain or channel. Biotreatment, pervious pavements, and other types of distributed GI measures rely on a connection to the storm drain through an underdrain to function in poorly-drained soils and to properly operate under larger-sized storm events. Projects were assigned scores based on distance from the nearest storm drain.

Different ranges of distances are prioritized for regional projects and the distributed GI types (i.e., LID and green streets) due to differences in the typical length of connection. Diversions to regional projects can often span greater distances, especially if pumping is involved. Regional project opportunities more than 1,000 feet from the nearest drain received zero points in this category. Opportunities less than 1,000 feet, 500 feet, and 200 feet away from the nearest drain received 1, 3, and 5 points, respectively.

Distributed GI, if designed with an underdrain, must often be placed nearer to existing storm drains than regional projects with pump diversions. Distributed GI constructed in high-infiltrating soils may not

require an underdrain. LID and green street project opportunities were given 5 points if located within well-drained soils (Hydrologic Soil Groups A and B). If located within poorly-drained soils (Groups C and D), these projects were given 3 points if within 200 feet of an existing storm drain and 1 point if farther than 200 feet from a storm drain.

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 City. 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 scores.

Vegetation Density

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. Using the County's vegetation mapping dataset, areas of low vegetation density are given higher scores to maximize the benefit achieved through urban greening. Using the County's high vegetation level shapefile, the total area of vegetation cover is aggregated at the census tract level. Areas with a lower percentage of vegetated area are prioritized.

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 5 miles of PG&E gas main that pass through the City of San Mateo, along Pacific Boulevard to the south and U.S. Route 101 to the north. Street segments along PG&E gas lines are given lower scores over other street segments.

Right-of-Way Width

Right-of-way width is an important metric for green street projects. The right-of-way is one of the most space-constrained sites for implementing GI. The right-of-way must maintain functionality for automotive, bicycle, and pedestrian traffic before consideration of GI. Implementing GI within the existing right-of-way without requiring a change to the right-of-way boundaries is a priority. For this reason, streets segments within wider right-of-way have a greater chance of supporting GI projects and were given higher scores. Because different street types (e.g., local, connector, arterial) have different roadway widths and width constraining features (e.g., sidewalks, street parking), streets are bracketed into the 33% widest, 33% moderate, and 33% narrowest streets according to their type. For example, the widest street segments of arterial streets occupy the same bracket as the widest street segments of local streets. Street segments within wider right-of-way were given higher scores.

Table 4-3 through 4-5 summarize the criteria and scoring used to prioritize GI opportunities across the City. The tables highlight the metrics that were previously used in the SRP, the metrics that were modified for the GI Plan, and the new City-specific metrics added to the prioritization process.

Table 4-3. Metrics for regional stormwater capture project opportunities

(**Bold** = metric was included in the SRP but modified for the GI Plan; Gray = 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	
Imperviousness (%)	< 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 100	
Parcel size (acres)	0.25 - 0.5	0.5 - 1	1 - 2	2 - 3	3 - 4	≥ 4	
Hydrologic soil group		D	Unknown	C	B	A	
Slope (%)	5 - 10	4 - 5	3 - 4	2 - 3	1 - 2	≤ 1	
Within a flood-prone watershed ~~Proximity to flood-prone channels (miles)~~	**Not in watershed**	~~> 3~~		~~1 - 3~~		**In flood-prone watershed** ~~≤ 1~~	**2**
Contains PCB interest areas	**None**			**Moderate**		**High**	
Currently planned by City or co-located with other City project	**No**					**Yes**	**2**
Drains to Bacteria TMDL water (Marina Lagoon)	**No**					**Yes**	
~~Above groundwater basin~~	~~No~~		~~Yes~~				
Augments water supply	**No**					**Above basin, outside of shallow GW, and 500' away from cleanup site**	

	Points						Weight Factor
	0	1	2	3	4	5	
Water quality source control	No	Yes					
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	**Not a disadvantaged community**	~~Yes~~				**MTC Community of Concern/ ACS Disadvantaged Community**	
City-Specific Metrics							
RAA-specified capacities by subwatershed (ac-ft)	Not in RAA subwatershed	Remaining subwatersheds		Subwatershed 231318		Subwatershed ID 231218	
Proximity to storm drain (ft)	> 1,000	500 - 1000		200 - 500		≤ 200	
Caltrans acreage in watershed	None	< 50 acres		50 - 100 acres		> 100 acres	

Table 4-4. Metrics for LID project opportunities

(**Bold** = metric was included in the SRP but modified for the GI Plan; ~~Gray~~ = 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	
~~Hydrologic soil group~~		~~D~~	~~Unknown~~	~~C~~	~~B~~	~~A~~	
Slope (%)	5 - 10	4 - 5	3 - 4	2 - 3	1 - 2	≤ 1	
Within a flood-prone watershed ~~Proximity to flood-prone channels (miles)~~	**Not in watershed**	~~> 3~~		~~1 - 3~~		**In flood-prone watershed** ~~≤ 1~~	**2**
Contains PCB interest areas	**None**			**Moderate**		**High**	
Currently planned by City or co-located with other City project	**No**					**Yes**	**2**
Drains to Bacteria TMDL water (Marina Lagoon)	**No**					**Yes**	
~~Above groundwater basin~~	~~No~~		~~Yes~~				
Augments water supply	**No**					**Above basin, outside of shallow GW, and 500' away from cleanup site**	
Water quality source control	No	Yes					

	Points						Weight Factor
	0	1	2	3	4	5	
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	**Not a disadvantaged community**	~~Yes~~				**MTC Community of Concern/ ACS Disadvantaged Community**	
City-Specific Metrics							
RAA-specified capacities by subwatershed (ac-ft)	Not in RAA subwatershed	Remaining subwatersheds		Subwatershed ID 231318		Subwatershed ID 231218	
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	
Vegetation density by tract		> 50%		20-50%		< 20%	

Table 4-5. Metrics for green street project opportunities

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

	Points						Weight Factor
	0	1	2	3	4	5	
Stormwater Resource Plan Metrics							
Street type	No Class		Arterial	Collector	Other	Local	
Imperviousness (%)	< 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 100	
~~Hydrologic soil group~~		~~D~~	~~Unknown~~	~~C~~	~~B~~	~~A~~	
Slope (%)		4 - 5	3 - 4	2 - 3	1 - 2	≤ 1	
Within a flood-prone watershed ~~Proximity to flood-prone channels (miles)~~	**Not in watershed**	~~> 3~~		~~1 - 3~~		**In flood-prone watershed** ~~≤ 1~~	**2**
Contains PCB interest areas	**None**			**Moderate**		**High**	
Currently planned by City or co-located with other City project	**No**					**Yes**	**2**
Safe Routes to School program	No					Yes	2
Drains to Bacteria TMDL water (Marina Lagoon)	**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					

	Points						Weight Factor
	0	1	2	3	4	5	
Reestablishes natural hydrology	No	Yes					
Creates or enhances habitat	No	Yes					
Community enhancement	**Not a disadvantaged community**	~~Yes~~				**MTC Community of Concern/ ACS Disadvantaged Community**	
City-Specific Metrics							
RAA-specified capacities by subwatershed (ac-ft)	Not in RAA subwatershed	Remaining subwatersheds		Subwatershed ID 231618		Subwatershed ID 230918	
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	
Vegetation density by tract		> 50%		20-50%		< 20%	
Utility conflicts *High conflict – PG&E gas mains* *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	
Roadway width (ft)		Narrowest 33% of street class		Middle 33% of street class		Widest 33% of street class	

4.4.3. Resulting City-Specific Prioritization List

The screening of parcels and street segments resulted in 123 regional, 172 LID, and 2,218 green street project opportunities across public parcels or right-of-way in San Mateo. For comparison, project opportunities were bracketed into High, Medium, and Low potential categories based on the total score from the prioritization analysis:

- High potential is defined as the 90th percentile of project opportunities.
- Medium potential is defined as between the 60th and 90th percentile.
- Low potential is defined as below the 60th percentile.

These categories represent the likeliness a project opportunity would result in an effective GI project if implemented at that site and is used as the basis for implementation strategy of the GI Plan. The list, or ranking, of the potential projects is not the order of implementation. Implementation and evaluation of potential projects will be based on other factors as described by the implementation strategy in Section 5.0. The number of project opportunities that fall into these brackets is summarized in Table 4-6.

Table 4-6. Summary of prioritization results for San Mateo

Bracket	Criteria	Project Type		
		Regional	LID	Green Street
High	> 90%	10	13	205
Medium	60 – 90%	27	49	644
Low	< 60%	86	110	1,369
TOTAL	**-**	**123**	**172**	**2,218**

Potential Regional Projects

A total of 10 high-potential, 27 medium-potential, and 86 low potential regional projects resulted from the City-specific prioritization. Table 4-7 depicts an example score sheet for two regional project opportunities in San Mateo. Figure 4-5 shows the regional project opportunities in San Mateo bracketed into High, Medium, and Low potential categories.

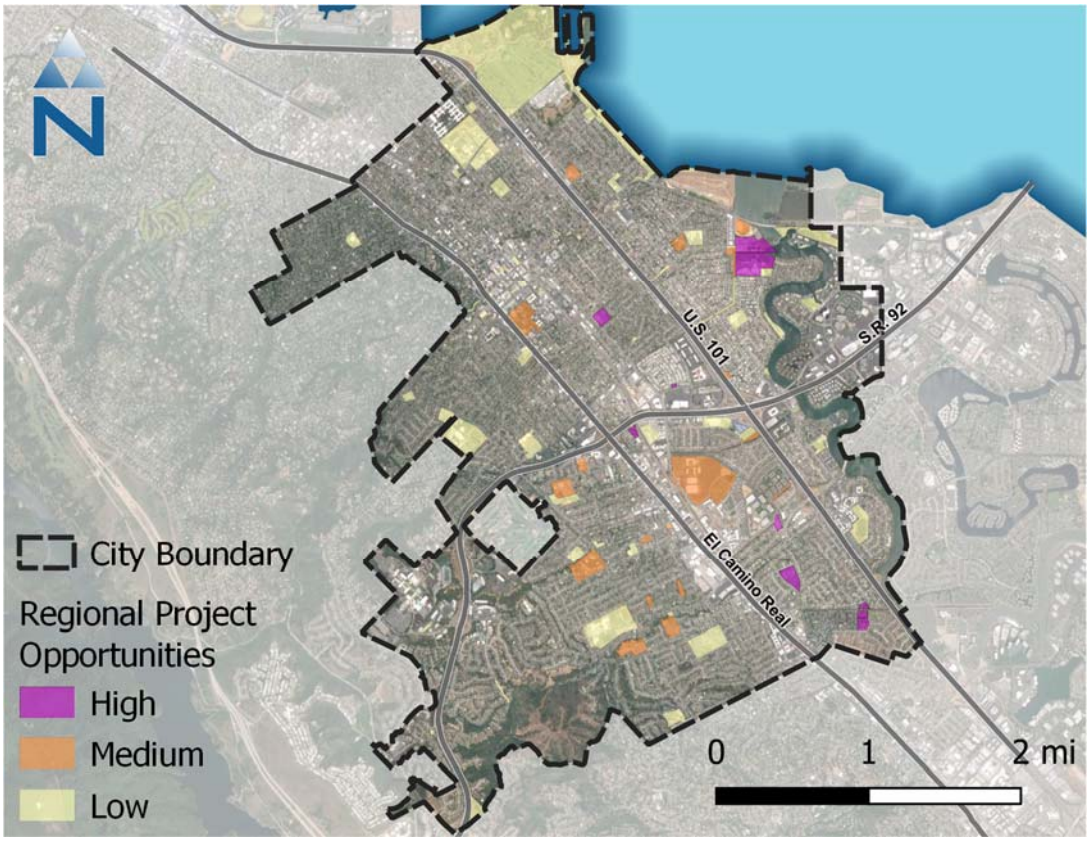


Figure 4-5. Regional project opportunities in San Mateo.

Table 4-7. Example scoring for two regional project opportunities in San Mateo

Project Opportunity Site Name	**Casanova Park**		**Fire Department Station #23**	
Category	High		Medium	
Total Score	50		45	
Characteristic	Value	Score	Value	Score
Parcel Land Use	Park	5	Public Building	3
Imperviousness (%)	57	2	76	4
Parcel Size (acres)	1.37	2	0.56	1
Hydrologic Soil Group	C	3	Unknown	2
Slope (%)	1	5	1	5
Within a flood-prone watershed	Yes	10	Not in flood-prone watershed	0
Contains PCB Interest Areas	High	5	High	5

Project Opportunity Site Name	Casanova Park		Fire Department Station #23	
Currently planned by City or co-located with other City project	No	0	No	0
Drains to TMDL water	Yes	5	Yes	5
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	No	0	No	0
Community enhancement	Not in a disadvantaged community	0	Not in a disadvantaged community	0
Subwatershed with highest capacity in RAA (by project type)	SWS 230918	1	SWS 231218	5
Proximity to storm drain (ft)	115	5	358	3
Caltrans area (acres)	68	3	118	5

Potential LID Projects

A total of 13 high-potential, 49 medium-potential, and 110 low-potential LID projects resulted from the City-specific prioritization. Table 4-8 depicts an example score sheet for two LID project opportunities in San Mateo. Figure 4-6 shows the LID project opportunities in San Mateo bracketed into High, Medium, and Low potential categories.

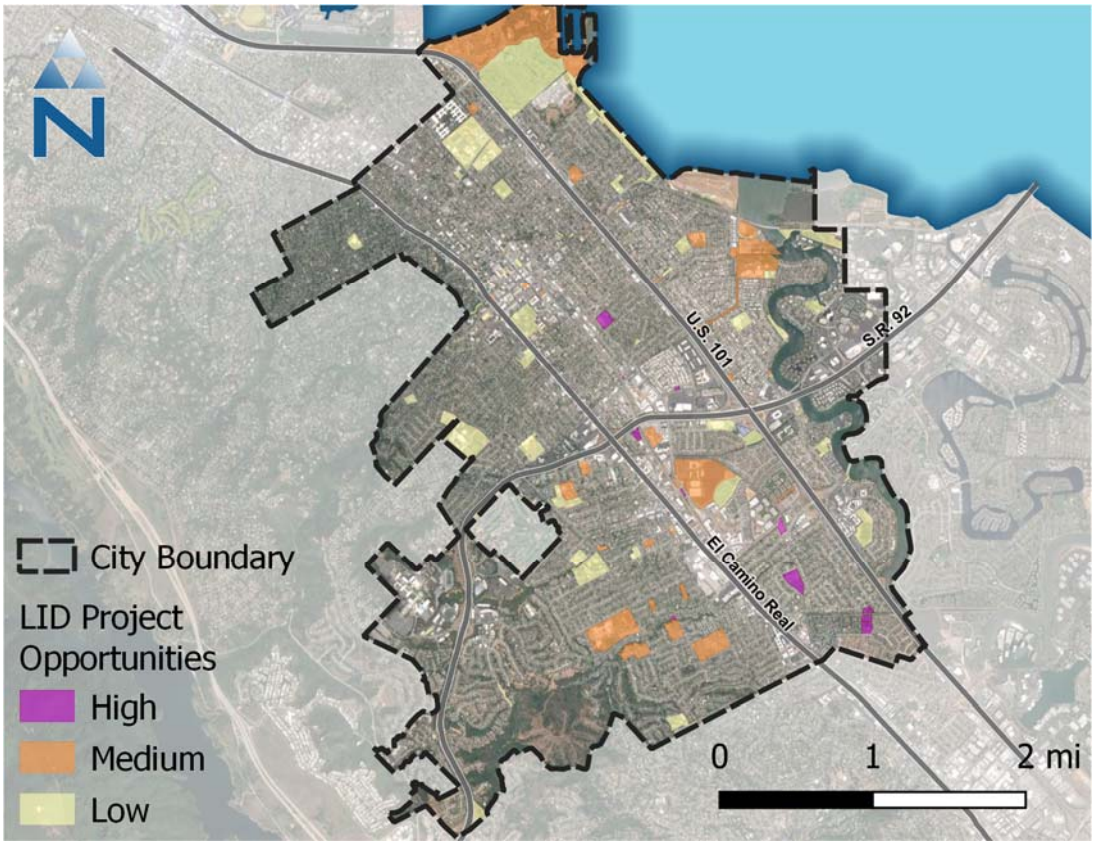


Figure 4-6. LID project opportunities in San Mateo.

Table 4-8. Example scoring for two LID project opportunities in San Mateo

Project Opportunity Site Name	**Trinta Park**		**San Mateo High School**	
Category	High		Low	
Total Score	42		29	
Characteristic	Value	Score	Value	Score
Parcel Land Use	Park	3	School	2
Imperviousness (%)	31	0	51	2
Slope (%)	1	5	1	5
Within a flood-prone watershed	No	0	Not in flood-prone watershed	0
Contains PCB Interest Areas	None	0	None	0
Currently planned by City or co-located with other City project	Yes, 401 Concar Dr PA 19-005	10	No	0
Drains to TMDL water	Yes	5	No	0

Project Opportunity Site Name	Trinta Park		San Mateo High School	
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	Not in a disadvantaged community	0	MTC Community of Concern 2017	5
Subwatershed with highest capacity in RAA (by project type)	SWS 231218	5	SWS 231618	1
Adequate infiltration/ Available connection to storm drain	Soil Group C and over 200 feet away from storm drain	1	Soil Group C and over 200 feet away from storm drain	1
Vegetation density	8.4%	5	19.4%	5

Potential Green Street Projects

A total of 205 high-potential, 644 medium-potential, and 1,369 low-potential green street projects resulted from the City-specific prioritization. Table 4-9 depicts an example score sheet for two green street project opportunities in San Mateo. Figure 4-7 shows the green street project opportunities in San Mateo bracketed into High, Medium, and Low potential categories.

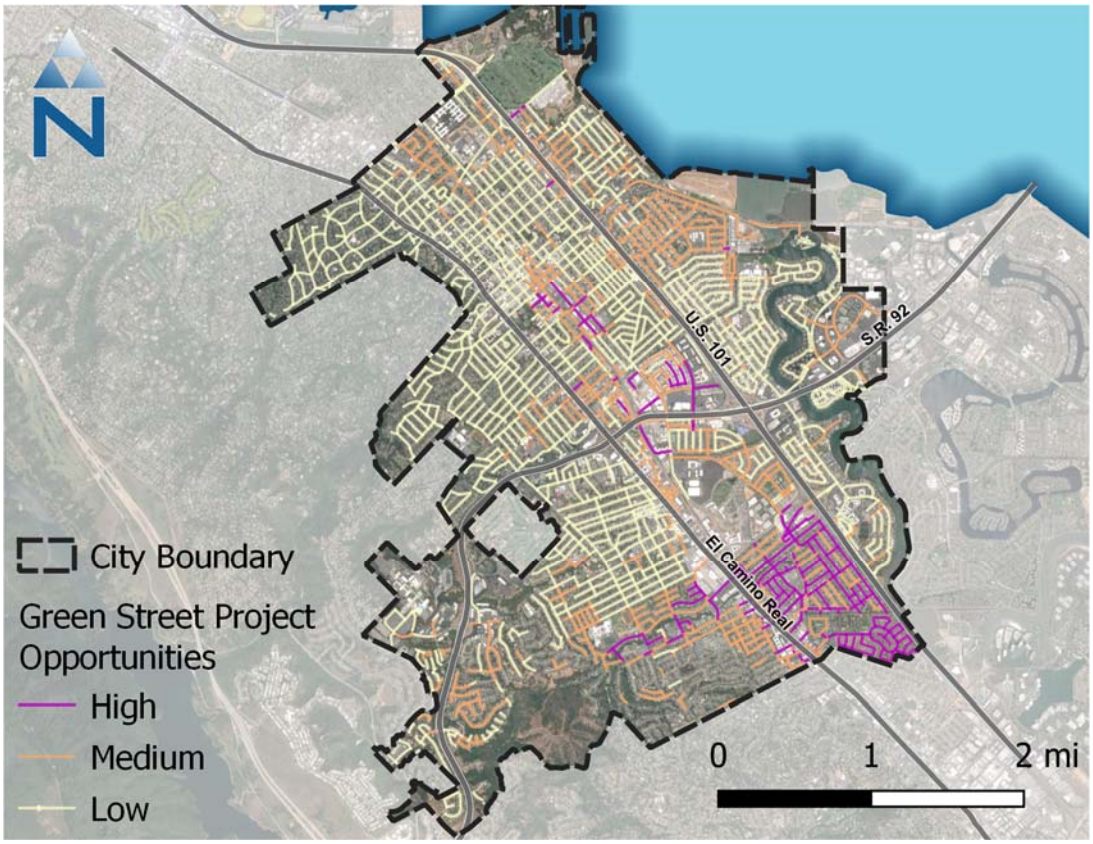


Figure 4-7. Green street project opportunities in San Mateo.

Table 4-9. Example scoring for two Green Street project opportunities in San Mateo

Project Opportunity Site Name	**South Claremont St**		**South Grant St**	
Category	High		Low	
Total Score	60		40	
Characteristic	Value	Score	Value	Score
Street type	Local	5	Collector	3
Imperviousness (%)	81	5	50	2
Slope (%)	1	5	1	5
Within a flood-prone watershed	Not in flood-prone watershed	0	Not in flood-prone watershed	0
Contains PCB Interest Areas	High	5	None	0
Currently planned by City or co-located with other City project	Yes, 940 S Claremont St PA18-036	10	No	0
Safe Routes to School program	No	0	No	0

Project Opportunity Site Name	South Claremont St		South Grant St	
Drains to TMDL water	Yes	5	Yes	5
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	Not in a disadvantaged community	0	Not in a disadvantaged community	0
Subwatershed with highest capacity in RAA (by project type)	SWS 231318	1	SWS 231218	1
Adequate infiltration/ Available connection to storm drain	Soil Group C and over 200 feet away from storm drain	1	Soil Group C and over 200 feet away from storm drain	1
Vegetation density	14.5%	5	13.7%	5
Utility conflicts	No high conflict utilities	5	No high conflict utilities	5
Roadway width	60 ft, Widest 33% of local street type	5	70 ft, Widest 33% of collector street type	5

5.0 Citywide GI Strategy

This chapter defines water quality targets based on the results of the RAA and presents the results of city-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 targets by 2030 and 2040.

5.1 Strategy Overview

The City of San Mateo is committed to the transition from "gray" stormwater storm drain infrastructure to a system that is comprised of both gray and "green" infrastructure (GI) elements. Traditionally, gray infrastructure is used to convey untreated stormwater runoff to local creeks and San Francisco Bay. Urban and developing areas are known contributors to certain pollutants in stormwater runoff. GI is designed to capture, detain, and treat stormwater using mechanisms that mimic natural treatment processes while providing a number of other benefits to the community.

The City has participated in a number of countywide GI planning initiatives, including the San Mateo County Green Infrastructure Reasonable Assurance Analysis (RAA), 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 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 City's GI strategy. The City's strategy utilizes the RAA results to specify an optimal mix of project types – including the three types prioritized in Chapter 4 – that would most cost-effectively achieve GI implementation goals. For more detailed information on the RAA and cost-optimization, refer to the RAA report and a summary of the RAA results for San Mateo in Appendix C.

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

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 potential based on a multiple-benefit prioritization process developed for the SRP.
5. **LID Retrofits and Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of either additional parcel-based LID 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.

Figure 5-1 shows an example of how each of the project types builds upon each other in the GI strategy to achieve the City's stormwater capture goals.

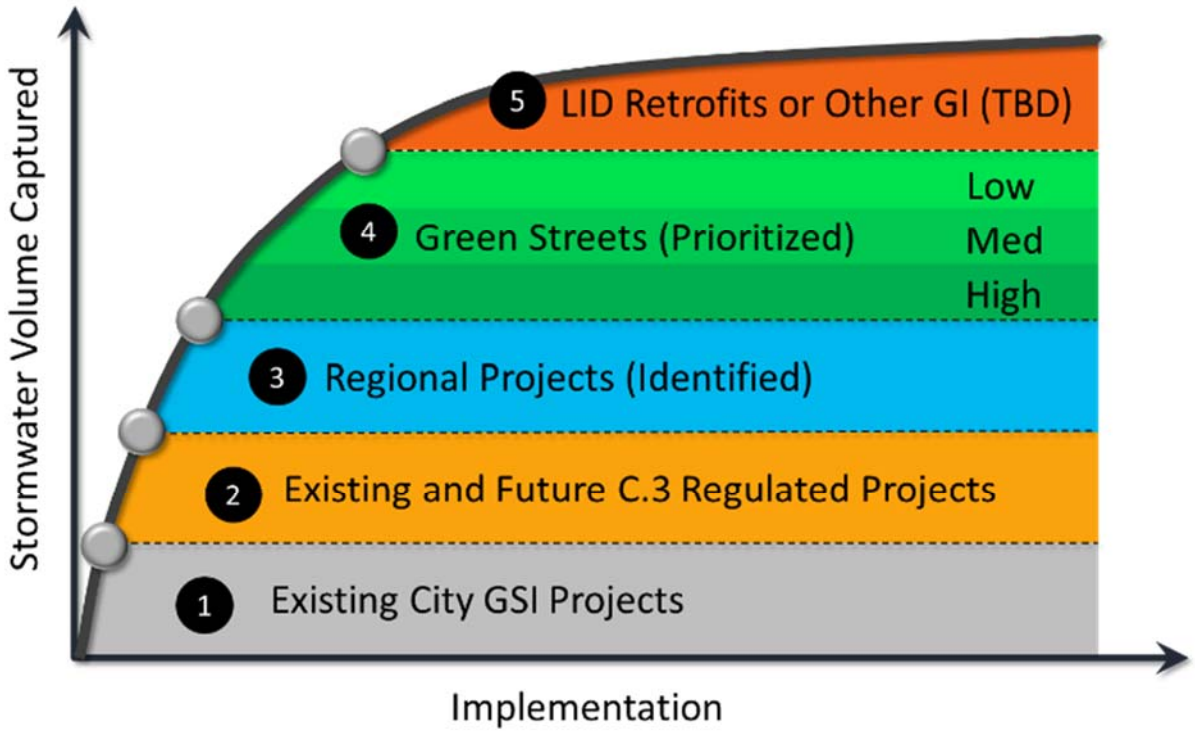


Figure 5-1. Multifaceted GI Strategy.

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 City'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 City'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 available funding, and can potentially change based on new information or engineering analyses performed over time.

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.

5.2 Existing and Early Implementation Projects

Some street improvement projects already planned for design and construction can be modified to incorporate GI in addition to or in lieu of traditional drainage infrastructure to achieve multiple benefits while helping reach water quality goals. The City actively looks for these types of opportunities, which has resulted in several green street projects being constructed and more scheduled for implementation. These existing and early implementation green street projects include:

- Laurel Elementary School Safe Routes to School
- Delaware Street Bike Lane and Streetscape Improvement Project
- North Central Pedestrian Improvements Project
- Poplar Corridor Safety Improvement Project
- East 4th Avenue and Fremont Street GI Project

5.2.1 Laurel Elementary School Safe Routes to School

The San Mateo-Foster City School District, the City of San Mateo, and the San Mateo Countywide Water Pollution Prevention Program created a project that built upon the Safe Routes to School program. The project encourages children to walk or bike to school by removing barriers that prevent them from doing so while increasing pedestrian safety. GI elements were integrated into the design to manage wet weather and prevent flooding near the school. A semi-circular rain garden and seating area captures a portion of rooftop runoff while interior and perimeter stormwater planters in the parking lot manages building and parking lot runoff. Two street intersections now feature stormwater curb extensions that shorten crossing distance while at the same time capturing, slowing, and cleaning runoff before it enters Laurel Creek. The project was completed in 2015.

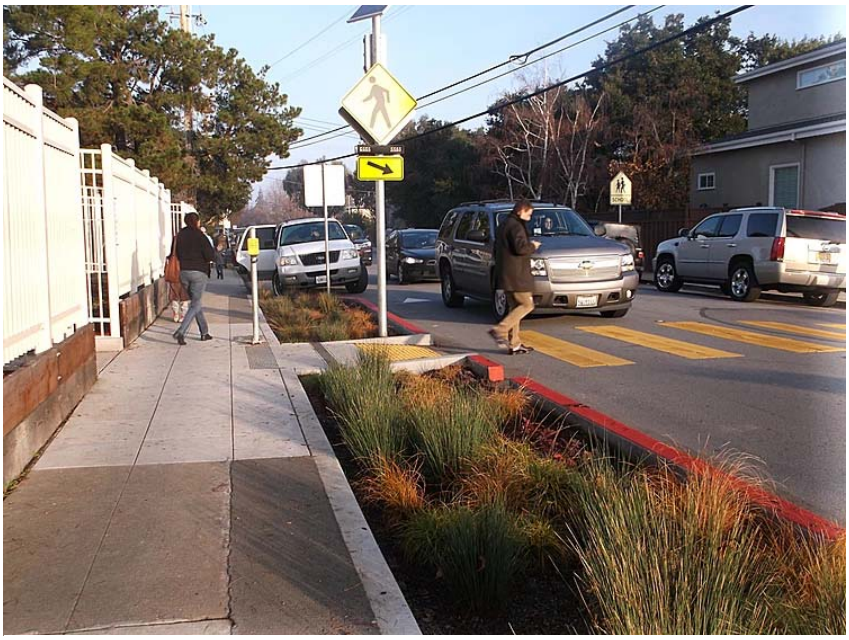


Figure 5-2. Laurel Elementary School Safe Routes to School Project (Source: City of San Mateo)

5.2.2 Delaware Street Bike Lane and Streetscape Improvement Project

The project consists of improvements to the bike lane and streetscape on South Delaware Street between Sunnybrae Boulevard and Charles Lane. Bioretention swales are incorporated into improvements including street, traffic signage and striping, lighting, landscape, and irrigation improvements. In addition, the project includes a bioretention bulb-out at East 16th Avenue and South Claremont Street. The project was completed in 2014.

Figure 5-3. Delaware Street Bike Lane and Streetscape Improvement Project (Source: EOA)

5.2.3 Poplar Corridor Safety Improvement Project

The Poplar Avenue/North Amphlett Boulevard intersection is a partial interchange that provides access to and from southbound US 101 for the northern part of San Mateo and southern part of Burlingame. Northbound freeway access for these areas is provided via the partial interchange at Peninsula Avenue.

Previously, the US 101 on and off-ramps formed a four-legged, three-way stop-controlled intersection with Poplar Avenue and Amphlett Boulevard. All turning movements were allowed at this intersection. The freeway off-ramp was uncontrolled; while the other three legs of the intersection are controlled by stop signs. The high volume of traffic at the intersection coupled with limited sight distance for some approaches resulted in higher frequency of accidents at the intersections on Poplar Avenue than other intersections in the area.

Over the past several years, the Public Works Department had been working with the community to determine an appropriate project to improve the safety within the Poplar Avenue corridor between US

101 and South Humboldt Street. The project included safety improvements along the Poplar Avenue Corridor as well as neighborhood enhancements along Humboldt Street between Peninsula Avenue and Poplar Avenue. The project includes bioretention bulb-outs at the intersection of Humboldt Street and College Avenue and a mid-block bioretention curb extension along Humboldt Avenue in front of the San Mateo Superior Court, Central Branch location. The project was completed in 2016.

Figure 5-4. Poplar Corridor Safety Improvement Project (Source: City of San Mateo)

5.2.4 North Central Pedestrian Improvements Project

The North Central Pedestrian Improvements Project is part of the City's Pedestrian Master Plan. It encompasses pedestrian improvements at three intersections and pedestrian scale lighting along major corridors through the North Central neighborhood. The intersection improvements include curb bulb-outs and pedestrian refuge islands to reduce the distances at pedestrian crosswalks and street lighting to improve safety for pedestrians in the area. The project was completed in 2017.

Figure 5-5. North Central Pedestrian Improvement Project (Source: City of San Mateo)

5.2.5 East 4th Avenue and Fremont Street GI Project

Improvements to install bioretention bulb-outs on the northwest and southwest corners of the intersection of East 4th Avenue and South Fremont Street. The project was later expanded to include the northeast and southeast corners of South Delaware Street at East 5th Avenue and East 9th Avenue. The project will include replacing concrete sidewalk, curb and gutter, and ramps, installing planters with bioretention soil and underdrain pipes, and adjusting the adjacent storm drain catch basins. The total project budget is $400,000 and is scheduled for completion in 2019.

5.3 Regulated Projects

5.3.1 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.[15] For most regulated projects, post-construction control measures must include LID site 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 City watersheds and are considered part of the City's total inventory of GI facilities.

5.3.2 Project Inventory to Date

Since 2005, approximately 50 acres of development in the City have been subject to the Provision C.3 regulations. The City tracks the locations of these facilities and conducts an operation and maintenance verification inspection program to ensure that they are maintained properly. GI projects in the public right of way and regulated projects constructed from FY05/06 through FY16/17 are presented in Figure 5-6.

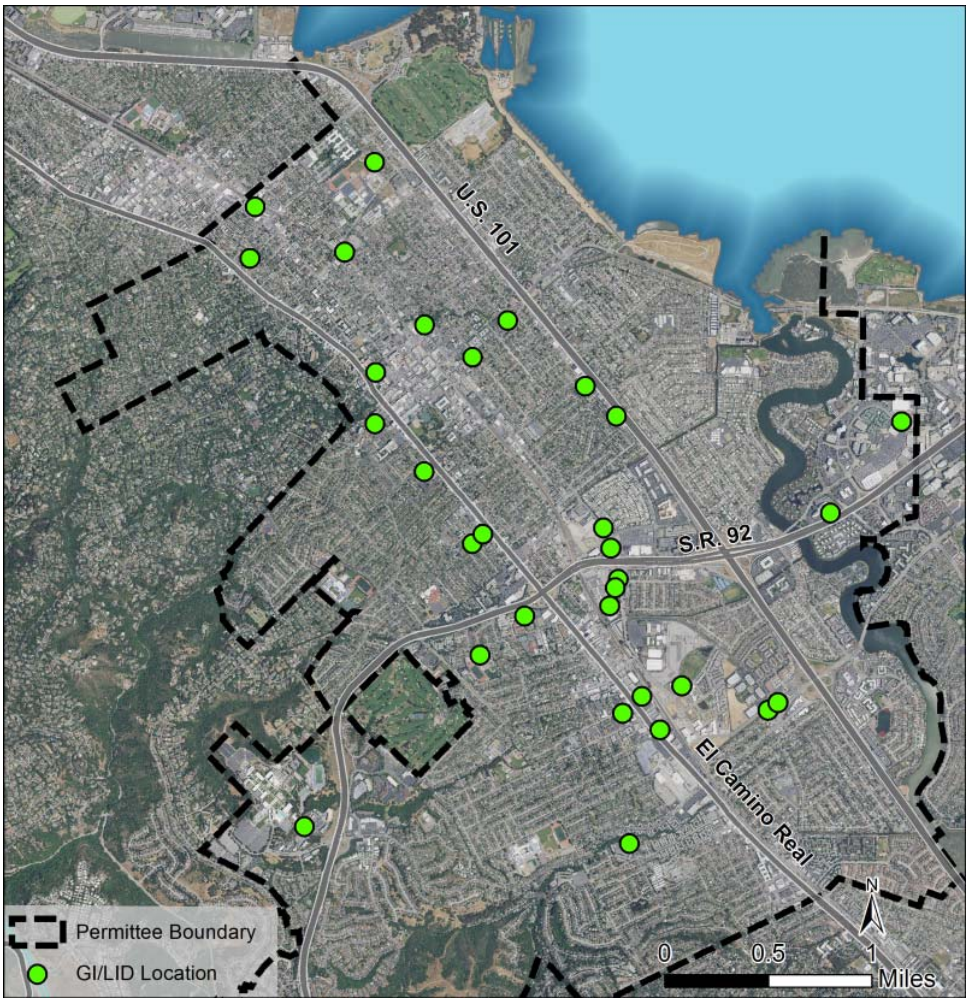


Figure 5-6. GI Projects in the Public Right of Way and Regulated Projects (FY05/06-FY16/17)

[15] 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.

5.3.3 Future Regulated Projects

The City will continue to require future regulated projects to incorporate appropriate GI measures, as part of the City's long-term GI implementation strategy. The amount of new and redevelopment to occur between present day and 2040 was projected as part of an analysis conducted by consultants to C/CAG to support the development of GI plans within the County[16]. 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 homes 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 for the RAA.

5.4 Regional GI Projects

Based on the prioritization from the SRP, described in Section 4.3, five potential regional projects across the County were identified for preparation of project concepts. These five projects were included in the RAA modeling. However, none of the C/CAG project drainage areas overlapped with area within the City of San Mateo. Therefore, no regional project is part of the City's current GI Strategy.

However, the City will continue to evaluate additional regional project locations. The City-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.

Project sites identified in the future may be added to the current list. 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.

5.5 Green Streets Projects

In addition to early implementation green street projects, discussed in Section 5.2, the City will continue to explore opportunities for implementation of green infrastructure in the right-of-way. A significant portion of the City'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 City.

Green street opportunities will be prioritized in areas where existing and regulated projects are not sufficient to meet GI implementation goals of the City. The results of the prioritization coupled with the results of the RAA (Appendix C) form the basis of the green street portion of the City's strategy. The prioritization identifies the highest-ranking sites considering metrics that are proxies for feasibility, project performance, and benefits (e.g., soils, site slope, impervious area), while the RAA determines the most cost-optimal distribution of projects (in terms of storage capacity) across subwatersheds to achieve

[16] 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

pollutant reduction goals. Cost optimization was based on: (1) the available opportunities in each subwatershed identified by the Countywide SRP and (2) cost-effectiveness given various characteristics associated with GI measures, including infiltration rates and higher pollutant generation from upstream land uses. While the RAA model output serve as a guide to inform implementation planning, actual implementation of projects may differ. The strategy can be refined as funding and grant opportunities are assessed and ongoing coordination with various City departments occurs. Figure 5-7 shows where green street opportunities identified in Section 4 are located in relation to subwatersheds where more GI may result in cost-effective attainment of water quality goals determined by the RAA.

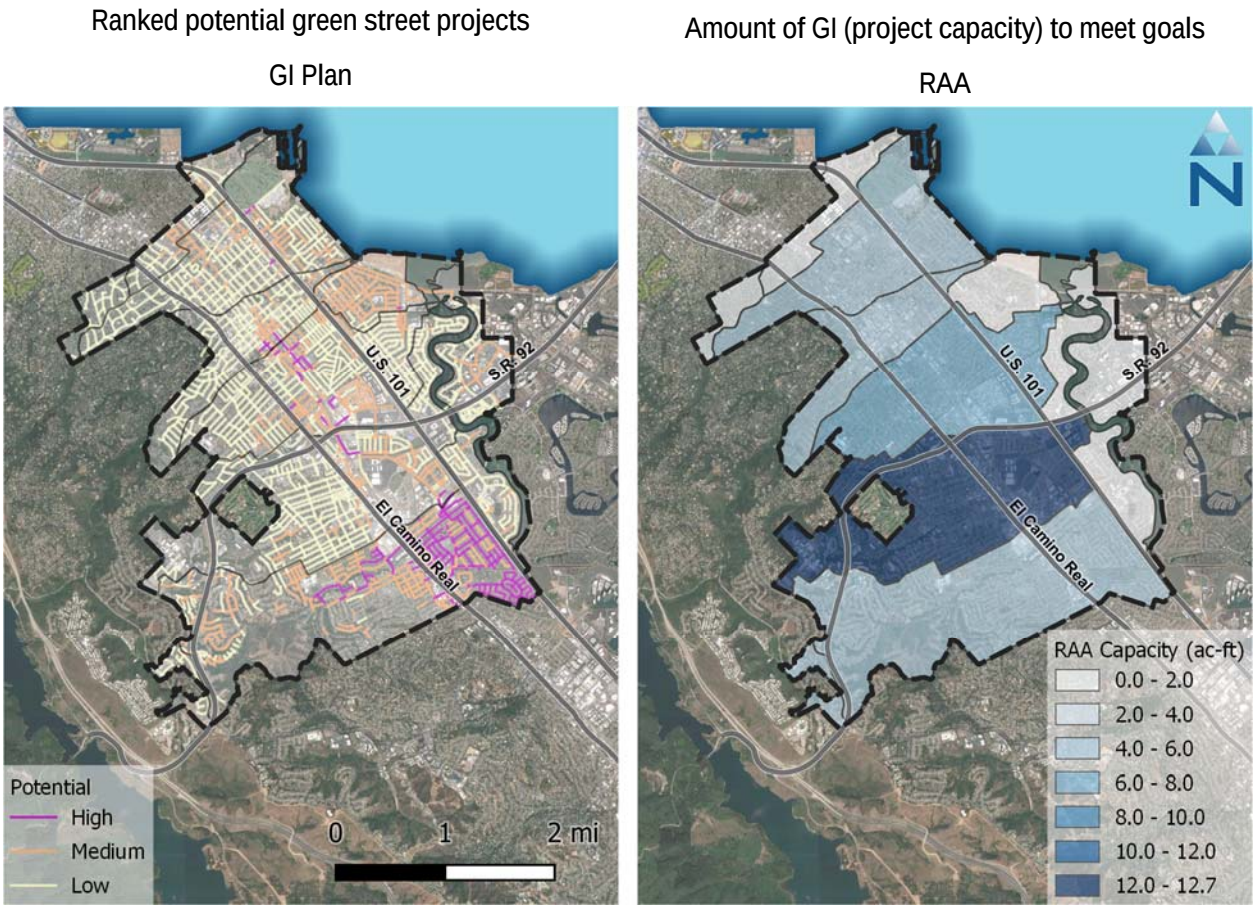


Figure 5-7. Prioritized potential green street projects and RAA-specified project capacity by subwatershed.

5.6 LID Retrofits and Other GI

In the case where insufficient opportunities exist to meet implementation goals, or where other project types were determined not to be cost-effective through model optimization, the remaining stormwater volume will be addressed through other GI projects to be determined. This category is intended as a placeholder to set goals for GI project implementation in addition to the identified projects discussed above. Storage capacity determined for this category may be met through any combination of project types, including LID retrofits on public parcels and additional regional projects yet to be identified.

The City's storage capacity needs are projected to be almost entirely met through a combination of C.3 projects on private development, the identified regional project, and green streets. As a result, only a

small portion (< 0.1 acre-feet storage capacity) is specified for other GI projects. However, 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 project opportunities that have not yet been identified may also offset the amount of green street project capacity specified by the RAA. Regional projects tend to be more cost effective than green streets due to scale. For this reason, the GI strategy will be subject to adaptive management.

The City 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. The need for other GI projects will continue to be evaluated in future updates to the GI Plan. Figure 5-8 and Figure 5-9 show where LID and regional project opportunities, respectively, are located in relation to subwatersheds where more GI may result in cost-effective attainment of water quality goals determined by the RAA.

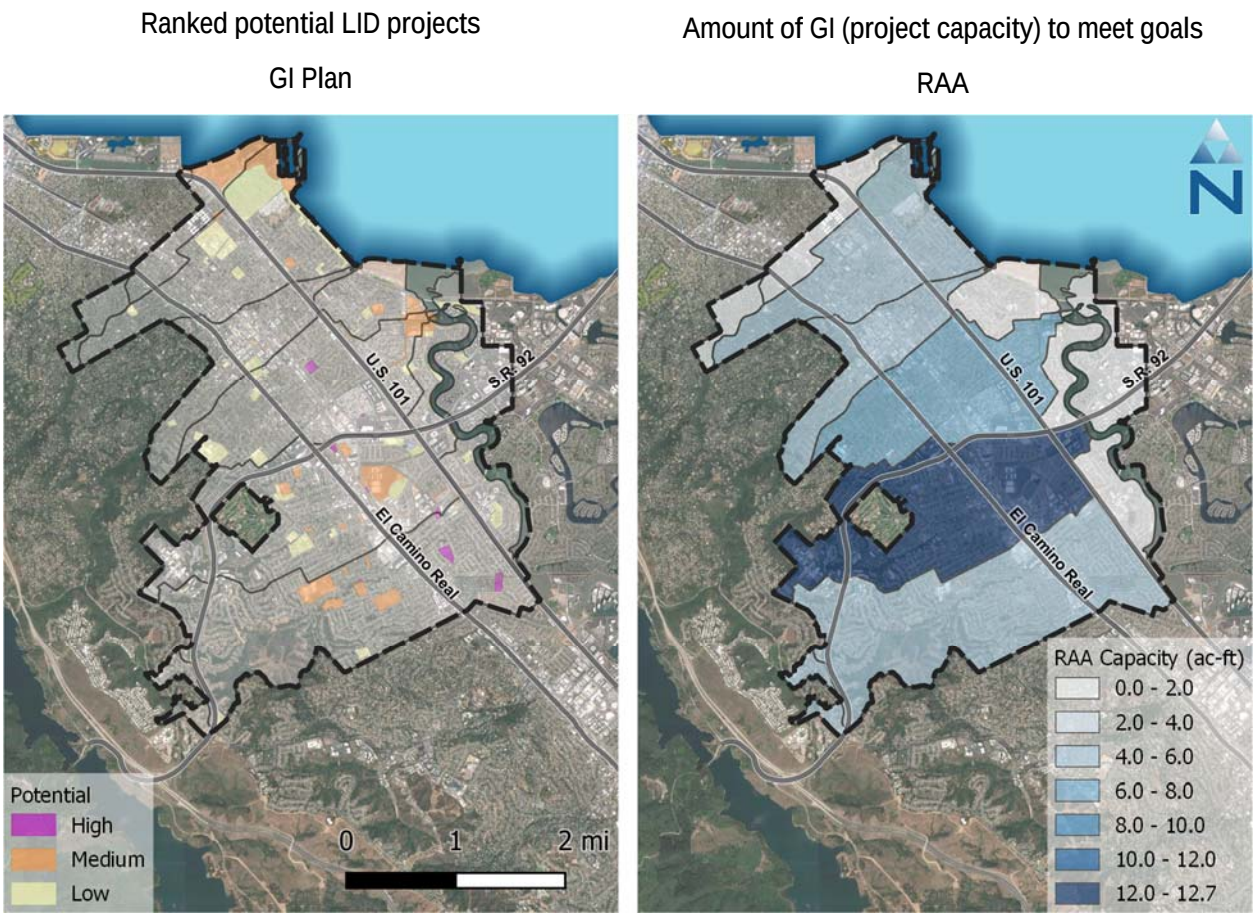


Figure 5-8. Prioritized potential LID projects and RAA-specified project capacity by subwatershed.

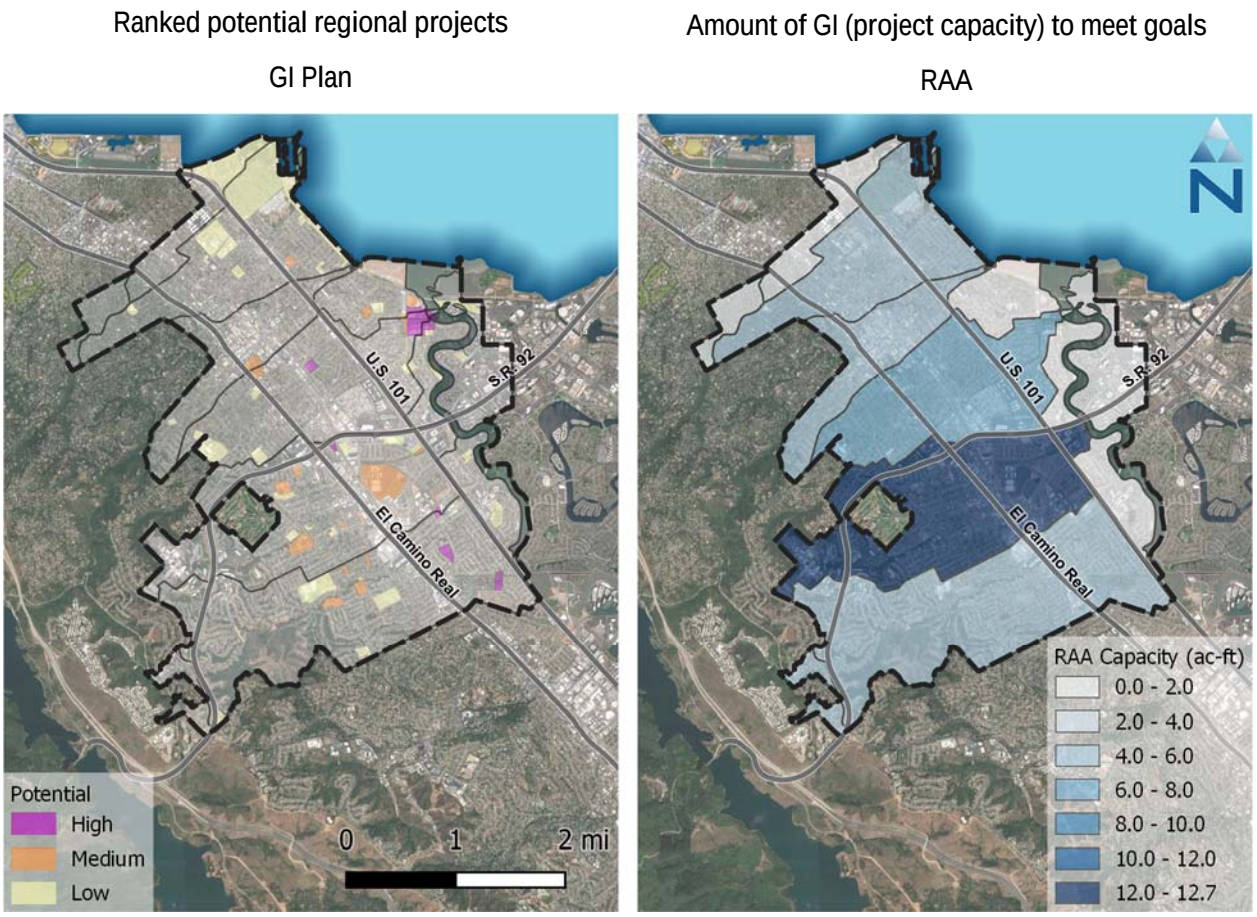


Figure 5-9. Prioritized potential regional projects and RAA-specified project capacity by subwatershed.

5.7 Impervious Area Projections

The 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." Impervious area treated by GI may be used as a gauge of progress towards implementation towards achieving goals set in the GI Plan. For existing projects, treated total area is tracked for annual reporting purposes and used to estimate treated impervious area. Impervious area from new and redevelopment were estimated using regional models of population and employment growth developed by C/CAG, discussed in Section 5.3.3. For the remaining project types, treated impervious area was estimated using storage capacity for each project type determined from the RAA, imperviousness land use assumptions, and estimates of the amount of each land use that contributes to each project type. Table 5-1 shows the treated impervious area, as well as other metrics that can be used to gauge implementation progress, that will be achieved through the City's GI strategy and across the milestones specified in the MRP.

Table 5-1. Implementation Metrics for PCB Load Reduction

Implementation Metrics		Implementation Milestones		
		2020	2030	Final 2040
Capacities (acre-ft)	Existing Projects	5.6	5.6	5.6
	Future New & Redevelopment	10.2	15.5	16.5
	Regional Projects (None Identified)	--	--	--
	Green Streets	--	6.9	17.5
	LID and Other GI Projects (TBD)	--	0.0	0.0
	Total	**15.8**	**27.9**	**39.6**
Impervious Area Treated (acres)	Existing Projects	40.3	40.3	40.3
	Future New & Redevelopment	137.9	209.6	223.1
	Regional Projects (None Identified)	--	--	--
	Green Streets	--	73.1	193.5
	LID and Other GI Projects (TBD)	--	0.0	0.0
	Total	**178.3**	**322.9**	**457.0**

The process of advancing project opportunities from the GI strategy through implementation is described in Chapter 6. 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 section can be refined using adaptive management to incorporate new information and sync with ongoing municipal planning, such as capital improvement planning and master planning.

6.0 Implementation Plan

This chapter defines the process for implementing the prioritized projects to achieve the projections defined in Section 5.7. The implementation plan has three main components: (1) the workplan defining the steps to implement the prioritized capital projects, (2) the legal and funding mechanisms that enable implementation, and (3) the technical tools that ensure implemented projects perform and enable quantification of overall progress toward the citywide goals.

6.1 Work Plan for Prioritized Projects

The Workplan for Prioritized Projects defines the workflow to further evaluate the prioritized GI capital opportunities summarized in Section 5 (i.e., regional projects, green streets, and LID retrofits) and progress the most promising projects into the design phase of the City's capital delivery process. This includes describing the status of near-term projects that have been specifically identified, as well as establishing the overall process for integrating GI opportunities into the City's capital planning framework. This process is a collaborative effort between several City departments and—pending the scope of the GI project—may involve coordination with county-level agencies as well (e.g., SMCWPPP and the new Flood and Sea Level Rise Resiliency Agency). An overview of the GI project development stages is shown in Figure 6-1.

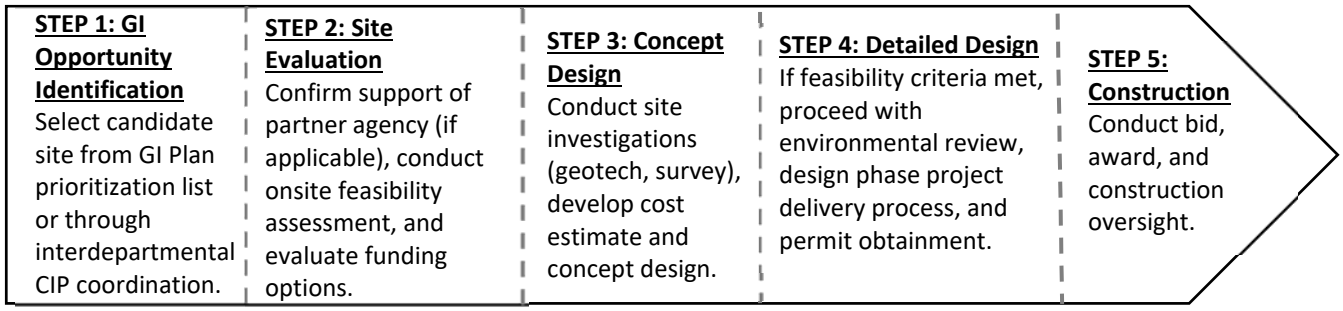


Figure 6-1. Overview of Project Development Stages

The Workplan defines the process for Steps 1 – 3, from GI opportunity identification through concept design. After Step 3, the concept enters the City'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:

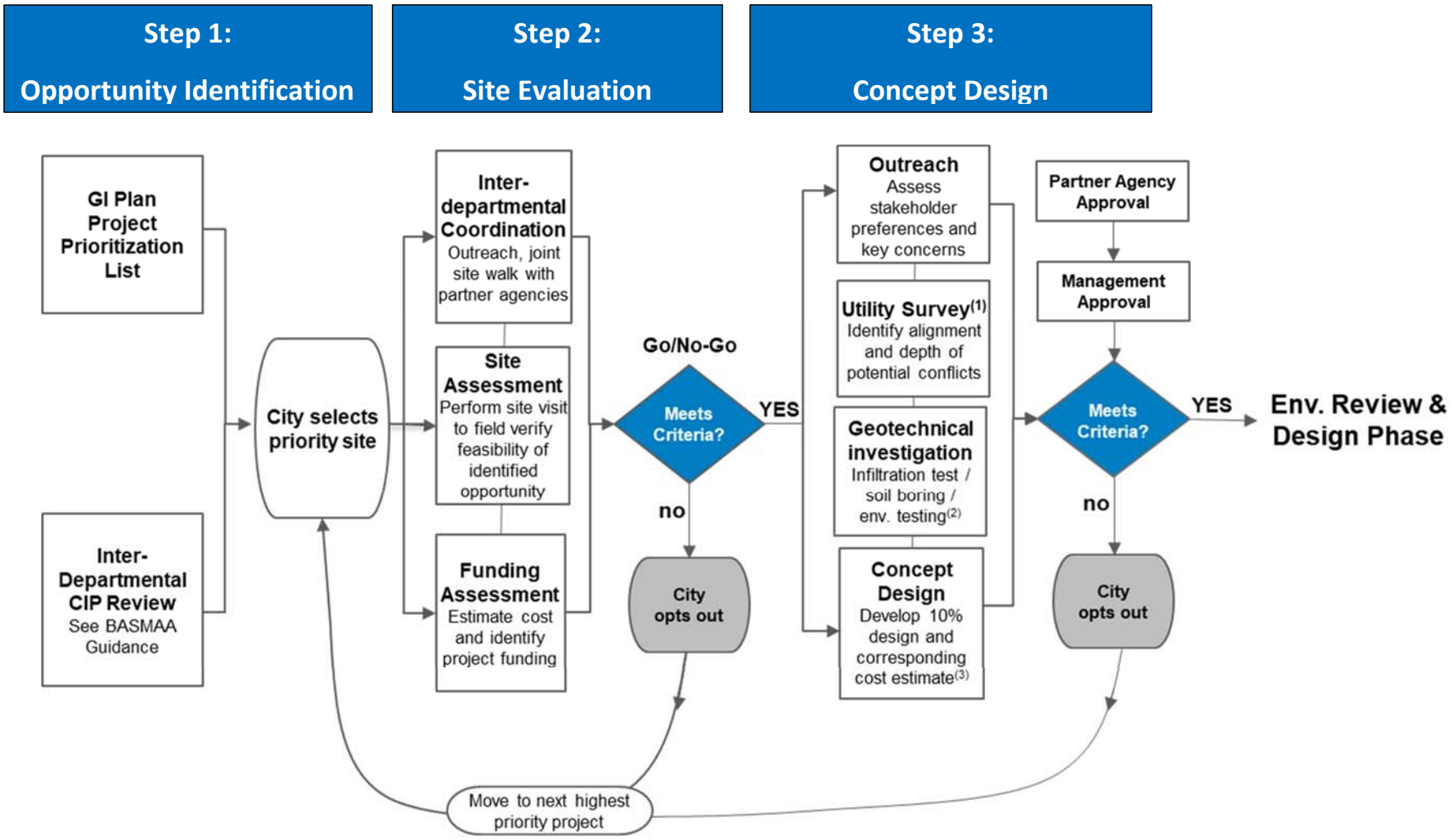
- Meets minimum impervious drainage area thresholds (i.e., ≥ 1 acre for co-located project, ≥ 2 acres for GI-only capital project)[17]
- Meets minimum GI sizing ratios
- Meets infiltration feasibility criteria (or rainwater capture and use feasibility for regional projects)
- Addresses key feedback from outreach process and has community support

These criteria provide the City with guidelines to implement higher performing GI capital projects. However, if a project fails to meet one of the criterion above, the City may still elect to proceed due to the project's overall benefits. Figure 6-2 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. Table 6-1 summarizes near-term GI opportunities that have been identified to proceed with further evaluation as part of the process.

Table 6-1. Subset of Near-Term GI Opportunities Proceeding with Further Evaluation

GI Identified Opportunity	Project Type	Status
North San Mateo Drive	Green Street	Design Phase
Delaware Street/5th and 9th Avenue	Green Street	Design Phase
E. 4th Ave and S. Fremont Street	Green Street	Design Phase
Central Park Improvements	LID Retrofit	Concept Phase

[17] 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 Improvement Strategy 2018).



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 6-2. Overview Workplan for Prioritized Projects

6.1.1. Workplan for Regional Projects

Step 1: Opportunity Identification

As summarized in Section 5, the City developed a prioritization list of regional project opportunities. These sites form a candidate pool of opportunities to undergo further evaluation. Although the regional project prioritization list will continue to be refined throughout the life of the GI Plan, two of the more promising identified opportunities—the City Corporation Yard near Trinta Park, and Detroit Drive Wastewater Treatment Plant (WWTP)—were selected to undergo onsite investigation consistent with Step 2 of this workplan. The location and drainage area of the regional project opportunity near the WWTP is shown in Figure 6-3. These projects are still under evaluation and may not proceed to step 3, described below, or be pursued further.

Figure 6-3. Drainage Area and Site Location of Identified Regional Project Opportunity

In addition to utilizing the results of the GI Plan, the City 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 local school districts, and the new Flood and Sea Level Rise Resiliency Agency. Similarly, projects proposed by others as part of regional water management plans, such as the San Francisco Bay Integrated Regional Water Management Plan (IRWMP), may provide collaboration potential.

Step 2: Site Evaluation

Step 2 includes site walks, interagency coordination, and funding evaluations as part of a stage one feasibility assessment of GI integration at the candidate site. The results of these evaluations help establish the preferred GI technologies and determine if the candidate site proceeds to the concept design step. 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 City 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. Example relevant agency stakeholders on regional projects include: SMCWPPP, Caltrans, the school districts, and the new Flood and Sea Level Rise Resiliency Agency.

In addition to interagency coordination, interdepartmental coordination should also be conducted. To have enough space for implementation, regional projects are often located in parks or open spaces within the City and may require coordination between Public Works, Community Development, Parks and Recreation, or others before proceeding with development of a concept. Figure 6-4 provides a summary of potential project collaboration stakeholders.

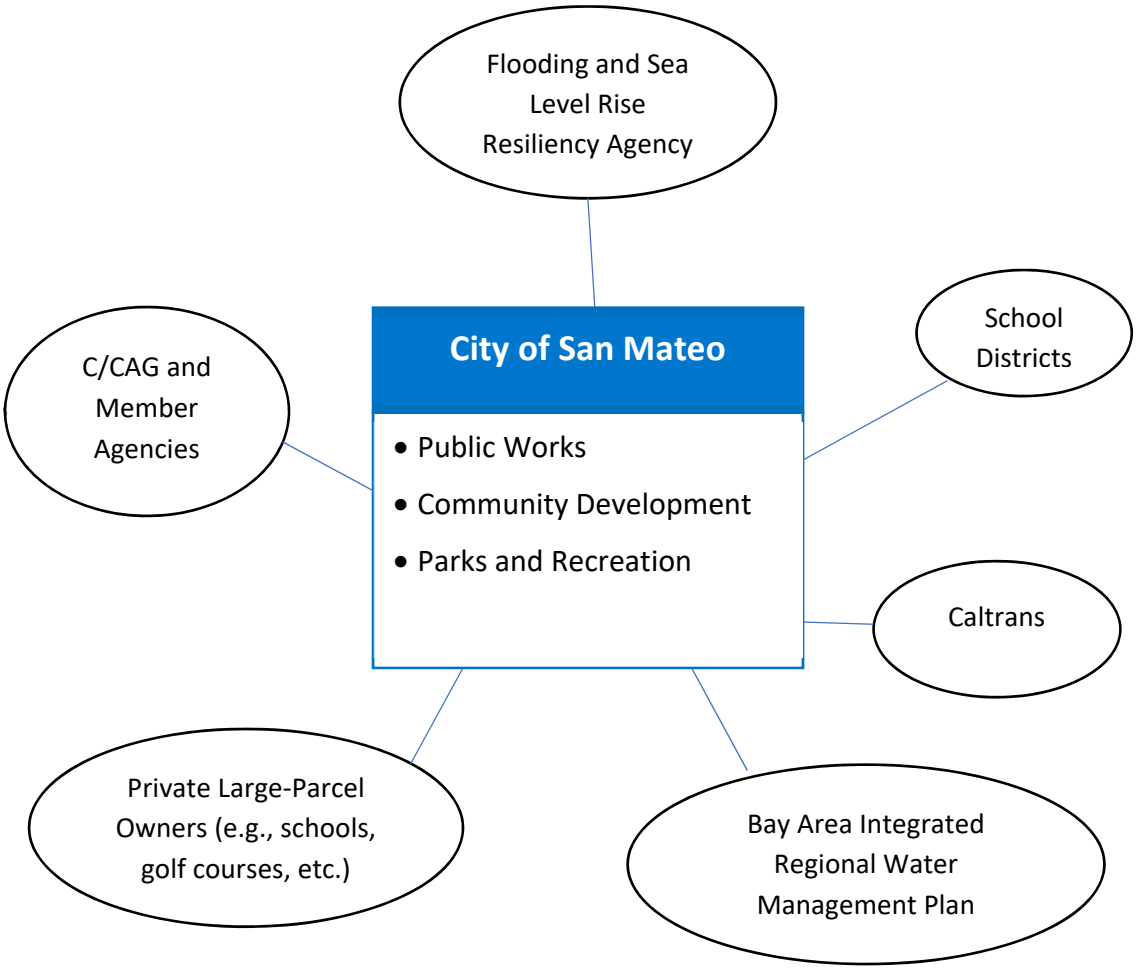


Figure 6-4 – Example of Potential GI Project Collaboration Stakeholders

Step 2b: Funding Potential – Critical to the feasibility of the identified opportunity is the assessment of project costs and funding source. 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 first two regional projects opportunities from the countywide Stormwater Resource Plan (SRP) to move forward to design (located in Atherton and South San Francisco). As with the SRP projects, the City of San Mateo regional project opportunities selected for further evaluation include Caltrans ROW as part of their drainage area. Thus, pending the results of the initial feasibility analysis, the City may investigate the potential for Caltrans grant funding to support implementation. Section 6.2 provides a more detailed description of the GI funding options that should be evaluated as part of this process.

If the opportunity is proposed as a co-located project with another planned City project, the GI design and implementation schedule should be developed in this step 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.

Step 2c: Site Assessment – During Step 1 Opportunity Identification, sites were prioritized primarily based on desktop analysis using best available spatial data. Within Step 2, 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 City 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.
5. Concept Fact Sheet – Summarize the results of the site evaluation on a site map that conveys the potential configuration of the concept. Fact sheets may include preliminary performance and cost estimates based on the proposed GI type and configuration. However, concept fact sheets do not

include the level of detail of a 10% concept design, which is described in Step 3. After conducting site evaluations during the GI Plan development, concept fact sheets for two of the more promising regional project opportunities were created. These fact sheets are included in Appendix D. The projects are still under evaluation and may not proceed further in the process.

Figure 6-5 – Site Assessment of Regional Concept Opportunity (Source: Lotus Water)

Step 2d: Feasibility Assessment - After updating site information, the opportunity should be compared against the criteria below. If the site meets the criteria and thus still has GI potential, then the opportunity should proceed to the next step.

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.

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 gather information on public preferences. Conducting this analysis early-on enables the City 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 gauge 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.

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 phase. 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 6-2.

Table 6-2. Example Concept Design Information

Existing Conditions	Proposed Site Plan

• Impervious areas (e.g., roof, pavement, driveway)
• On-site stormwater infrastructure (drains, downspouts, inlets, etc.), pipe and structure locations
• Flow direction arrows for sheet/surface flow and pipe flow
• Existing connections to the storm sewer
• Utilities (e.g., water, sewer, gas, electric)
• Trees (drip line and trunk diameter)
• Existing contours
• Road labels
• Labels of existing uses (playground, parking, etc.)
• North arrow and scale
• Property and easement boundaries
	• Project boundary
	• Stormwater management practices (BMPs): footprint of each, corresponding drainage areas, and drainage components (e.g., underdrain, outlet control structures)
	• Proposed connections to existing conveyance systems or storm drains
	• Proposed site drainage features (new drains, downspouts, etc.)
	• Flow direction arrows for sheet flow and pipe flow.
	• Changes to land cover, including impervious surfaces
	• Areas that require regrading or grading contours
	• Labels of proposed uses (playground, parking, etc.)
	• BMP Performance Summary Table
	  o BMP ID Number
	  o Facility type and sizing information
	  o 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 Americans with Disabilities Act (ADA), Fire, and other permit needs;
- A constructability evaluation based on maintenance and construction access (e.g., City moratorium constraints, site access constraints, etc.);
- Construction cost estimate and schedule; and
- CEQA checklist.

Step 3e: Compare Against Feasibility Criteria – 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, the concept can 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.
- No critical flaws identified in public outreach conducted to assess concerns and preferences

6.1.2. Green Streets and LID Retrofits

Step 1: Opportunity Identification

As described in Section 5 - 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 targets. This forms the basis of the identified green street and LID retrofit GI opportunities.

In addition, the City 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 projects for potential synergies with GI objectives, the City has already identified several near-term projects to be evaluated for GI integration (see full list of identified projects in Section 5). One such example is the North San Mateo Drive Pedestrian and Bicycle Improvement Project, shown in Figure 6-6. The City may identify additional opportunities through coordination with C/CAG's countywide Sustainable Streets Master Plan (SSMP), which is currently in development, and the City's ongoing implementation of its own Sustainable Streets Master Plan.

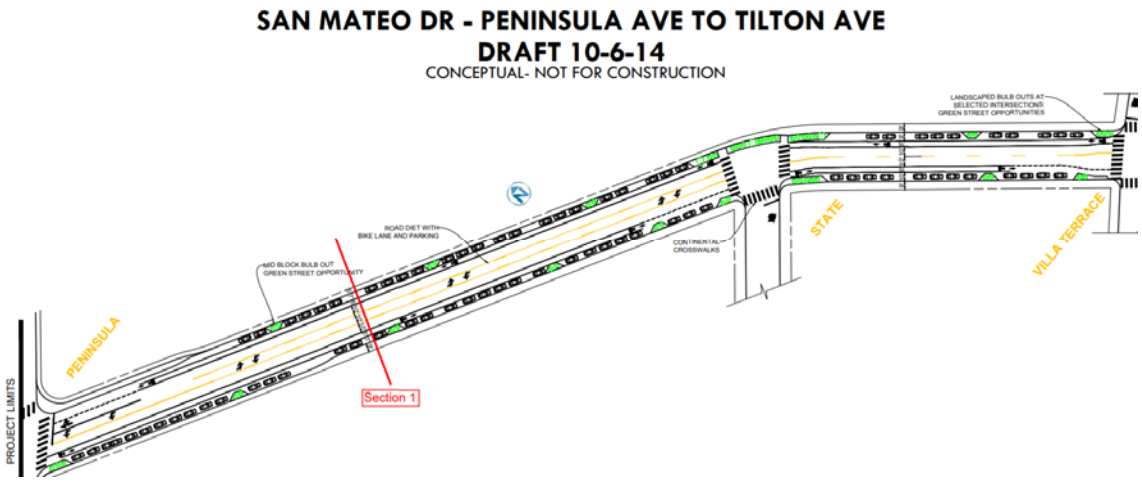


Figure 6-6 – Example of Near-Term City Project Being Evaluated for GI Opportunities

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*[18] to provide a descriptive workflow for moving projects from opportunities identification into the design phase.

Step 2: Site Evaluation

Step 2 includes site walks, interagency coordination, and funding evaluations as part of a stage one feasibility assessment of GI integration at the candidate site. The results of these evaluations help establish the preferred GI technologies and determine if the candidate site proceeds to the concept design step. 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 City departments—such as Public Works and Community Development. Similarly, LID Retrofits on parcels may require the City's stormwater staff to collaborate with Parks and Recreation Department and/or Community Development. Coordination with stakeholder agencies and departments 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 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 City'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

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

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 6.2 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 Step 2, 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. This should include an assessment of data on property boundaries, easements, and right-of-way boundaries. 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 City 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.
5. Concept Fact Sheet – Summarize the results of the site evaluation on a site map that conveys the potential configuration of the concept. Fact sheets may include preliminary performance and cost estimates based on the proposed GI type and configuration. However, concept fact sheets do not include the level of detail of a 10% concept design, which is described in Step 3.

Step 2d: Feasibility Assessment – 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 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.

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 City 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.

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: Site Surveys – Conduct a site survey to enable concept design development. Survey should verify site boundaries, ownership, and easement information. 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 6-2.

Step 3e: Feasibility Assessment – 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, the concept can proceed to the design phase.

GI Feasibility Criteria:

- Meets minimum drainage area thresholds
- Meets minimum GI sizing requirements
- Meets infiltration feasibility criteria (or rainwater harvest 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

6.2 Implementation Mechanism

The GI Plan quantifies stormwater capture capacity needs and prioritizes specific projects for near-term integration into CIPs and long-term integration into City planning efforts. However, implementation of these projects is contingent upon the City having the proper legal mechanisms to implement the Plan, and identifying sufficient funding sources for GI planning, design, construction, and maintenance.

6.2.1 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 1.3, the City of San Mateo 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 reduce the risk of flooding by managing peak flows. Chapter 7.39 of the City's Municipal Code provides legal authority for the City to require regulated private development projects 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 City. As part of the GI Plan process, the City reviewed its existing policies, ordinances, and other legal mechanisms related to the implementation of stormwater NPDES permit requirements in order to identify documents that need to be updated or modified to provide sufficient legal authority to implement the GI Plan.

The City determined that it has sufficient legal authority to construct GI projects in the public right-of-way or on public property, and there are no barriers to GI implementation within current legal codes, policies, or ordinances. The City intends to continue to evaluate legal mechanisms to facilitate implementation of projects with private developers and/or other agency partners as part of this GI Plan and, will consider whether additional policies or ordinances could help facilitate GI Plan implementation in the future, if needed. The City will also evaluate the potential to require IPM practices in Green Infrastructure long term maintenance agreements and internal policies and SOPs.

6.2.2 Funding Options

Provision C.3.j.i.(2)(k) of the Municipal Regional Stormwater Permit (MRP) requires that the City'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 City 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"[19] (referenced herein as the GI Funding Report) that is intended to provide guidance on funding types, challenges and strategies. Sections of that report serve as a basis for the City's GI funding mechanisms per the following sections below.

The municipalities within San Mateo County are considering a new countywide agency called The Flood and Sea Level Rise Resiliency Agency which could, in the future, provide funding for GI to the City and the other SMCWPPP Permittees.[20] One step in that process is establishing a nexus to support implementation of a stormwater infrastructure impact fee (stormwater fee). The GI Funding Report addresses this issue in more detail.

The Bay Area Stormwater Management Agencies Association (BASMAA) convened in 2017 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[21]. The final report of the Roundtable process is the Roadmap of Funding Solutions for Sustainable Streets (BASMAA 2018), 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.

An evaluation of funding options is included in Potential Sources of Funding for Sustainable Streets, Appendix B of the Roadmap of Funding Solutions for Sustainable Streets. This appendix of the Roadmap presents the results of the evaluation of grant and loan monies that may be used to fund projects that include both GI and transportation improvements. The results of this evaluation are presented in two tables:

- *Transportation Funding Sources that May Potentially Fund Sustainable Streets* table identifies nine transportation grants, and provides an evaluation of the conditions under which green stormwater infrastructure is eligible for funding.
- *Resource-Based Grant and Loan Programs that May Potentially Fund Sustainable Streets* table identifies nine resource-based grant and loan programs and provides an evaluation of the conditions under which transportation is eligible for funding.

The City will review these sources as part of the funding plan for prioritized projects as they are advanced to the City's capital improvements program.

Current Funding Sources

The funding of the GI Plan can be considered a part of San Mateo's overall stormwater management program; therefore, GI can be integrated with related City 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 City stormwater and drainage infrastructure:

[19] SMCWPPP – January 2019

[20] Flood and Sea Level Rise Resiliency Agency: https://resilientsanmateo.org/

[21] 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

- 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
- Other stormwater program components – municipal operations, illicit discharge detection and elimination, commercial and industrial control, pesticide monitoring, public information and participation, sustainable landscaping, construction site control, creek monitoring, and implementing controls on pollutants of concern such as trash, PCBs, mercury and copper.

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. Those approaches are discussed in detail in the GI Funding Report.

The City currently uses a mix of funding sources including contribution from private development projects to support GI initiatives. The City's General Fund, permit fees and other revenue sources 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.) Table 6-3 displays the various sources and how the objectives and management of the City's Stormwater Program are achieved with those sources of revenue.

Table 6-3. Current Funding Sources

Source	Public or Private Funds	Activity Type: Administration, Implementation or Maintenance	
General Fund	Public	A	Stormwater program
	Public	I	Capital Improvement Program
Development Fees	Private	A	Stormwater program
Wastewater/ Sewer Fees (Fund 72)	Private	A	Stormwater program
C/CAG (Measure M)	Public	I	Street Sweeping, Street Paving
	Public	I	LID Implementation
Gas Tax	Public	I	Sustainable Street/Street Rehabilitation projects incorporating GI
Measure A Sales Tax (County)	Public	I	Sustainable Street/Street Rehabilitation projects incorporating GI
Traffic Impact Fee (or Transportation Improvement Fee)	Private	I	Sustainable Street/Street Rehabilitation projects incorporating GI
Grants (MTC, OBAG)	Public	I	Sustainable Street/Street Rehabilitation projects incorporating GI
Grants (Caltrans)	Public	I	Trash Capture Project
Measure S Sales Tax (City)	Public	I	Trash Capture CIP
Solid Waste Fees	Private	I	Trash Capture CIP, Street Sweeping

Potential Future Funding Options

The City has reviewed the 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: stormwater fee, parcel tax, in-lieu fees and grants.

Each of the options being considered by the City for future enactment will be included in a Funding Analysis Report. The City will be obtaining the services of a consultant to assist with evaluating the information in the GI Funding Report and other references.

The options are discussed in the sections below excerpted from the GI Funding Report, unless otherwise noted. The first two options are balloted approaches: stormwater fee and parcel tax. The fourth one entails a fee or option that would be part of an alternative compliance[22] program for private new and redevelopment projects. Grants are discussed in the final section.

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 Agency 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 City and the other SMCWPPP Permittees.[23] 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.

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[22] Alternative compliance programs can be used for implementing stormwater treatment in the public ROW where on-site constraints preclude GI. Additional information is further described on page 6 of this memo.

[23] Flood and Sea Level Rise Resiliency Agency: https://resilientsanmateo.org/

Parcel Tax

Special taxes are decided by registered voters and require a two-thirds majority for approval. Traditionally, special taxes have been decided at polling places corresponding with primary and general elections. More recently, however, local governments have had success with single issue special taxes by conducting them entirely by mail and not during primary or general elections. Special taxes are well known to Californians and are utilized for all manner of services, projects, and programs. They are usually legally very stout and flexible and can support an issuance of debt such as loans or bonds in most cases.

There are several types of special taxes, but the most common for stormwater services are parcel taxes. Parcel taxes are levied against real property and can be calibrated for some parcel metric such as acreage, size of building, impermeable area, type of use, or simply a flat rate where each parcel pays the same amount. One thing that distinguishes taxes from fees is that taxes do not necessarily need to have a direct nexus between the amount of the tax and the service received. As such, tax mechanisms can exempt certain types of property (e.g., public property) or owners (e.g., seniors or low income). While exemptions may reduce revenues somewhat, they are usually very popular with voters. Examples of parcel taxes that have been successfully implemented for stormwater services are in the cities of Culver City, Los Angeles, Santa Cruz, and Santa Monica. The most recent successful parcel tax measure was in Los Angeles County where the Flood Control agency passed a tax that will raise as much as $300 million per year for projects that would capture, treat and recycle rainwater.

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 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[24], 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.

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

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.

Development of an In-lieu Fee as part of an Alternative Compliance Program

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. Given the amount of development occurring within the City of San Mateo, approaches such as this one that leverage new and redevelopment will be seriously considered.

MRP Requirements and Allowance for Alternative Compliance

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.

Provision C.3.e.i. of the MRP 2.0 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 2.0 Provision C.3.e.ii.[25] However, the Special Project option may not be included in future MRPs, and the City may leverage alternative compliance as an option to fund and/or construct municipal GI projects. The City 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. This approach presents challenges

[25] 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.

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. 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[26]). 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. The SFPUC recently announced a GI Grant program[27] that may use future revenue from developer in-lieu fees, among other funding sources.

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 City 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 City's GI Plan coupled with the identification of GI opportunities in the City's CIP projects will go a long way toward meeting this challenge.

Grants

Federal, state, and regional grant programs have funding available to local governments to support GI efforts. These grant programs are listed in the GI Funding Report.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. 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

[26] 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.

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

- 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, some federal funds are pass-through via the state, but they are still considered federal and may therefore not be eligible as a match with other federal funds; and
- 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.

Appendix B of the BASMAA Funding Roadmap report presents the results of an evaluation of grant and loan monies that may be used to fund projects that include both GI and transportation improvements.

An additional loan program not identified in either of the reports excerpted above (SMCWPPP GI Funding Report and BASMAA Funding Roadmap) is the U.S. EPA Water Infrastructure Finance and Innovation Act (WIFIA). The WIFIA program provides long-term, low-cost supplemental loans for regionally and nationally significant projects. The WIFIA program can fund development and implementation activities for projects that are eligible for the Clean Water State Revolving Fund.

6.2.3 Private Development Programs, Incentives, and Policies

The City of San Mateo has begun to implement additional GI requirements for new private development projects. As appropriate and determined by City staff, some private new and redevelopment projects will be required to construct GI measures along the frontages of their property boundaries in the public right of way to treat runoff from roadways, sidewalks and other impervious surfaces. The City will continue to develop and refine their process for implementing this requirement including the development of standard conditions of approval, design standards and maintenance responsibilities.

6.3 Performance Assurance

The success of the GI Plan is contingent upon the performance of implemented GI facilities meeting or exceeding expectations for stormwater volume capture and pollutant removal. To increase reliability that implemented projects perform as predicted, the City has compiled a suite of tools that set the standards for GI design, construction, inspection, and maintenance. These tools are summarized in Table 6-4 and image excerpts from the plans are shown in Figure 6-7.

Table 6-4. GI Performance Assurance – Technical Guidance Documents

Guidance Topic	Project Phase	Guidance Document
Sizing Requirements	Planning and Design	SMCWPPP C.3 Regulated Projects Guide
		BASMAA Alternative GI Sizing Guidance (*See Appendix A*)
Design Guidance	Planning and Design	SMCWPPP GI Design Guide
		San Mateo Typical GI Details and Specifications
Inspection and Maintenance	Inspection and Maintenance	SMCWPPP GI Design Guide
		SMCWPPP C.3 Regulated Projects Guide
		San Mateo GI Projects Database

SMCWPPP C.3 Regulated Project Guidance

The C.3 Regulated Projects Guide was written to help developers, builders, and project applicants to select and size appropriate post-construction stormwater controls for regulated projects. The handbook provides the regulatory background and requirements under the MRP, as well as guidance for stormwater control measure selection, sizing, design, and maintenance.

SMCWPPP GI Design Guide

The GI Design Guide provides guidance on design and implementation of stormwater controls in the public right-of-way and on public property. This includes definitions of GI types, integration strategies per site type, operation and maintenance guidance, and construction considerations.

City of San Mateo GI Typical Details and Specifications

The GI Typical Details and Specifications refine the Typical Details included in the SMCWPPP GI Design Guide to make them suited for City of San Mateo. GI projects in the City will be designed and built in accordance or consistent with the typical details and specifications.

Figure 6-7. Key Technical Tools

Inspection and Maintenance Plan

Once constructed in conformance to City standards, the GI projects will be inspected and maintained to provide assurance that the facilities will perform as intended over their lifespan. The City has developed a thorough inspection and maintenance program that follows the guidance and list of activities described in the GI Design Guide. If contractors are assigned maintenance of GI projects, the maintenance activities specific to GI are specified in the contract.

6.4 Outreach and Education

The City prepared a GI Public Outreach Plan with an Outreach Strategy (Appendix E) to identify the City's target audiences, key messages, and the methods and materials for engagement and education needed to accomplish the GI outreach requirements in the MRP. Target audiences include City of San Mateo residents, property owners, and school age children, City staff and elected officials, and locally active stakeholder groups. Outreach to department staff, managers, and elected officials is crucial to getting their support for the GI Plan and the transition from traditional to green stormwater management. For residents, property owners and stakeholders, outreach is important in order to achieve public

acceptance of GI projects, particularly when these might cause a temporary inconvenience, and potentially also for support of funding efforts.

The City completed an internal multi-departmental workshop in March 2019 to explain GI requirements and strategies for implementation and a presentation in June 2019 to the City Sustainability and Infrastructure Committee as part of the GI Plan approval to educate elected officials on the elements of the GI Plan, requirements of MRP Provision C.3.j and methods of implementation requirements.

Future GI outreach efforts by the City may include the distribution of general or project-specific information via City social media sites, websites, events, neighborhood meetings, and/or press releases. Outreach efforts have been and will continue to be coordinated with SCMWPPP, who maintains a GI webpage (https://www.flowstobay.org/content/about-sustainable-streets-and-green-infrastructure), student stormwater pollution prevention outreach program, and rain barrel rebate program, and has produced various outreach materials such as posters and fact sheets explaining GI.

6.5 Project Tracking System

6.5.1 Current City Tracking Systems (Regulated and GI)

The City maintains a database of GI projects (C.3 Regulated Projects and City non-regulated, public right of way projects) and associated project activities. Once the status of a project is updated to reflect that GI has been installed, then that 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. This process will be integrated with the tracking system under development by C/CAG.

6.5.2 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. Additionally, the City's GI Plan must demonstrate with "reasonable assurance" that pollutant reductions will be met over defined periods of time (SFBRWQCB 2015).

Ultimately, the GI Tracking Tool aims to document GI projects, quantify key metrics related to their performance, and compare those metrics to goals established by the MRP. Beyond the requirements set by the MRP, the dynamic mapping and visualization of the tool can potentially support a variety of efforts by C/CAG member agencies, including public outreach, discussions with public officials, and engagement of potential funding partners and other interested stakeholders to continue to build support for GI implementation. The GI Tracking Tool will be designed in a modular, flexible framework such that other programs could be integrated over time (e.g., flood resiliency). 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.

a. Tracked Metrics

The GI Tracking Tool will track projects and quantify performance metrics on a city/countywide basis. The 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."

The most basic tracking mechanism incorporates the location and type of each uploaded project to the GI Tool, including the following:

- The locations of projects will be shown on a dynamic map along with key base layers (watershed boundaries, waterbodies, city boundaries, storm drains, etc.)
- The user may click on any project and view more information regarding that project including its type (LID on a parcel, green street, regional facility, etc.) and other fields set by C/CAG members.
- 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 allow for quantification of performance metrics and tracking of progress toward key implementation 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.
4. **Climate change mitigation:** based on climate change modeling conducted under C/CAG's Sustainable Streets Master Plan, metrics will be created to link GI to climate change adaptation and mitigation.

The GI Tracking Tool will be developed so that 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.

b. Tool Components

The Tracking Tool will contain components to support the tracking of GI project benefits across San Mateo County. The tool will be organized into several interfaces to support mapping and visualization of GI projects, presentation of detailed graphs, figures, and other analytics on completed projects to-date, review of specific project details, and annual reporting. The components of the GI Tracking Tool are outlined in Figure 6-8 and further described in the following sub-categories of this section.

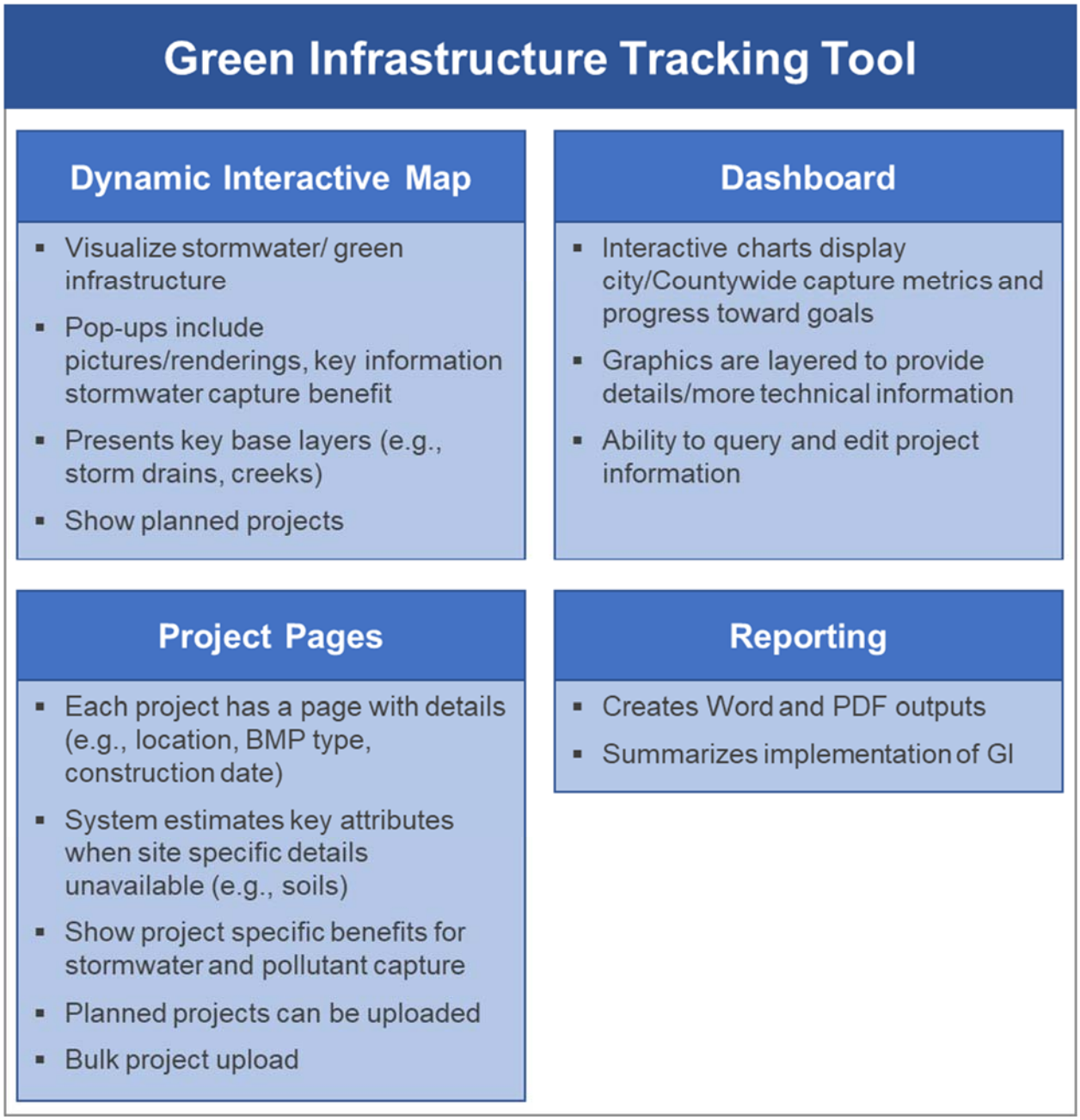


Figure 6-8. Overview of GI Tracking Tool elements and functionality.

Mapping

A dynamic interactive map will be included as part of the Tracking Tool to support the visualization of completed projects across the county. The mapping interface locates implemented projects and helps convey the scale of implementation 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 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 will facilitate annual reporting of GI implementation to meet MRP requirements. The system will allow for exporting of project summaries into multiple formats (e.g., Word, PDF). These generated outputs will include tables summarizing key project characteristics (such as location and drainage area) to supplement annual reports for regulatory agencies.

6.5.3 Proposed Process and Timeline for Tracking System Integration

The City's current process for annual reporting will be updated to integrate with the Tracking Tool once completed. Currently, project information is compiled once annually for submission 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 City's annual reporting process while providing the following benefits:

- **System maintainability:** A web-based tool will be easier to maintain than methods using 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 instead of in bulk annual uploads. This may ease the burden on City staff by reducing data compilation into manageable blocks. Additionally, planned projects may be entered into the system and project details updated throughout different phases of implementation (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 to ensure update upon project completion.
- **Data consistency:** Standardized data entry ensures that the same parameters are tracked for all completed projects. Furthermore, this promotes consistency and increases confidence in calculations and outputs while streamlining annual reporting to the Water Board. This also minimizes the propagation of errors due to tighter control over the quality assurance of entered data. 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 will facilitate 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, city boundaries, storm drains, soil types (to support infiltration estimates), rain gages (to support performance estimates), and aerial imagery and street map (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. The 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 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 from the City's database to the new system. The metrics tracked under the new system (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.

APPENDIX A - GI Sizing Methodology

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 criteria are further described under Standard Sizing Methodology section below.

GI measures in public right-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 Methodology due to constraints in the public right-of-way such as lack of space, utility conflicts, or other factors, the City 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 for use by the City of San Mateo and other Permittees in their GI Plans and is described in the Alternative Sizing Methodology section below.

Standard Sizing Methodology

Chapter 5 of the SMCWPPP C.3 Technical Guidance[28] contains detailed procedures for sizing specific stormwater treatment measures using volume-based sizing criteria, flow-based sizing criteria, or a combination flow and volume approach. In general, the treatment measure design standard is capture and treatment of 80% of the annual runoff (the small, frequent storm events.) There is also a simplified sizing method for biotreatment in which the surface area of the treatment measure is equal to 4% of the contributing impervious area, i.e., a sizing factor of 0.04[29].

GI measures should be located and sized to treat the C.3.d Amount from the contributing impervious surface area from the public right-of-way (street and sidewalk) where possible. Similarly, for GI measures in parking lots and public parks, every attempt should be made to locate and size GI measures to treat the C.3.d amount of runoff from the contributing impervious surface areas. Consideration should be given to the feasibility of treating impervious surface area from adjacent parcels, even if privately owned. If site constraints prevent locating and sizing GI measures to meet C.3.d requirements in public right-of-way, the alternative sizing methodology described below may be used.

Alternative Sizing Methodology

To develop the alternative sizing methodology, BASMAA contracted with a consultant to model bioretention facilities using rainfall data from six Bay Area gauges to determine the smallest facility sizes that will treat the C.3.d volume, and what percentages of that volume are treated in smaller facilities. The hydrologic analysis report also provides minimum bioretention sizing criteria for projects to provide

[28] SMCWPPP C.3 Stormwater Technical Guidance V.5, 2016 will soon be updated to C.3 Regulated Projects Guide – www.flowstobay.org/newdevelopment

[29] This sizing factor is based on a permeability of 5 inches per hour (in/hr) through the biotreatment soil media and a rainfall intensity of 0.2 in/hr, as specified in MRP Provision C.3.d.

treatment of 80% of annual runoff (per MRP C.3.d) based on the mean annual precipitation (MAP) of the project site. The equation below was developed from the model results across the 10 rain gauges in the report for a bioretention unit with 6 inches surface reservoir configuration.

Sizing Factor = *0.00060 x MAP + 0.0086*

Where: *Sizing Factor* is the ratio of the surface area of the bioretention facility to the impervious area contributing runoff

MAP is the mean annual precipitation of the project site.

For example, the MAP for City of San Mateo ranges from approximately 18 to 24 inches per year. Using the sizing factor equation, the sizing factor for non-regulated GI projects in San Mateo would range from 0.019 to 0.023 (or roughly 2%). This indicates that GI facilities in the street right-of-way can be sized with as low as a 2% sizing factor and still meet the C.3.d sizing requirements.

There are typically more constraints on the placement and sizing of GI measures in a public right-of-way (street) than for parcel-based GI projects, and there may be GI opportunities for which the 2% sizing factor cannot be achieved. However, undersized GI measures or GI measures designed to only treat a portion of the runoff from the contributing drainage area may still have some water quality, runoff reduction, or other benefits.

The BASMAA Development Committee developed regional guidance on how to use the modeling results and what design approaches to use in specific situations when the C.3.d sizing requirements cannot be met[30]. The regional guidance includes the following recommendations for sizing GI facilities in green street projects:

1. Bioretention facilities in street projects should be sized as large as feasible and meet the C.3.d Amount where possible. Constraints in the public right-of-way may affect the size of these facilities and warrant the use of smaller sizing factors. Bioretention facilities in street projects may use the sizing curves in the BASMAA GI Facility Sizing Report to meet the C.3.d criteria. Local municipal staff involved with other assets in the public right of way should be consulted to provide further guidance to design teams as early in the process as possible.
2. GI Measures in street projects smaller than what would be required to meet the Provision C.3.d Amount may be appropriate in some circumstances. As an example, it might be appropriate to construct a GI measure where a small proportion of runoff is diverted from a larger runoff stream. Where feasible, such facilities can be designed as "off-line" facilities, where the bypassed runoff is not treated or is treated in a different facility further downstream. In these cases, the proportion of total runoff captured and treated can be estimated using the BASMAA GI Facility Sizing Report (BASMAA, 2017). In cases where "in-line" bioretention systems cannot meet the C.3.d criteria, the facilities should incorporate erosion control as needed to protect the facility from high flows.

If it is determined that GI measures in a City green street project are unable to be designed to meet the C.3.d sizing requirements, the following steps can be taken:

[30] BASMAA, 2018. "*Guidance for Sizing Green Infrastructure Facilities in Street Projects*."

- Document the project constraints that preclude meeting the C.3.d sizing requirements. For example, if an underground utility is preventing installation at the appropriate depth, or the sidewalk planter area is inadequate for ideal sizing, or heritage trees and their root structures conflict with the desired GI location, document those constraints.
- Use the sizing charts from the BASMAA GI Facility Sizing Report (BASMAA, 2017) to determine the smallest facility size that will meet the C.3.d sizing requirements.
- If the minimum facility size is still infeasible, identify possible variations from the standard design. For example, determine whether the depth can be adjusted only in the area where a utility conflict exists. Using this alternative design, estimate the percent of the C.3.d volume that will be treated. Evaluate the cost-effectiveness of installing the GI measure given the other benefits realized (e.g., pedestrian safety, traffic calming, reduced local flooding, etc.) and the amount of pollutant removal achieved.

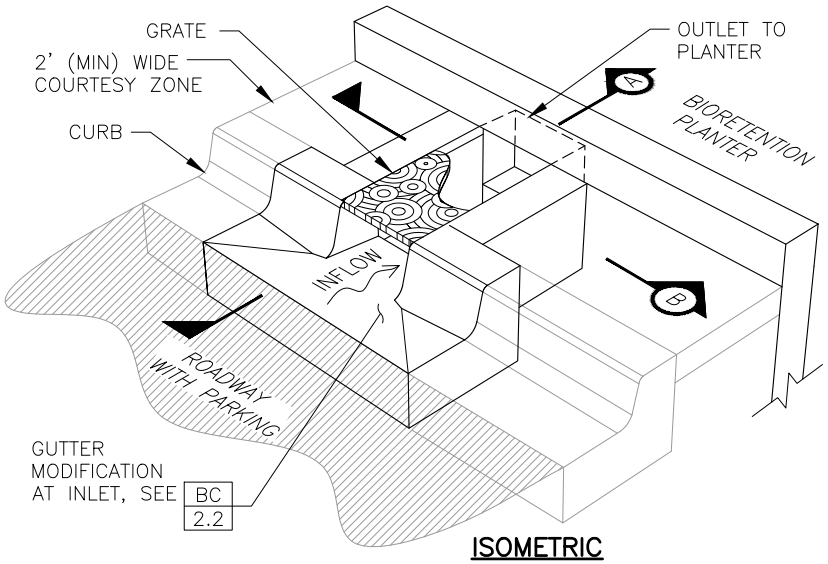
APPENDIX B – Green Infrastructure Typical Details

APPENDIX B-1. General Recommended Modifications of Typical GI Details

Recommended Modification	Applicable GI Detail Section
• Replace SFPUC logo with San Mateo logo; update cover sheet	All pages
• Exchange all references to San Francisco-specific codes, requirements, standard drawings, policies, etc. to applicable City of San Mateo/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: • Revise callout "connection to sewer" to "connection to storm sewer" • 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
• Modify bioretention/stormwater planter and subsurface infiltration system design criteria to be consistent with C.3 Guide, e.g. the following: • 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. • 2-3-inch minimum depth of mulch. • 12-inch maximum depth of ponded water. • Different freeboard requirements for different drainage conditions per C.3. • 72-hour maximum facility drawdown time; remove lesser drawdown times for surface and water and soil layer. • Reference to plant list provided in C.3 Guide.	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, Subsurface Infiltration Systems Designer Notes: SI 1.1, SI 1.2, SI 2.2

Recommended Modification	Applicable GI Detail Section
• Underdrain placement of 6” above bottom of drain rock. • Subsurface infiltration system setbacks.	
• Modify all curbs, gutters and sidewalks and references to city standard details for streetscape elements to align with Public Works Standard Details; 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.
• Revise utility setback and protection requirements to be consistent with City and local utility provider requirements and 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 City.	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

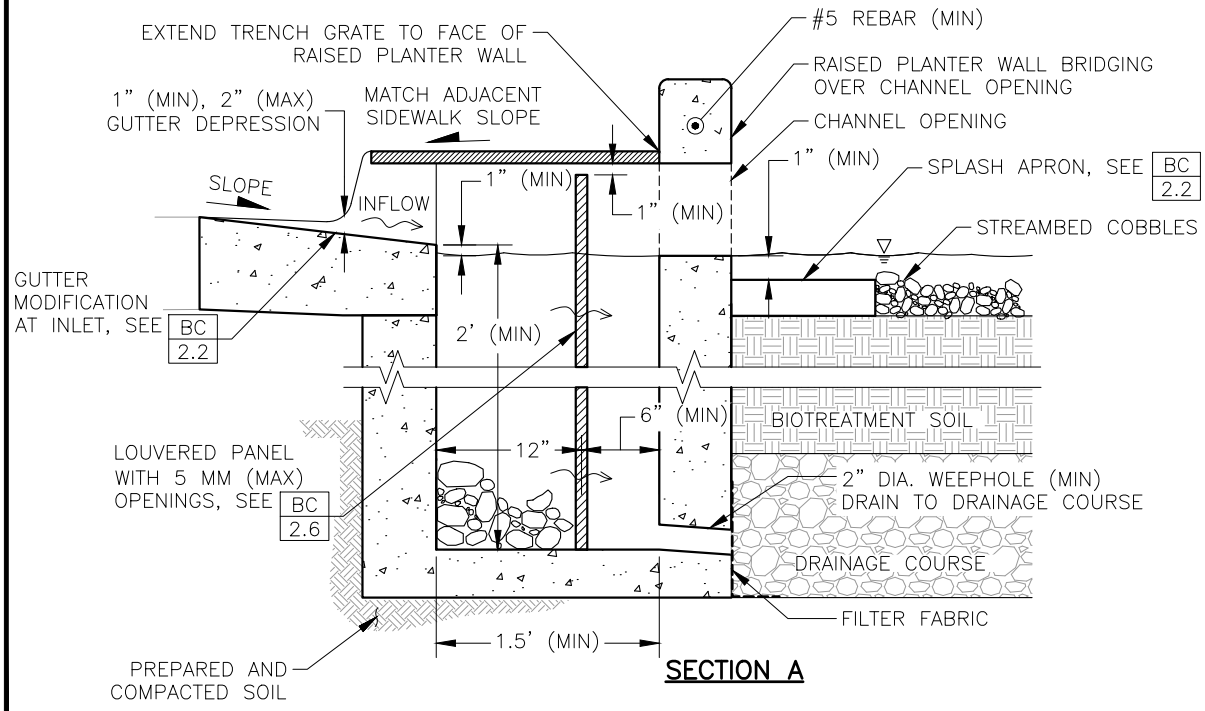
APPENDIX B-2. New GI Typical Details



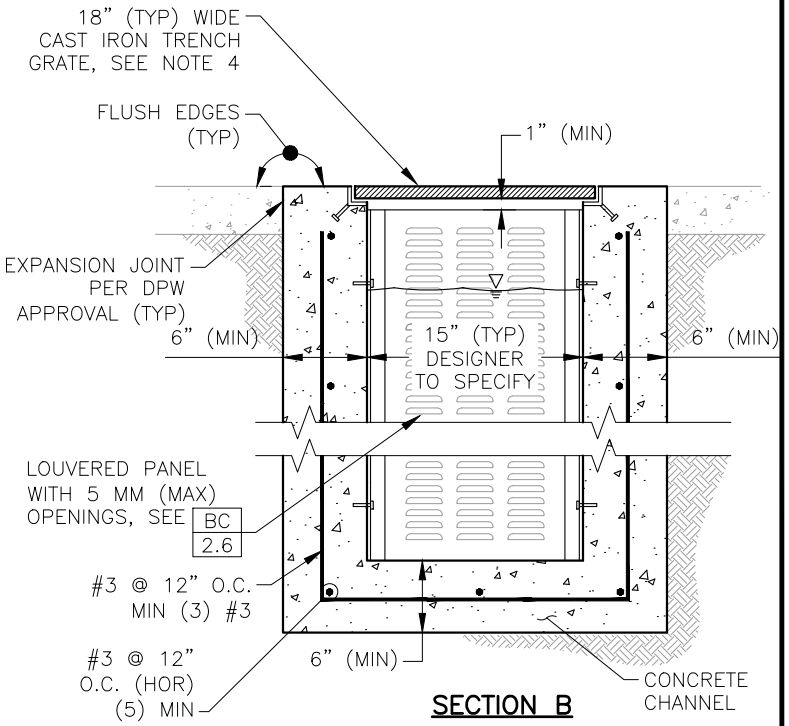
ISOMETRIC

NOTES:

1. THIS DETAIL SHOWS ONE EXAMPLE OF A NON-PROPRIETARY TRASH CAPTURE DEVICE THAT CAN BE PROVIDED ON THE INLET SIDE OF ROADSIDE BIORETENTION PLANTERS TO MEET THE FULL TRASH CAPTURE SYSTEM REQUIREMENTS MANDATED BY THE STATE WATER BOARD. TRASH CAPTURE CAN ALSO BE PROVIDED AT THE OVERFLOW OR BYPASS OUTLET STRUCTURE BY TRAPPING PARTICLES 5 MM OR GREATER DURING THE DESIGN STORM EVENT. SEE THE STATE WATER BOARD SITE FOR MORE INFORMATION.
2. ALL MATERIAL AND WORKMANSHIP FOR TRENCH DRAIN AND TRASH CAPTURE ASSEMBLY SHALL CONFORM TO CITY OF SAN MATEO STANDARD SPECIFICATIONS AND APPLICABLE PUBLIC WORKS CODES.
3. PROVIDE AT LEAST 1 INCH DROP BETWEEN INLET ELEVATION AT GUTTER AND PONDING ELEVATION.
4. ALL TRENCH GRATES/TRASH CAPTURE STRUCTURE LIDS SHALL BE REMOVABLE, RATED PER THE ANTICIPATED LOADING (H-20 LOADING WITHIN PUBLIC STREETS), AND BOLTED IN PLACE OR OUTFITTED WITH APPROVED TAMPER-RESISTANT LOCKING MECHANISM, FLUSH OR RECESSED IN GRATE.
5. BOND NEW CURB AND GUTTER TO EXISTING CURB AND GUTTER WITH EPOXY AND DOWEL CONNECTION.
6. HORIZONTAL CONTROL JOINTS SHALL BE PROVIDED EVERY 10 LINEAR FEET, OR PER MANUFACTURER'S RECOMMENDATIONS.
7. APPLY EPOXY BONDING AGENT AT ALL TRENCH DRAIN CONSTRUCTION COLD JOINTS.



SECTION A

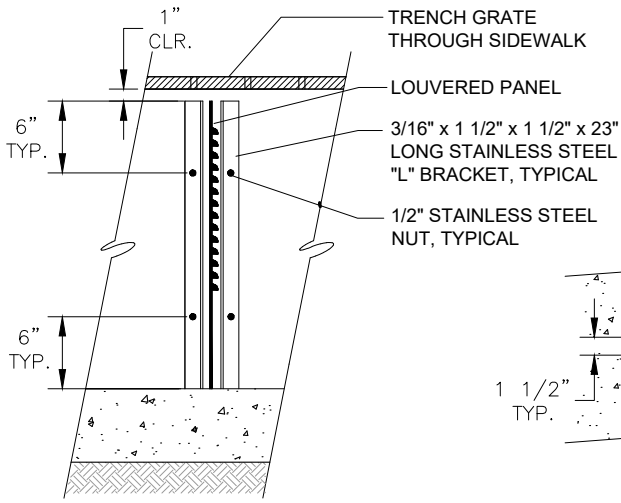


SECTION B

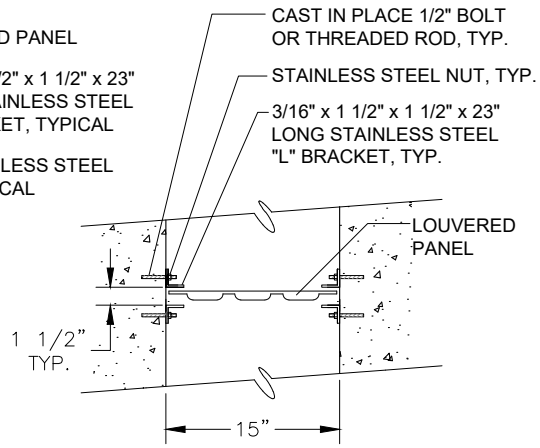
INLET – TRENCH DRAIN WITH TRASH CAPTURE (1)

NOT FOR CONSTRUCTION - REFER TO USER GUIDE

	GREEN INFRASTRUCTURE TYPICAL DETAILS CITY OF SAN MATEO	DATE JUNE 2019 VERSION 1.0 REVISED	**BIORETENTION COMPONENTS** INLET WITH TRASH CAPTURE CURB CUT WITH TRENCH DRAINS (1 OF 2)	DWG NO. **BC 2.5**



SIDE ELEVATION VIEW
N.T.S.



PLAN VIEW OF INLET CHANNEL

NOTES:

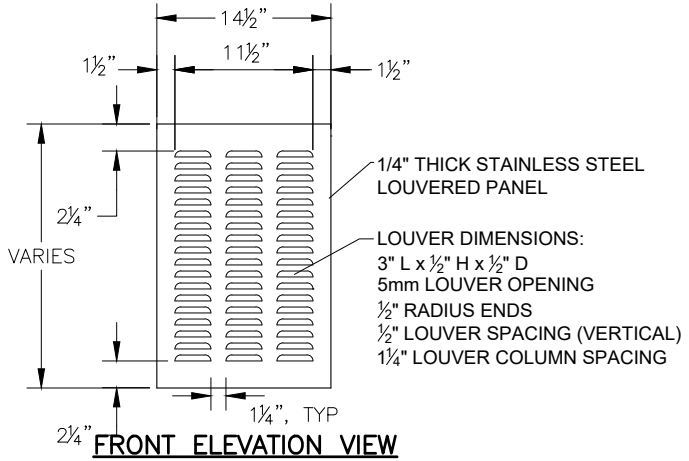
1. LOUVERED PANEL MINIMUM DIMENSION: 22"H x 14 1/2"W x 1/4T". PANEL SIZES SHALL VARY DEPENDING UPON FACILITY REQUIREMENTS.
2. FIELD VERIFY AND MAINTAIN 1" CLEAR FROM BOTTOM OF TRENCH GRATE.
3. LOUVERED PLATE AND BRACKET SHALL BE CONSTRUCTED FROM TYPE 304 STAINLESS STEEL. SUPPLIER SHALL BE THE FOLLOWING, OR AN APPROVED EQUAL:

   ROCOE MOSS COMPANY

   4360 WORTH STREET

   LOS ANGELES, CA 90063

   WWW.ROSCOEMOSS.COM



FRONT ELEVATION VIEW

NOT FOR CONSTRUCTION - REFER TO USER GUIDE

	GREEN INFRASTRUCTURE TYPICAL DETAILS CITY OF SAN MATEO	DATE JUNE 2019 VERSION 1.0 REVISED	**BIORETENTION COMPONENTS** **INLET WITH TRASH CAPTURE** **CURB CUT WITH TRENCH DRAINS (2 OF 2)**	DWG NO. **BC** **2.6**

PURPOSE:

TREE WELLS CONTROL PEAK FLOWS AND VOLUMES OF STORMWATER RUNOFF BY PROVIDING SURFACE, SUBSURFACE STORAGE, AND INFILTRATION INTO NATIVE SOIL. WATER IS ALSO TREATED AS IT FILTERS THROUGH THE BIOTREATMENT SOIL.

DESIGNER NOTES & GUIDELINES:

1. THE DESIGNER MUST ADAPT PLAN AND SECTION DRAWINGS TO ADDRESS SITE-SPECIFIC CONDITIONS.

2. TREE WELL AREA, PONDING DEPTH, BIOTREATMENT SOIL DEPTH, AND AGGREGATE STORAGE DEPTH MUST BE SIZED TO MEET PROJECT WATER QUALITY REQUIREMENTS. C.3. REGULATED PROJECTS MAY REQUIRE EXPANSION OF TREE WELL VOLUME UNDER THE PAVEMENT USING INFILTRATION TRENCHES, STRUCTURAL SOIL, AND/OR MODULAR PAVEMENT SUPPORT CELLS.

3. FACILITY DRAWDOWN TIME (i.e. TIME FOR SURFACE PONDING TO DRAIN THROUGH THE ENTIRE SECTION INCLUDING AGGREGATE STORAGE AFTER THE END OF A STORM REQUIREMENTS:

   - 48 HOUR MAXIMUM FACILITY DRAWDOWN UNLESS OTHERWISE APPROVED PER THE PROVISIONS OF THE COUNTY'S MOSQUITO & VECTOR CONTROL DISTRICT.

4. THE TREE WELL PLANTER EDGE SHOULD BE DELINEATED WITH A 6-INCH HIGH CURB (PREFERRED), LOW RAILING, OR TREE GRATE TO PREVENT PEOPLE FROM ENTERING THE PLANTER. THE VERTICAL DROP BETWEEN THE TREE WELL AND ADJACENT PATH OF TRAVEL MUST COMPLY WITH ACCESSIBILITY REQUIREMENTS. WHEN A TREE GRATE IS USED, A MINIMUM SEPARATION OF 4 INCHES BETWEEN THE GRATE AND TREE TRUNK SHALL BE MAINTAINED. REFER TO SECTION 3.1 OF THE SMCWPPP GREEN INFRASTRUCTURE DESIGN GUIDE FOR DETAILED GUIDANCE ON CURB, RAILING, AND OTHER EDGE TREATMENTS.

5. RECOMMENDED TREE ROOT VOLUME IS 400 CUBIC FEET FOR SMALL TREES (6-INCH DIAMETER TRUNK), 1,000 CUBIC FEET FOR MEDIUM SIZED TREES (16-INCH DIAMETER TRUNK), AND 1,400 CUBIC FEET FOR LARGE TREES (24-INCH DIAMETER TRUNK), WHERE VOLUMES ARE BASED ON A 3-FEET DEEP PLANTER AREA. IN CONSTRAINED SITES, ROOT CHANNELS, MODULAR PAVEMENT SUPPORT CELLS, AND OTHER TECHNIQUES CAN BE USED TO EXPAND THE TREE ROOT VOLUME. CONSULT WITH A DESIGN PROFESSIONAL TO ENSURE SUFFICIENT TREE ROOT VOLUME IS PROVIDED FOR TREE HEALTH.

6. WHEN A TREE WELL IS LOCATED BEHIND A STREET CURB, VERTICAL ELEMENTS OF THE TREE WELL THAT ARE MORE THAN 12 INCHES ABOVE THE ROAD SURFACE SHALL BE SET 18 INCHES BEHIND THE FACE OF CURB. TREE PLACEMENT SHOULD NOT IMPACT SIGHT DISTANCE FOR EXISTING DRIVEWAYS AND ON-STREET PARKING OR EXISTING DRIVEWAY AND PARKED VEHICLE INGRESS AND EGRESS.

7. TREE SPECIES AND UNDERSTORY PLANTS (IF USED) SHALL BE SPECIFIED BY A DESIGN PROFESSIONAL. PROVIDE A MINIMUM OF 2 FEET OF CLEARANCE BETWEEN THE TREE TRUNK AND THE UNDERSTORY PLANTS TO REDUCE COMPETITION FOR WATER, NUTRIENTS, AND ROOT SPACE WITH TREES.

8. THE PREFERRED SIZE FOR A TREE WELL IS 6-FEET WIDE AND 6-FEET LONG, FOR A PLANTER AREA OF 36 SQUARE FEET. WHERE SIDEWALK WIDTH IS CONSTRAINED, THE WIDTH MAY BE 4 FEET MINIMUM AND A DESIRED LENGTH OF 8 FEET WITH A MINIMUM OF 5 FEET.

9. MULTIPLE TREES IN A TREE TRENCH SHOULD BE SPACED APPROXIMATELY 25 FEET TO 35 FEET APART DEPENDING ON TREE SPECIES.

10. IF STREET PARKING IS PROHIBITED ADJACENT TO THE SIDEWALK/TREE WELL AREA, THE STEPOUT ZONE CAN BE REMOVED AND THE TRENCH DRAIN INLET CAN BE CHANGED TO A SIMPLER CURB CUT INLET.

11. IF PROJECT REQUIREMENT, THE DESIGNER SHOULD DETERMINE IF ADDITIONAL MEASURES ARE NEEDED TO MEET THE REGIONAL WATER QUALITY BOARD'S TRASH FULL CAPTURE REQUIREMENTS, i.e. TRASH CAPTURE INLET STRUCTURE AND/OR SCREEN WITHIN THE OVERFLOW STRUCTURE.

12. THE DESIGNER MUST EVALUATE UTILITY SURVEYS FOR POTENTIAL UTILITY CROSSINGS OR CONFLICTS. REFER TO **GC 2.1** - **GC 2.12** FOR UTILITY CROSSING DETAILS AND **GC 1.4** - **GC 4.4** FOR UTILITY CROSSING CONFLICT DETAILS.

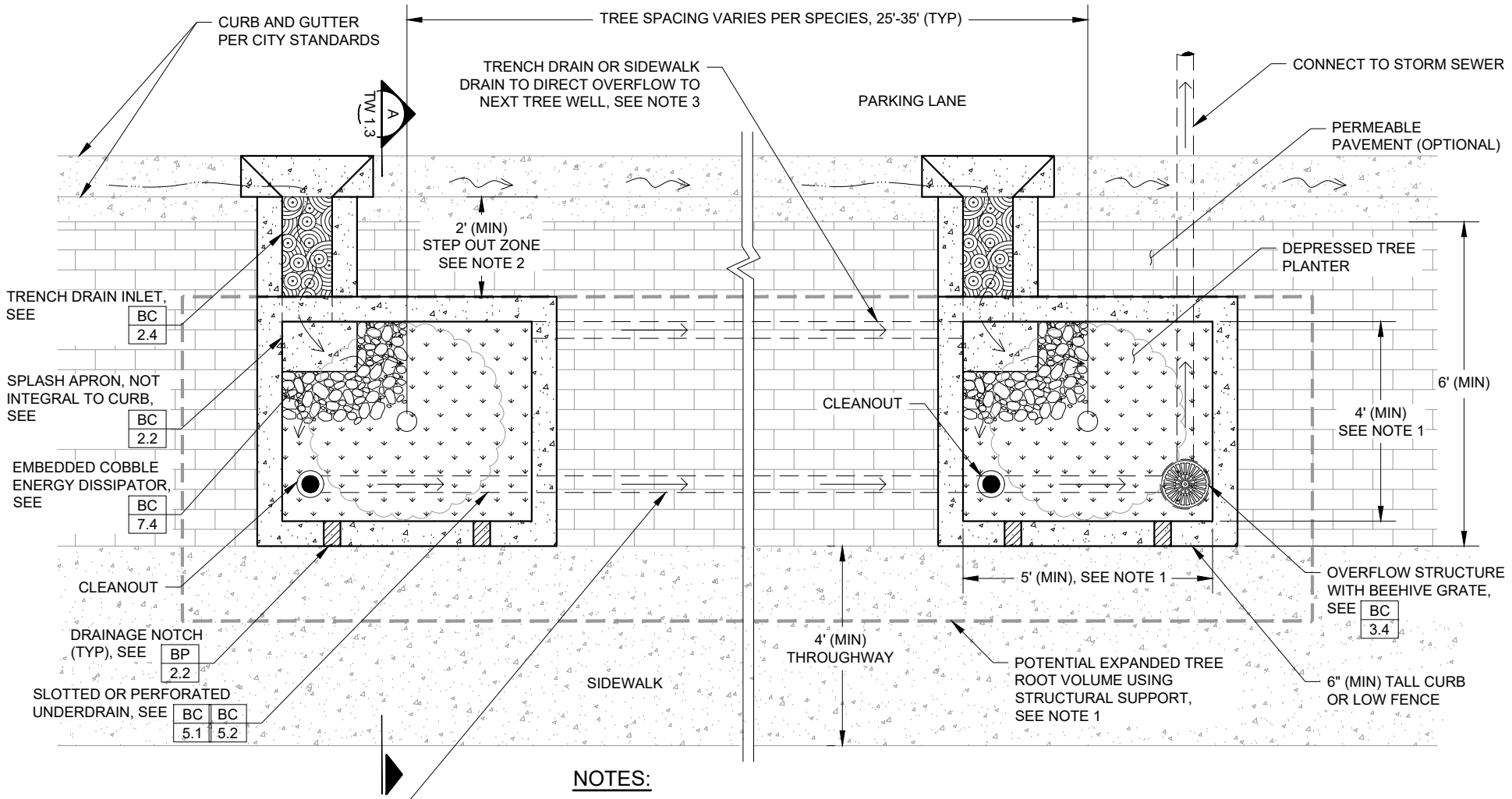
13. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT CITY OF SAN MATEO STANDARDS AND OTHER UTILITY PROVIDER REQUIREMENTS. TREES SHALL NOT BE LOCATED WITHIN FIVE (5) HORIZONTAL FEET OF A WATER ASSET, MEASURED FROM THE CENTERLINE OF THE TREE TO THE OUTSIDE EDGE OF THE ASSET.

RELATED COMPONENTS

EDGE TREATMENTS:	BC 1.1	BC 1.7
INLETS:	BC 2.1	BC 2.4
OUTLETS:	BC 3.1	BC 3.4
AGGREGATE STORAGE:		BC 4.1
UNDERDRAINS:	BC 5.1	BC 5.2
LINERS:	GC 1.1	GC 1.2
UTILITY CROSSINGS:	GC 2.1	GC 2.12
OBSERVATION PORTS:	GC 3.1	GC 3.3
UTILITY CONFLICTS:	GC 4.1	GC 4.4
CLEANOUTS:		GC 5.2

NOT FOR CONSTRUCTION - REFER TO USER GUIDE

	GREEN INFRASTRUCTURE TYPICAL DETAILS CITY OF SAN MATEO	DATE: JUNE 2019 VERSION: 1.0 REVISED:	**TREE WELL** **DESIGNER NOTES (1 OF 1)**	DWG NO. **TW 1.1**

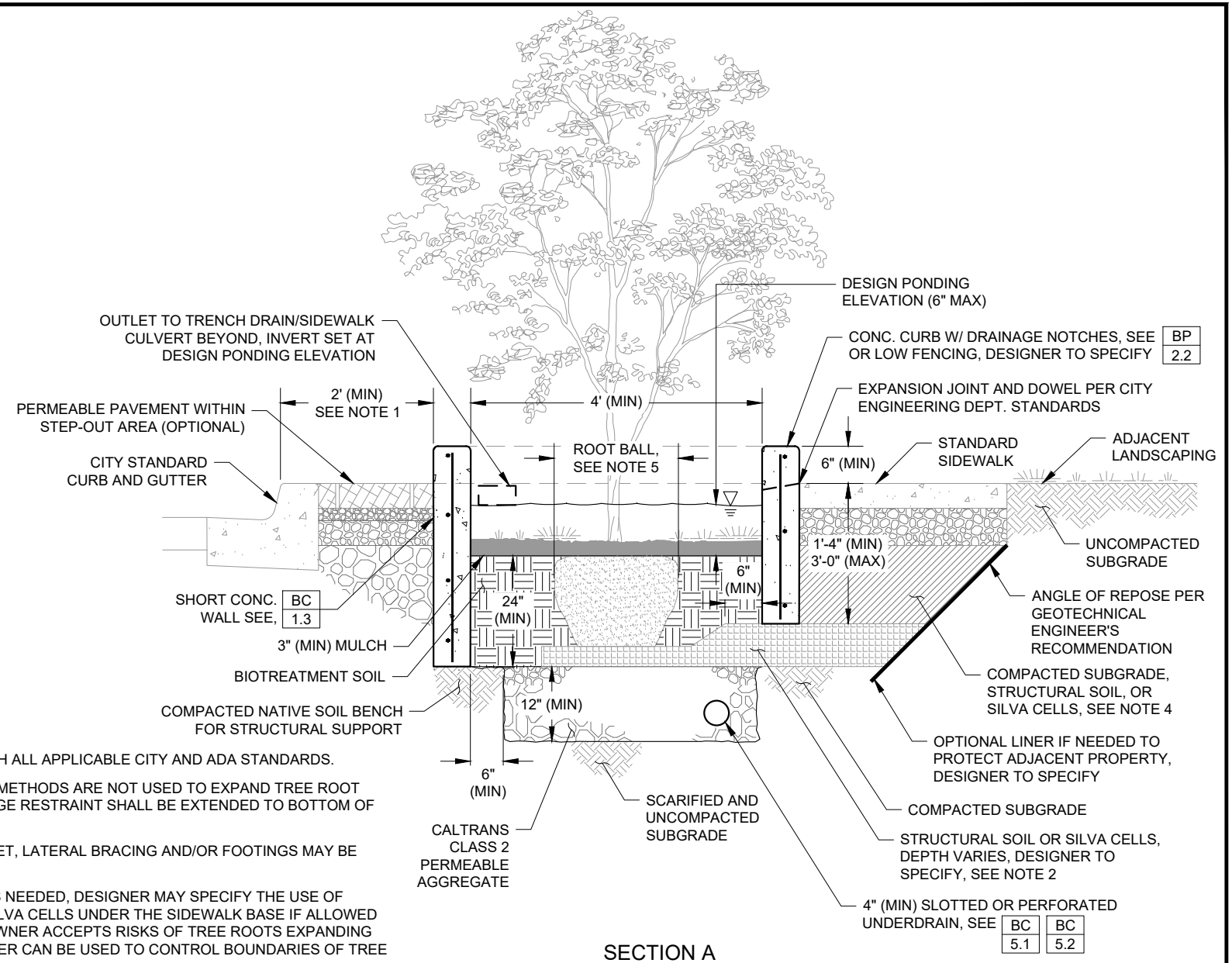


NOTES:

1. PREFERRED TREE WELL SIZE IS 6 FEET BY 6 FEET, BUT CONSTRAINED SITES CAN REDUCE WIDTH TO 4 FEET PROVIDED THEY CAN ACCOMMODATE MINIMUM REQUIRED TREE ROOT VOLUME BY INCREASING LENGTH AND/OR USING STRUCTURAL SOIL, PERMEABLE PAVEMENT, AND/OR SILVA CELLS UNDER ADJACENT SIDEWALK.
2. DESIGNER TO SPECIFY MINIMUM SIDEWALK WIDTH BEHIND AND STEP-OUT ZONE IN FRONT OF TREE WELL THAT COMPLIES WITH ALL APPLICABLE CITY AND ADA REQUIREMENTS. STEP-OUT ZONE CAN BE ELIMINATED IF PARKING IS PROHIBITED ALONG CURB. SEE DESIGNER NOTES.
3. IF SIDEWALK DRAIN, I.E. SHALLOW PIPES, ARE USED TO CONVEY SURFACE WATER BETWEEN TREE WELLS, MULTIPLE 3-INCH DIAMETER SCHEDULE 40 PVC OR CAST IRON PIPES SHALL BE INSTALLED WITH A MINIMUM COVER OF 2 INCHES OF CONCRETE OVER PIPES. REFER TO CITY STANDARD SIDEWALK UNDERDRAIN DETAIL 3-1-120 FOR ADDITIONAL REQUIREMENTS. IF TRENCH DRAIN IS USED, THE GRATE SHALL BE ADA COMPLIANT AND HAVE A NON-SLIP SURFACE. **DESIGNER TO SPECIFY SIZE(S) REQUIRED TO MEET CAPACITY NEEDS.**

NOT FOR CONSTRUCTION - REFER TO USER GUIDE

	GREEN INFRASTRUCTURE TYPICAL DETAILS CITY OF SAN MATEO	DATE: JUNE 2019 VERSION: 1.0 REVISED:	**TREE WELL** **CONNECTED TREE WELLS WITH PARKING - PLAN**	DWG NO. **TW 1.2**



SECTION A

NOTES:

1. STEP-OUT WIDTH SHALL COMPLY WITH ALL APPLICABLE CITY AND ADA STANDARDS.
2. IF STRUCTURAL SOIL AND/OR OTHER METHODS ARE NOT USED TO EXPAND TREE ROOT VOLUME BEYOND TREE PLANTER, EDGE RESTRAINT SHALL BE EXTENDED TO BOTTOM OF BIOTREATMENT SOIL.
3. IF TREE WELL LENGTH EXCEEDS 6 FEET, LATERAL BRACING AND/OR FOOTINGS MAY BE REQUIRED. DESIGNER TO SPECIFY.
4. IF ADDITIONAL TREE ROOT VOLUME IS NEEDED, DESIGNER MAY SPECIFY THE USE OF ADDITIONAL STRUCTURAL SOIL OR SILVA CELLS UNDER THE SIDEWALK BASE IF ALLOWED BY PUBLIC WORKS AND PROPERTY OWNER ACCEPTS RISKS OF TREE ROOTS EXPANDING UNDER SIDEWALK. TREE ROOT BARRIER CAN BE USED TO CONTROL BOUNDARIES OF TREE ROOTS.
5. ROOT BALL SIZE TO BE SPECIFIED BY THE DESIGNER AND APPROVED BY THE CITY ARBORIST IF WITHIN PUBLIC RIGHT-OF-WAY.
6. REFER TO DESIGNER NOTES FOR ADDITIONAL DESIGN GUIDANCE.

NOT FOR CONSTRUCTION - REFER TO USER GUIDE

	GREEN INFRASTRUCTURE TYPICAL DETAILS CITY OF SAN MATEO	DATE: JUNE 2019 VERSION: 1.0 REVISED:	**TREE WELL** **CONNECTED TREE WELLS WITH PARKING - SECTION**	DWG NO. **TW 1.3**

APPENDIX B-3. Utility Protection Guidance

City of San Mateo Guidance Regarding the Protection of Public Utility Assets Near and/or Under Green Infrastructure Facilities

General:

1. Public Works may exercise exemptions to the following asset protection standards based on site-specific constraints and project conditions.

Bioretention Planters and Permeable Pavement:

1. Bioretention planters and permeable pavement edge treatments are not permitted above or within three (3) horizontal feet of the outside diameter of a sewer/storm drain main, water main, valve box, manhole collar, or other public utility asset unless otherwise approved by the Public Works Engineer.
2. Bioretention planter inlets and outlets are not permitted within twelve (12) horizontal inches of a catch basin, or a distance that allows for the standard curb inlet gutter apron to be constructed, whichever is greater.
3. The footprint of bioretention planters are not permitted to contain operable water surface facilities and service points (including but not limited to water valves, meter boxes, and manholes). Irrigation valve boxes may be located within bioretention planters as long as the covers are elevated above the ponding level and the base is set on drain rock and not biotreatment soil.
4. Projects that install bioretention planters or permeable pavement above potable water or sewer service laterals shall maintain 12 inches (minimum) vertical separation between the bottom of the bioretention planter/permeable pavement system and the top of the lateral pipe with special accommodations for pipe protection (e.g. sleeving, concrete encasement, etc.) where applicable per the discretion of the Public Works or the utility provider. Exceptions to the minimum vertical separation may be granted to gravity pipe systems that cannot meet minimum slopes and/or elevations.
5. Paving materials installed above or adjacent to water and/or wastewater assets within the public right of way shall:
    a. Be approved by San Mateo Public Works prior to installation.
    b. Meet H-20 traffic loading ratings (as defined by AASHTO).
    c. Not diminish the overland flow capacity of the street.
    d. Not obstruct or obscure water castings.
6. Trees shall not be located within five (5) horizontal feet of a water or sewer asset, from the centerline of the tree to the outside edge of the asset.

Sidewalk Extensions/Bulbouts:

1. Sidewalk extensions/bulbouts longer than 130 feet shall only be allowed to extend over potable and recycled water mains when approved in writing by San Mateo Public Works and/or water agency in writing.
2. Sidewalk extensions longer than 130 feet are not allowed over high-pressure water systems; their valves are not allowed within sidewalk extensions.
3. Sidewalk extensions may extend over potable/recycled water lateral service valves, provided the following conditions are satisfied:
    a. The valve box shall be replaced.
    b. A clear path of travel a minimum of four (4) feet wide shall be provided for Water Department staff between the street and the valve.
4. Sidewalk extensions shall not extend over or around potable/recycled water main valves that are in the street under existing conditions. Main valves shall be accessible at all times by water service provider and Fire Department vehicles.

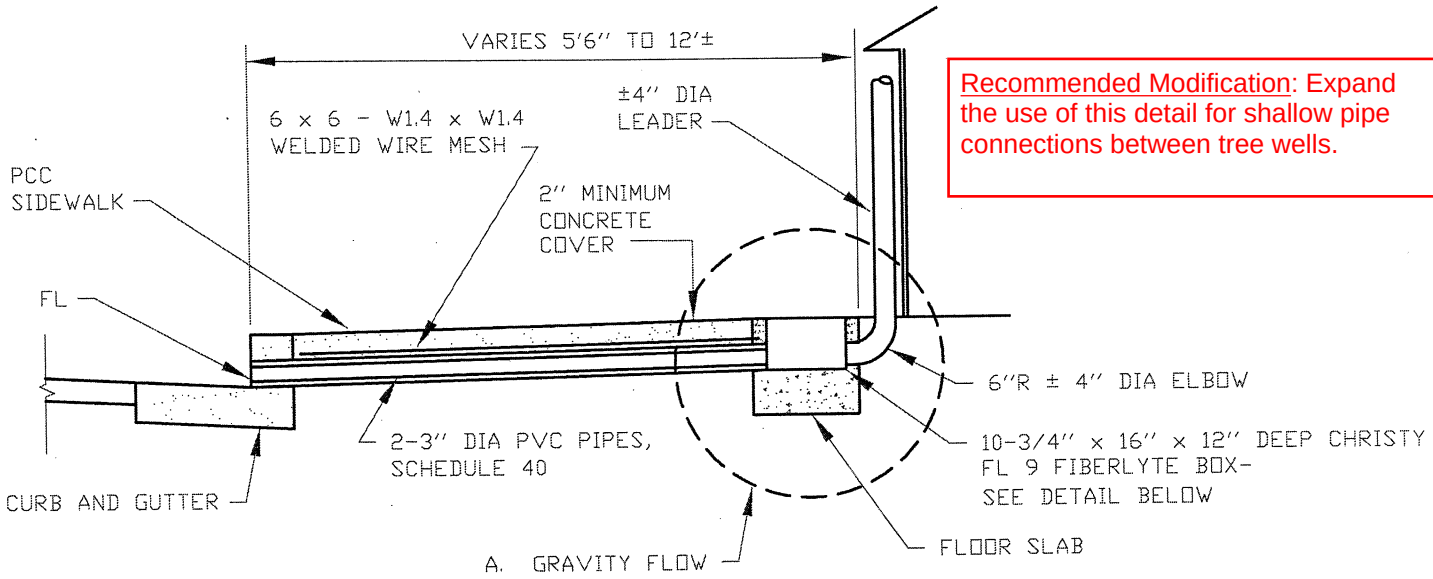
5. Sidewalk extensions, bulbouts, curbs and gutters shall not be built in the same location as existing manholes, unless special approval is granted by Public Works and the manhole cover is modified to meet ADA and maintenance requirements. The lip of any new gutter shall be horizontally offset from the outside edge of any manhole frame by a minimum of six (6) inches. The face of any new curb shall be horizontally offset from the outside edge of any manhole frame by a minimum of eighteen (18) inches.
6. If a project results in a manhole located outside of a vehicular path of travel, unobstructed vehicular access with H-20 traffic loading shall be provided within ten (10) horizontal feet of the manhole.

Utilities:

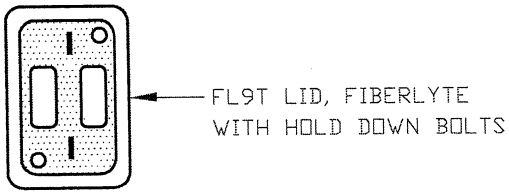
1. Sewer Laterals:
    a. Positive surface slope shall be maintained from all sewer lateral cleanout lids to the gutter.
    b. Pedestrian path-of-travel shall avoid the flow path for sewage resulting from a sewer lateral cleanout back-up.
2. New utilities and/or underground structures shall comply with all utility agency requirements and other applicable federal, state, and local codes.
3. New utilities and/or underground structures aligned adjacent to an existing water/wastewater asset shall not be installed within three (3) horizontal feet of the outside diameter of the existing utility asset.
4. New utilities and/or underground structures that cross over or under an existing water asset shall be installed as far as possible from and no closer than twelve (12) inches to the outside diameter of the asset.
5. New utilities and/or underground structures that cross over or under an existing water/wastewater asset shall cross at an angle of forty-five (45) to ninety (90) degrees, as measured between the centerline of the crossing utility and the water asset, unless otherwise authorized.
6. PG&E Facilities: Per current Greenbook Joint Trench Configurations, the minimum allowable horizontal separation between PG&E facilities and "wet" facilities is 3’ with a minimum 1’ of undisturbed earth or the installation of a suitable barrier between the facilities. If a 3’ horizontal separation cannot be attained between "wet" utilities and PG&E dry facilities, a variance may be approved by the local Inspection Supervisor and submitted to the Service Planning Support Program Manager for approval. Separations of 1’ or less are not permissible and will not be allowed.
   https://www.pge.com/includes/docs/pdfs/mybusiness/customerservice/startstop/newconstruction/greenbook/servicerequirements/greenbook_manual.pdf#page=381

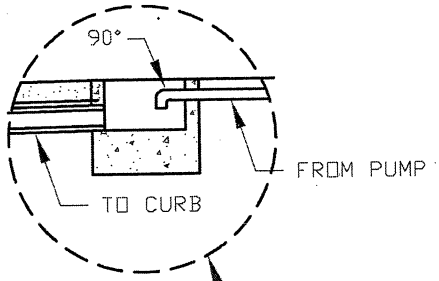
   Gas only service trenches shall have a minimum cover of 24 inches (12” to warning tape, 12” to top of pipe, 4” of approved backfill immediately above pipe. See page 2-9 here:
   https://www.pge.com/includes/docs/pdfs/mybusiness/customerservice/startstop/newconstruction/greenbook/servicerequirements/greenbook_manual.pdf#page=69

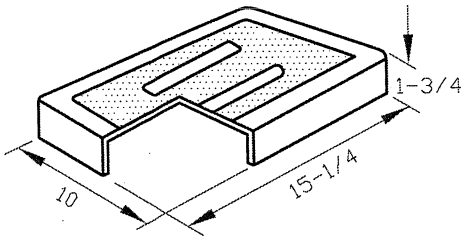
APPENDIX B-4. Existing City Standard Details

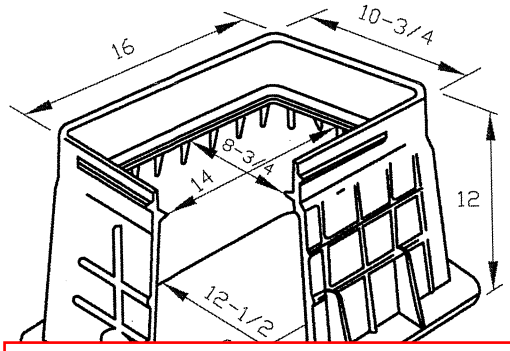


Recommended Modification: Expand the use of this detail for shallow pipe connections between tree wells.









NOTES:

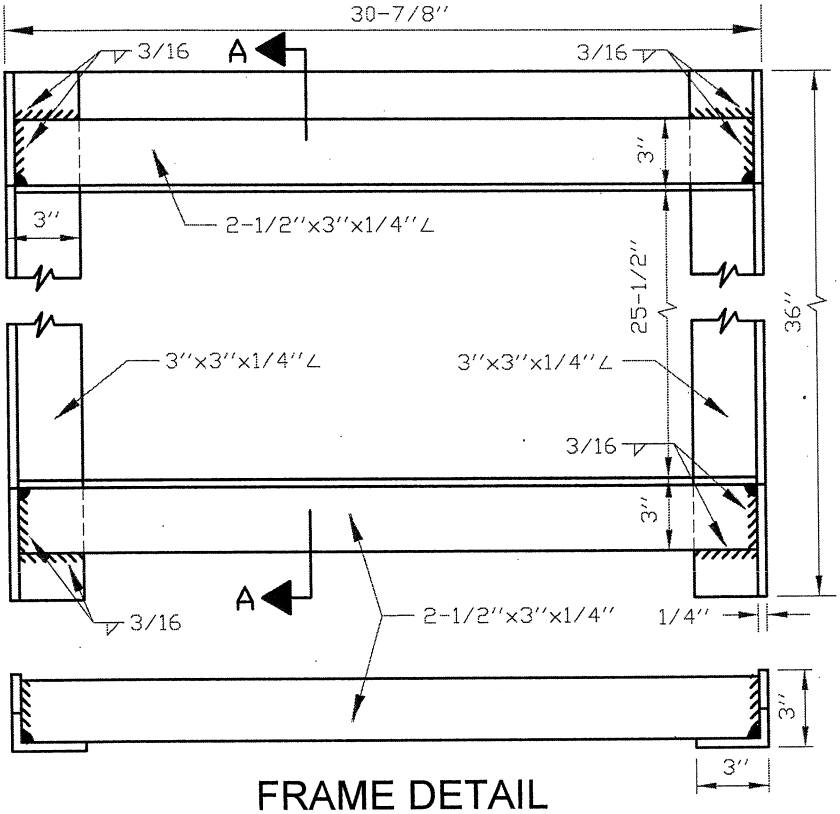
1. FLOOR SLAB DIMENSIONS: 20" x 16" x 6". FILL BOX WITH CONCRETE AS NECESSARY TO MAKE 2 % GRADE TO GUTTER FLOW LINE.
2. BOX TO BE FIBERLYTE FL9 BOX 10" x 17" AS MANUFACTURED BY CHRISTY (657-7070) OR CITY APPROVED EQUAL.
3. CURB & GUTTER & SIDEWALK MUST BE SAW CUT ON SCORE MARKS. CORE DRILLING EXISTING CURB IS NOT ALLOWED.
4. CURB & GUTTER MUST BE SAWCUT A MINIMUM OF 2' WIDE & SHALL MATCH SIDEWALK SCORE MARKS UNLESS APPROVED IN ADVANCE BY CITY. DOWEL WITH #4 x 12" @ 18" O.C.
5. SIZE OF BOX SHALL BE DETERMINED BY LICENSED CIVIL ENGINEER TO ACCOMMODATE DISCHARGE FLOW WITHOUT CREATING A FLOODING SITUATION.

RECOMMENDED MODIFICATIONS TO CITY STANDARD DETAILS TO ALIGN WITH TYPICAL GREEN INFRASTRUCTURE DETAILS - 6/3/19 FINAL

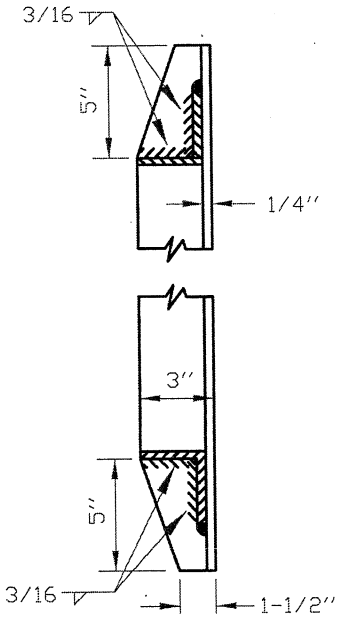
ENGINEERING DEPARTMENT — CALIFORNIA 94403

STANDARD SIDEWALK UNDERDRAIN

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2002	PC	OC	CITY ENGINEER	3	1	120



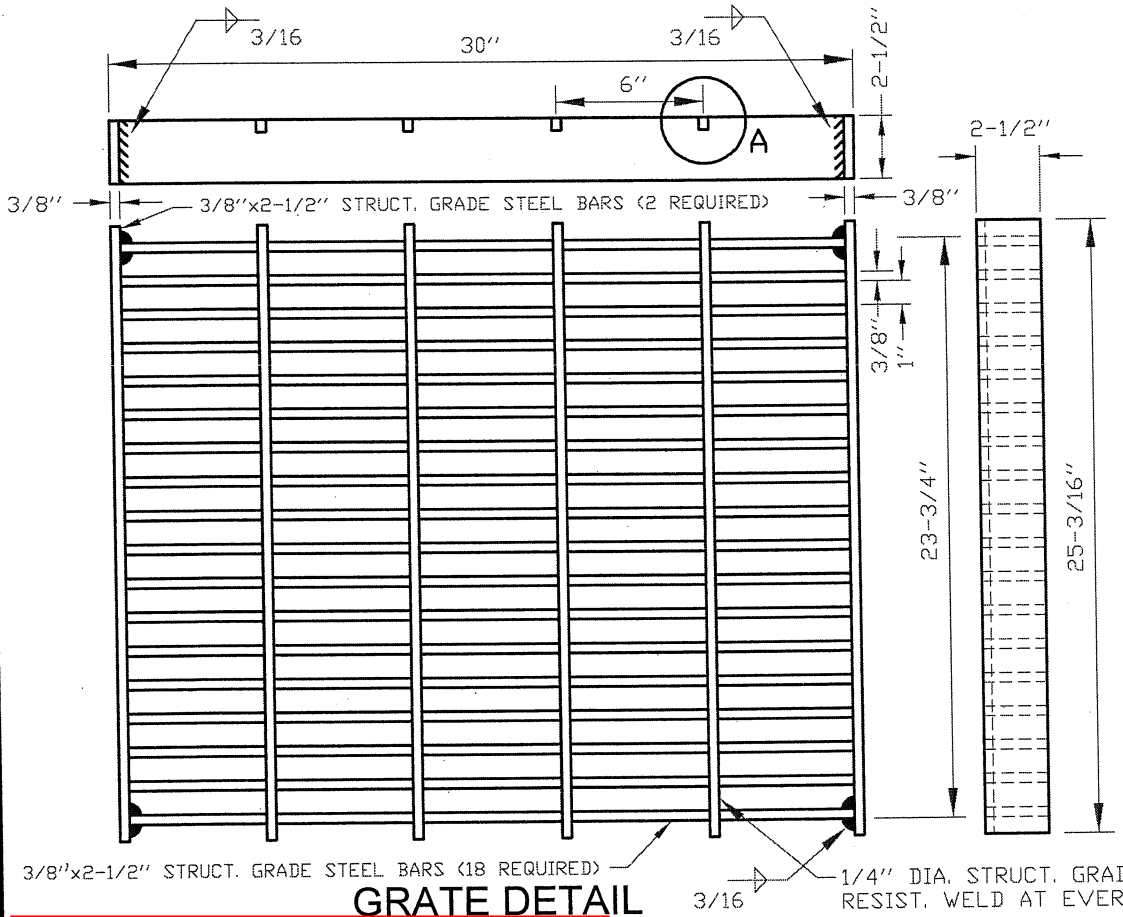
FRAME DETAIL



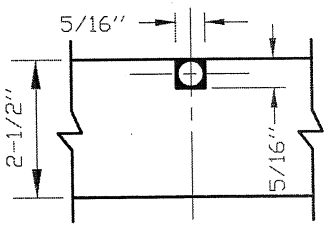
SECTION A-A

NOTES:

1. TOP AND BOTTOM SURFACES OF GRATE TO BE GROUND FLUSH AFTER WELDING.
2. ALL METAL SURFACES SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM. ALL FABRICATING, SHEARING, BENDING, AND WELDING SHALL BE DONE BEFORE GALVANIZING.
3. FRAME AND GRATE ASSEMBLY SHALL BE ASSEMBLED IN SHOP BEFORE DELIVERY.



GRATE DETAIL



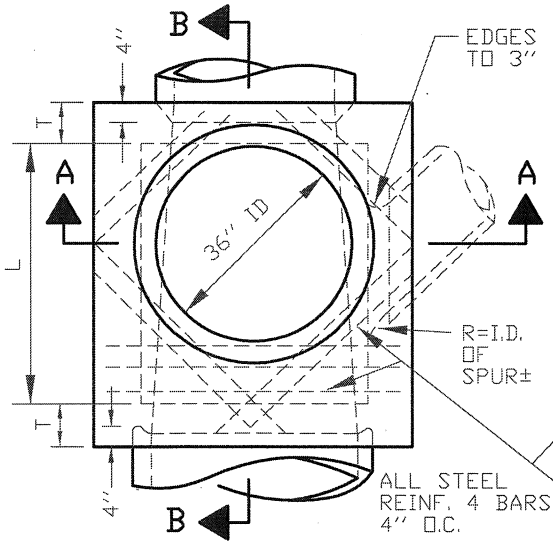
SECTION A

Recommended Modification: Add standard details for bioretention overflow structure grates and trench drain curb cut inlets for right-of-way projects.

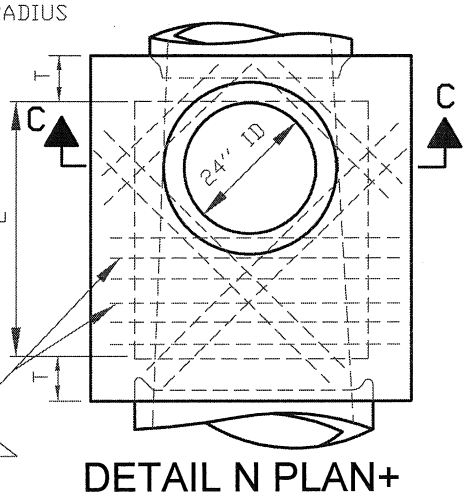
CALIFORNIA 94403

STANDARD CATCH BASIN
ME & GRATE DETAIL, TYPE "3"

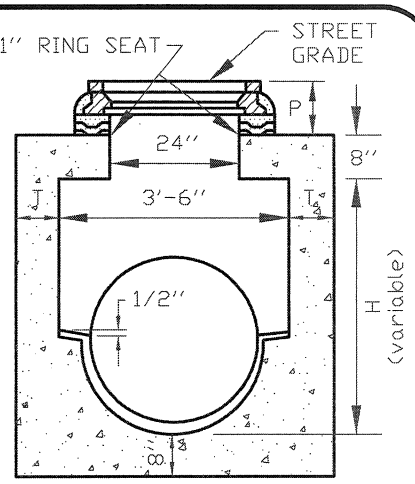
DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2002	PC	OC	CITY ENGINEER	3	1	125



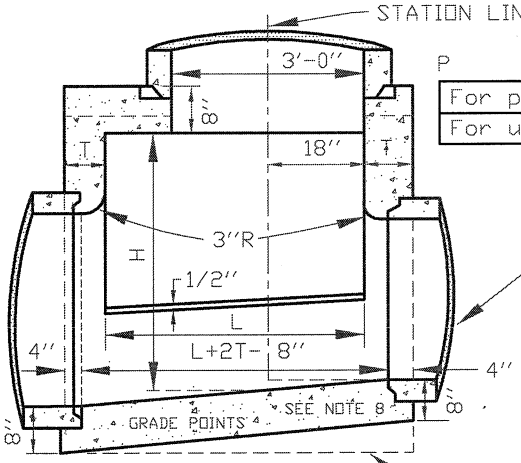
PLAN+



DETAIL N PLAN+



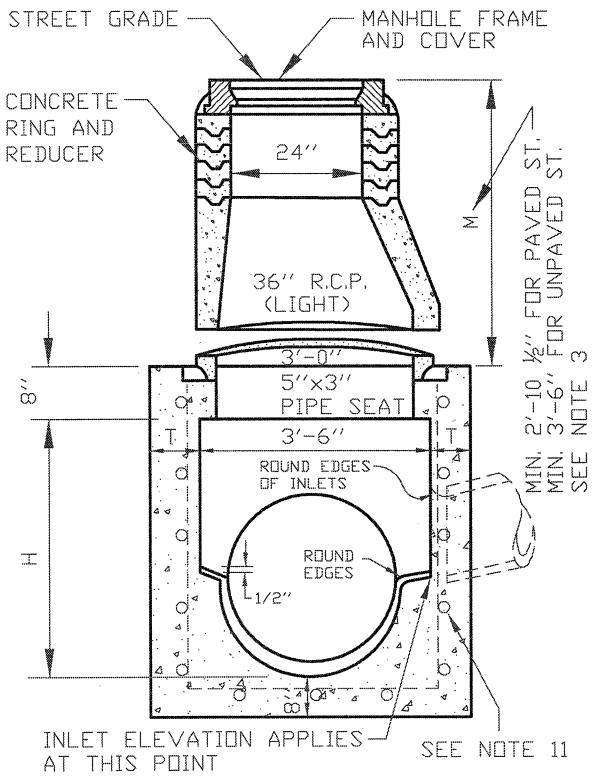
SECTION C-C



SECTION B-B

P	Max	Min
For paved streets	11"	8-1/2"
For unpaved streets	16"	15"

(SEE NOTE 4)



SECTION A-A

NOTES:

1. HEIGHT H (IN SEC. A-A AND SEC. B-B) SHALL BE NOT LESS THAN 4'-0", BUT MAY BE INCREASED PROVIDED THAT THE VALUE OF M SHALL BE NOT LESS THAN THE MIN. SPECIFIED AND THAT THE REDUCER SHALL BE USED.
2. LENGTH L SHALL BE 4'-0" UNLESS OTHERWISE SHOWN ON PLAN. L MAY BE INCREASED OR LOCATION OF MANHOLE SHIFTED TO MEET PIPE ENDS.
3. SHAFT SHALL BE CONSTRUCTED AS PER SEC. C-C AND DETAIL N WHEN DEPTH M FROM STREET GRADE TO TOP OF BOX IS LESS THAN 2'-10 ½" FOR PAVED STREETS OR 3'-6" FOR UNPAVED STREETS.
4. DEPTH P MAY BE REDUCED TO AN ABSOLUTE LIMIT OF 8" WHEN LARGER VALUES OF P WOULD REDUCED H (IN SEC. C-C) TO 3'-6" OR LESS.
5. T SHALL BE 8" FOR VALUES OF H UP TO AND INCLUDING 8/, 10" FOR VALUE OF H OVER 8'.
6. REINFORCING STEEL SHALL BE STRAIGHT BARS 1-½" CLEAR FROM FACE OF CONCRETE.
7. STATIONS OF MANHOLES SHOWN ON PLAN APPLY AT CENTER LINE OF SHAFT. ELEVATIONS ARE SHOWN AT SHAFT CENTER AND REFER TO THE PROLONGED INVERT GRADE LINE. SEE NOTE 2 FOR SHIFTING LOCATION.
8. FLOOR OF MANHOLE SHALL BE STEEL-TROWELED.
9. RINGS, REDUCER, AND PIPE FOR ACCESS SHAFT SHALL BE SEATED IN MORTOR AND NEATLY POINTED OR WIPED INSIDE SHAFT.
10. USE 560-B-3250 CONCRETE.
11. WALL REINFORCING IS #4 BARS @ 12" O.C. EACH WAY.

Recommended Modification: Add note specifying when bolted ladders or steps are required in manholes over a certain depth, e.g. 4 or 5 feet. This requirement should be consistent with bioretention overflow structure detail, BC 3.4.

CALIFORNIA 94403

STANDARD STORM DRAIN MANHOLE

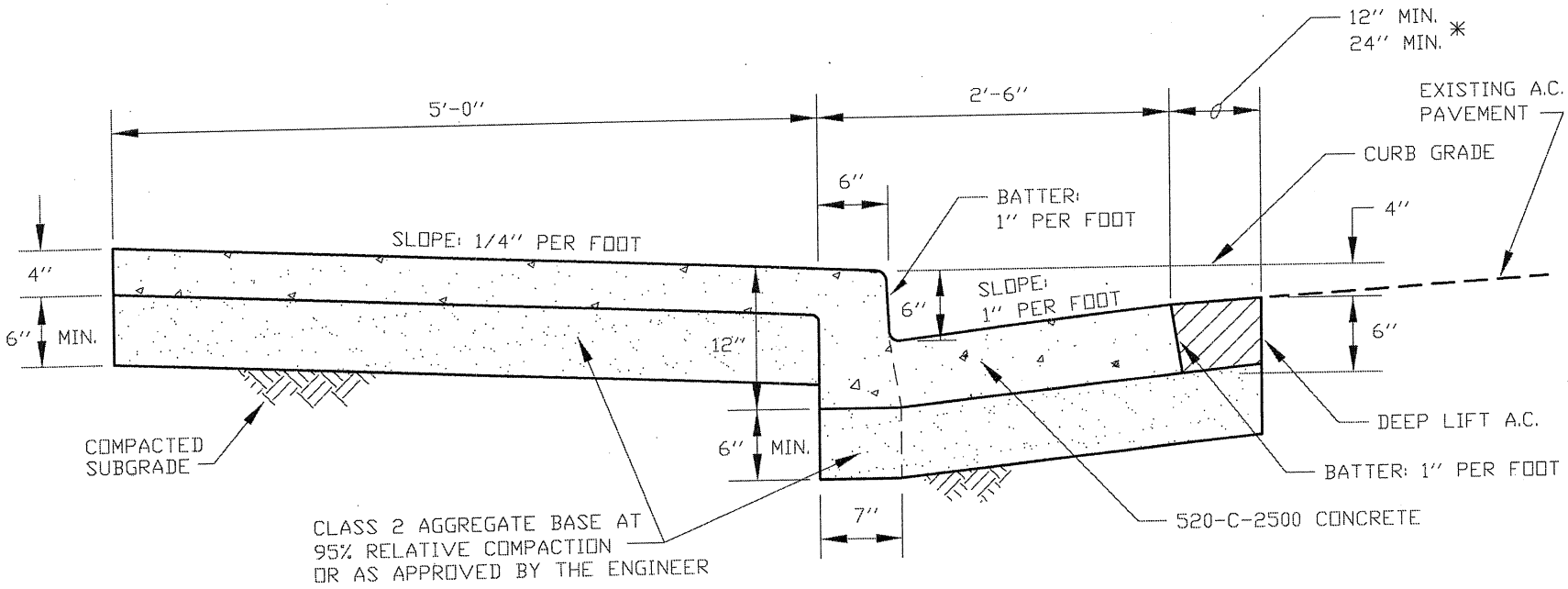
DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2002	PC	OC	Mark Kearns CITY ENGINEER	3	1	126

ENGINEERING DEPARTMENT

TYPICAL SECTION OF TYPE "A" CURB, GUTTER, AND SIDEWALK

CALIFORNIA 94403

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2002	PC	OC	CITY ENGINEER	3	1	141A



TYPE "A"

NOTE: FOR EXPANSION JOINTS, WEAKEND PLANE JOINTS AND SCORING, SEE "MISCELLANEOUS DETAILS - CURB, GUTTER, AND SIDEWALK" STD. 3-1-141C.

NOTE: PROVIDE AND INSTALL # 4 x 12" LONG DOWELS AT 18" O.C. MAXIMUM AT THE END OF UNFINISHED CONCRETE POUR OR WHERE NEW CONCRETE JOINS EXISTING CONCRETE.

NOTE: CONCRETE SHALL CONTAIN 1LB OR 1PT OF LAMP BLACK PER CU. YD.

NOTE: CURB AND GUTTER TO BE POURED MONOLITHIC UNLESS APPROVED BY CITY ENGINEER.

Recommended Modification: Add curb and gutter detail for conditions in which sidewalk is not monolithic, as is the case for curbs adjacent to bioretention planters or sidewalks that use permeable pavement.

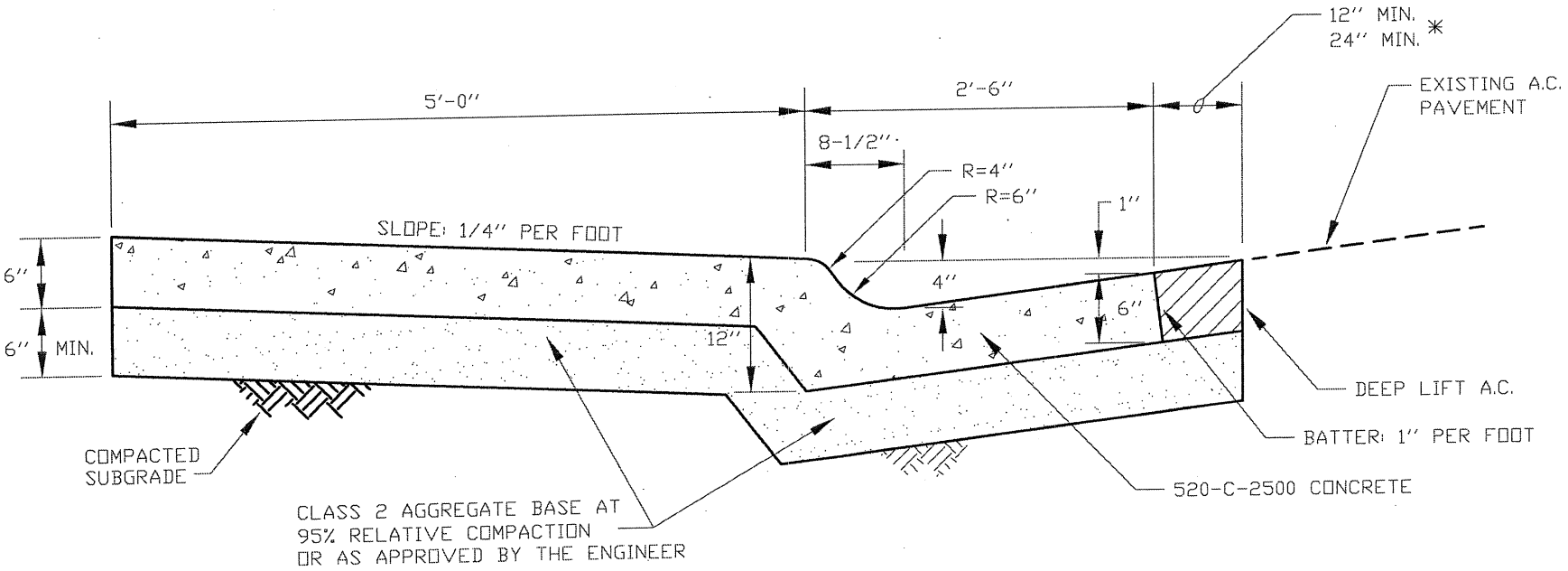
✳ REQUIRED ONLY WHERE EXISTING A.C. PAVEMENT IS NOT BEING RECONSTRUCTED AND ONLY FOR THE PURPOSE OF SETTING UP FORMS AT LIP OF GUTTER.

ENGINEERING DEPARTMENT

TYPICAL SECTION OF TYPE "B" CURB, GUTTER, AND SIDEWALK

CALIFORNIA 94403

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2002	PC	OC	CITY ENGINEER	3	1	141B



TYPE "B"

NEED SPECIAL APPROVAL BY CITY ENGINEER

NOTE: FOR EXPANSION JOINTS, WEAKEND PLANE JOINTS AND SCORING, SEE "MISCELLANEOUS DETAILS - CURB, GUTTER, AND SIDEWALK" STD. 3-1-141C.

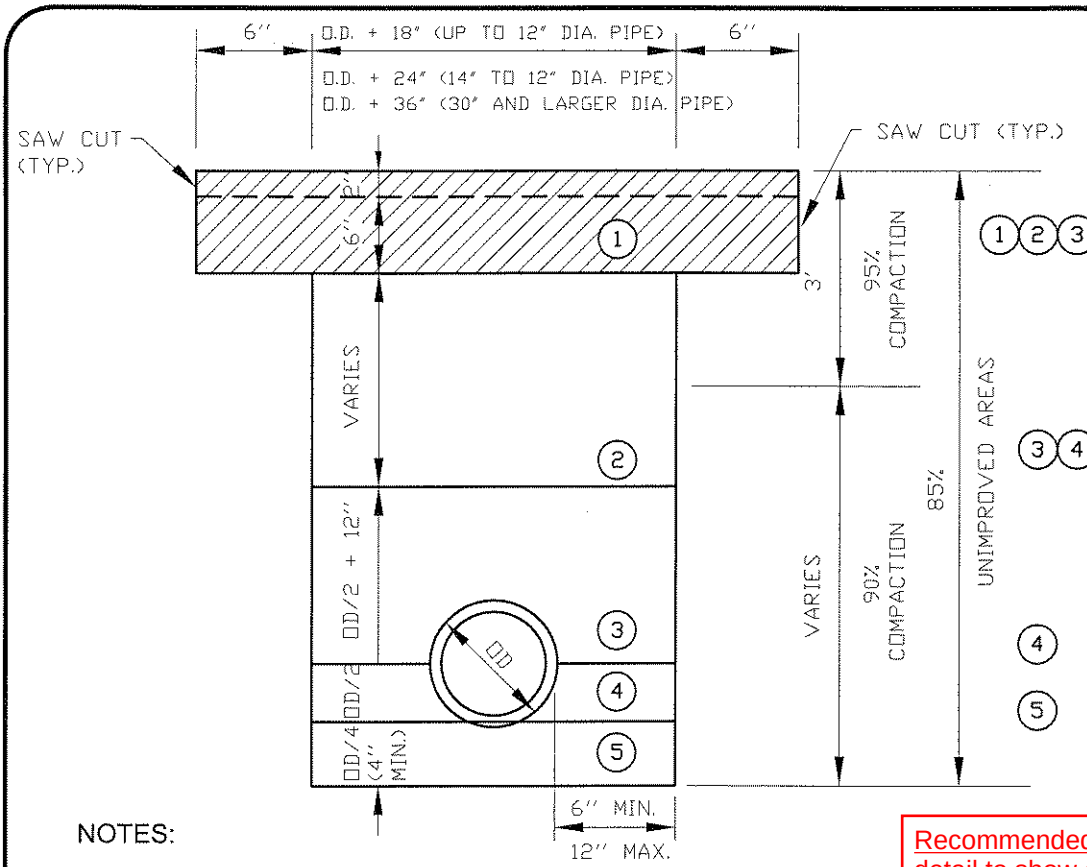
NOTE: PROVIDE AND INSTALL # 4 x 12" LONG DOWELS AT 18" O.C. MAXIMUM AT THE END OF UNFINISHED CONCRETE POUR OR WHERE NEW CONCRETE JOINS EXISTING CONCRETE.

NOTE: CONCRETE SHALL CONTAIN 1LB OR 1PT OF LAMP BLACK PER CU. YD.

NOTE: CURB AND GUTTER TO BE POURED MONOLITHIC UNLESS APPROVED BY CITY ENGINEER.

Recommended Modification:
1. Add note that rolled curbs are not be used adjacent to bioretention planters, tree wells, or other depressed landscape stormwater management facilities.
2. Add rolled curb and gutter detail for conditions in which sidewalk is not monolithic, as is the case for curbs adjacent to sidewalks that use permeable pavement.

* REQUIRED ONLY WHERE EXISTING A.C. PAVEMENT IS NOT BEING RECONSTRUCTED AND ONLY FOR THE PURPOSE OF SETTING UP FORMS AT LIP OF GUTTER.



COMPACTION METHOD

(1)(2)(3) MECHANICAL COMPACTION
MECHANICAL (EXCEPT UNIMPROVED AREAS MAY BE JETTED OR WITH ENGINEERS APPROVED)

(3)(4) ARE EXCEPTIONS
WHEN QUARRY FINES OR SAND IS USED IT SHALL BE JETTED OR JETTED AND VIBRATED.

(4) JETTED

(5) JETTED

NOTES:

1. WHEN WORKING OVER BAY MUD: WEIGHT OF BACKFILL INCLUDING PIPE AND CONT EXCAVATED.
2. SAND SLURRY BACKFILL PERMITTED FOR TRENCHES LESS THAN 6" WIDE.

Recommended Modification: Expand upon detail to show condition in which utilities pass under permeable pavement and/or bioretention (if allowed by City), e.g. can Area 2 be uncompacted or lightly compacted if liner is provided over top of Area 3?

BEDDING CLASSES AND TRENCH BACKFILL MATERIALS

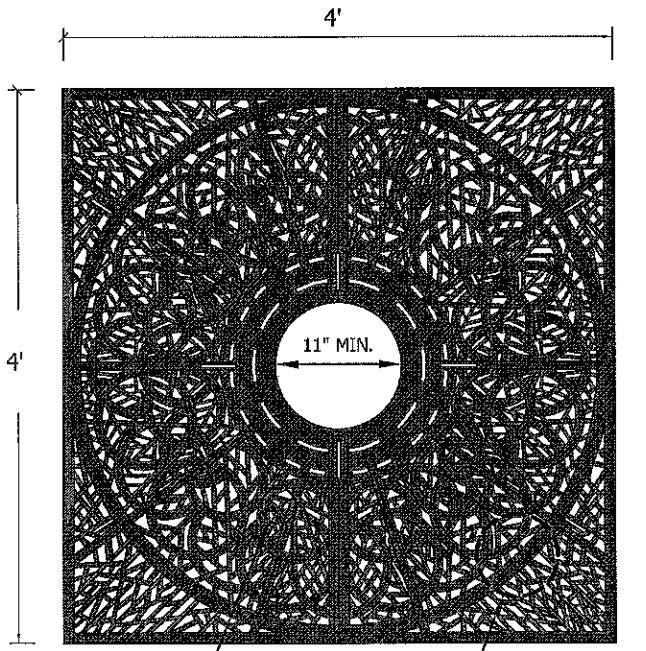
Bedding Class	A - 2	A - 1	A	A - 0	B - 2	B - 1	C	D
Load Factor	4.5	3.2	3.0	2.3	1.9	1.5	1.5	1.1

Location / Material	Backfill Materials
(1)	Street Areas - 2" Asphalt Concrete and 6" 520-A-2500 Concrete or 8" 520-A-2500 Concrete Unimproved Areas - Aggregate Base or Native Material, as directed by the Engineer
(2)	Crushed Aggregate Base or Approved Native Material, as directed by the Engineer.
(3)	Vibrated Concrete / Crushed Aggregate Base or Approved Native Material, except Quarry Fines or Sand for V.C.P.
(4)	Vibrated Concrete / Quarry Fines or Sand / Crushed Aggregate Base or Approved Native Material, except Quarry Fines or Sand for V.C.P.
(5)	Vibrated Concrete / Quarry Fines or Sand or Drain Rock / Vibrated Concrete / Quarry Fines or Sand or 3/4" max. crushed rock

ENGINEERING DEPARTMENT — CALIFORNIA 94403

STANDARD TRENCH DETAIL

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
2005	MQ	OC	CITY ENGINEER	3	1	153



TREE GRATE

OT SERIES, TITLE 24 4'x4' SQUARE WITH 3/8" OR LESS SLOTS. SEMI-GLOSS BLACK POWDER COATING.

OT SERIES, TITLE 24 2' RADIUS ROUND, IF APPROVED BY CITY ENGINEER.

TRAFFIC RATED GRATES REQUIRED BEHIND CURB. IF INSTALLED BEHIND SIDEWALK, OPTIONAL PEDESTRIAN RATED ALLOWED, IF APPROVED BY CITY ENGINEER.

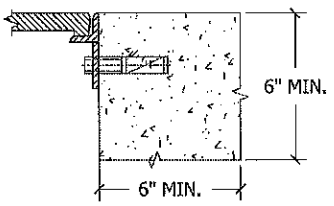
STAKE OPENINGS ARE REQUIRED. LIGHT PORTS AND IRRIGATION ACCESS CUTOUTS IF NECESSARY.

MANUFACTURE

URBAN ACCESSORIES:
465 East 15th Street, Tacoma, WA 98421
(253)572-1112

DISTRIBUTOR

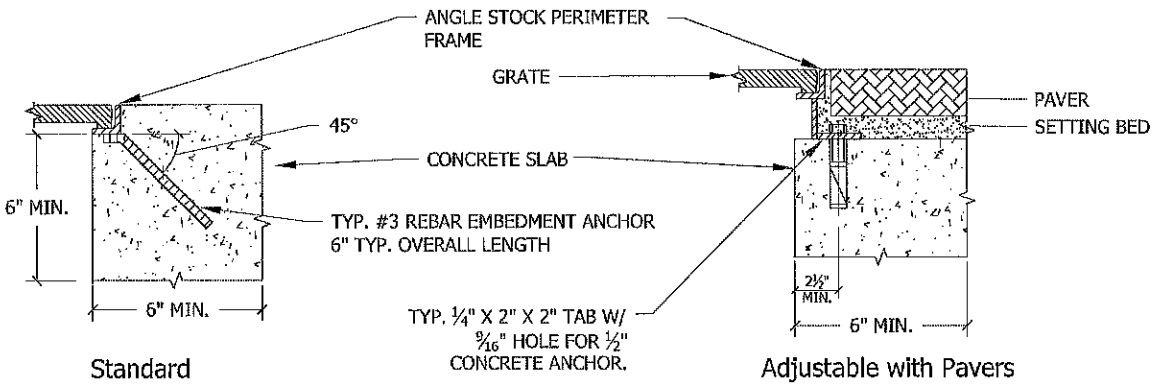
RECREATION REPUBLIC INC.
802 North Twin Oaks Valley Road
San Marcos, CA 92069
(888)843-6128



Standard

SECTION — Retrofit

1-1/2" = 1' - 0"



Standard

Adjustable with Pavers

SECTION — New Construction

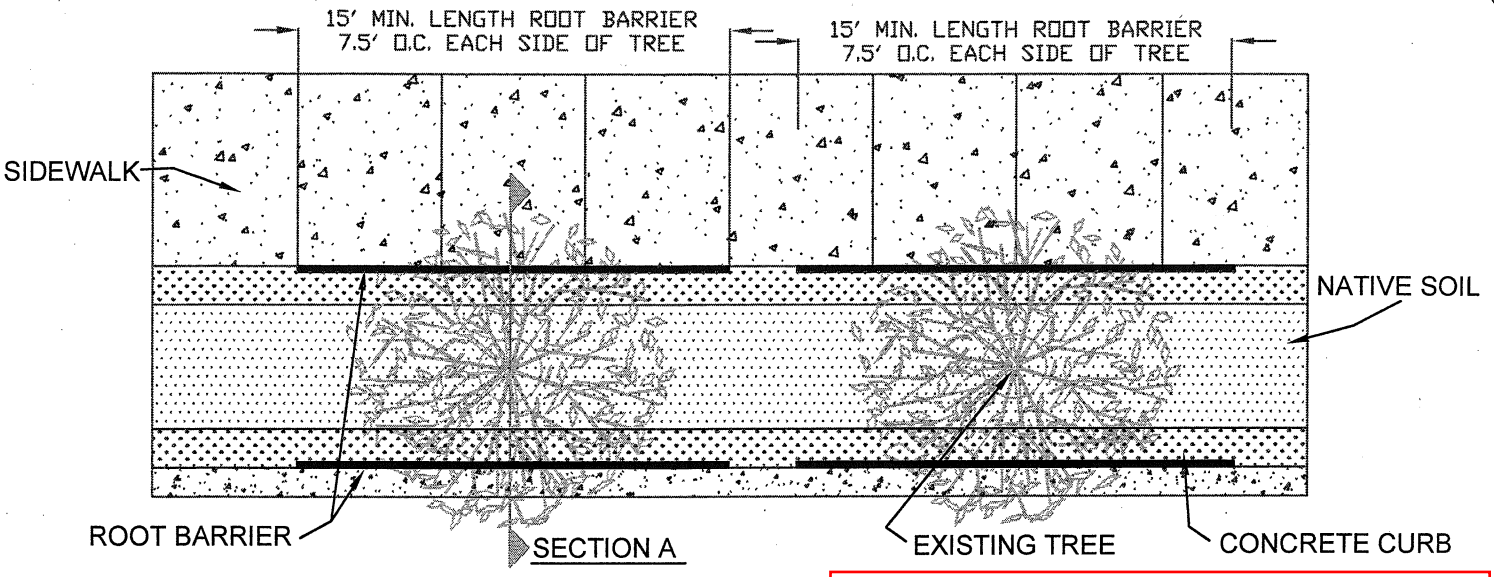
1-1/2" = 1' - 0"

Recommended Modification: If City wants to allow tree grates to be installed over tree wells, add detail for larger sizes. The preferable tree well size is 6 feet by 6 feet.

CITY OF SAN MATEO

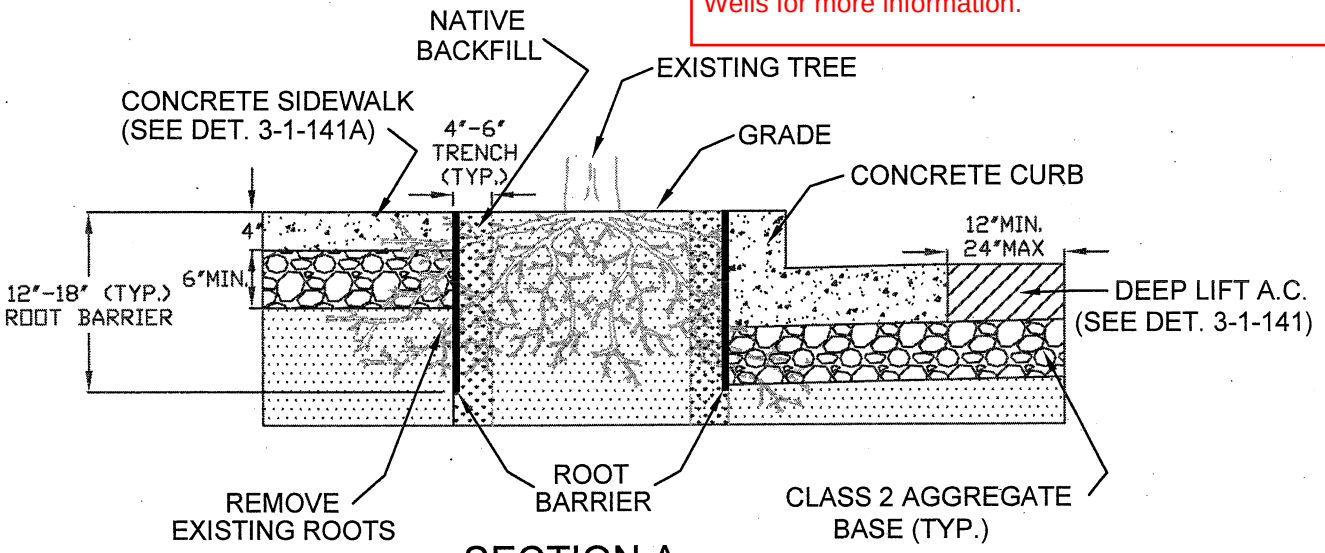
TREE GRATE

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
9/2013	LC	MQ	CITY ENGINEER	3	1	847



PLAN VIEW

Recommended Modification: Add note similar to the following "Root barrier installation is not mandatory for depressed tree wells that are designed to manage stormwater runoff. Refer to Typical GI Detail for Tree Wells for more information."



SECTION A

NOTES:

1. ROOT BARRIER SHALL BE BLACK, INJECTION MOLDED PANELS OR LINEAR ROLL WITH 90° DEFLECTING RIBS.
2. ROOT BARRIER SHALL BE MANUFACTURED WITH 50% POST CONSUMER POLYPROPYLENE PLASTIC WITH ADDED ULTRAVIOLET INHIBITORS; RECYCLABLE.
3. INSTALL MINIMUM 12" TO MAXIMUM 18" HIGH ROOT BARRIER.
4. ROOT BARRIER SHALL HAVE A MINIMUM WALL THICKNESS OF 0.06" (60 mil) & RIB THICKNESS OF 0.08" (80 mil).
5. THE VERTICAL ROOT DEFLECTING RIBS SHALL BE FACING INWARDS TO THE ROOT BALL.
6. ROOT BARRIER SHALL BE 15' LONG; 7.5' O.C. FROM TREE UNLESS APPROVED OTHERWISE BY ENGINEER.
7. ROOT BARRIER TRENCH SHALL BE 4" WIDE TO 6" WIDE.
8. ROOT BARRIER SHALL BE INSTALLED VERTICAL IN TRENCH ADJACENT TO SIDEWALK AND CURB AT GRADE.
9. THE CITY ARBORIST SHALL BE NOTIFIED BEFORE EXTENSIVE CUTTING OF ROOTS.

CITY OF SAN MATEO CALIFORNIA

ENGINEERING DEPARTMENT — CALIFORNIA 94403

TREE ROOT BARRIER INSTALLATION

DATE	DRAWN BY	CHECKED BY	APPROVED	CASE	DRAWER	SET
7/02	MQ	Dm Paul	Mark Reams CITY ENGINEER	3	1	933

APPENDIX C – Reasonable Assurance Analysis Summary for 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 City 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.

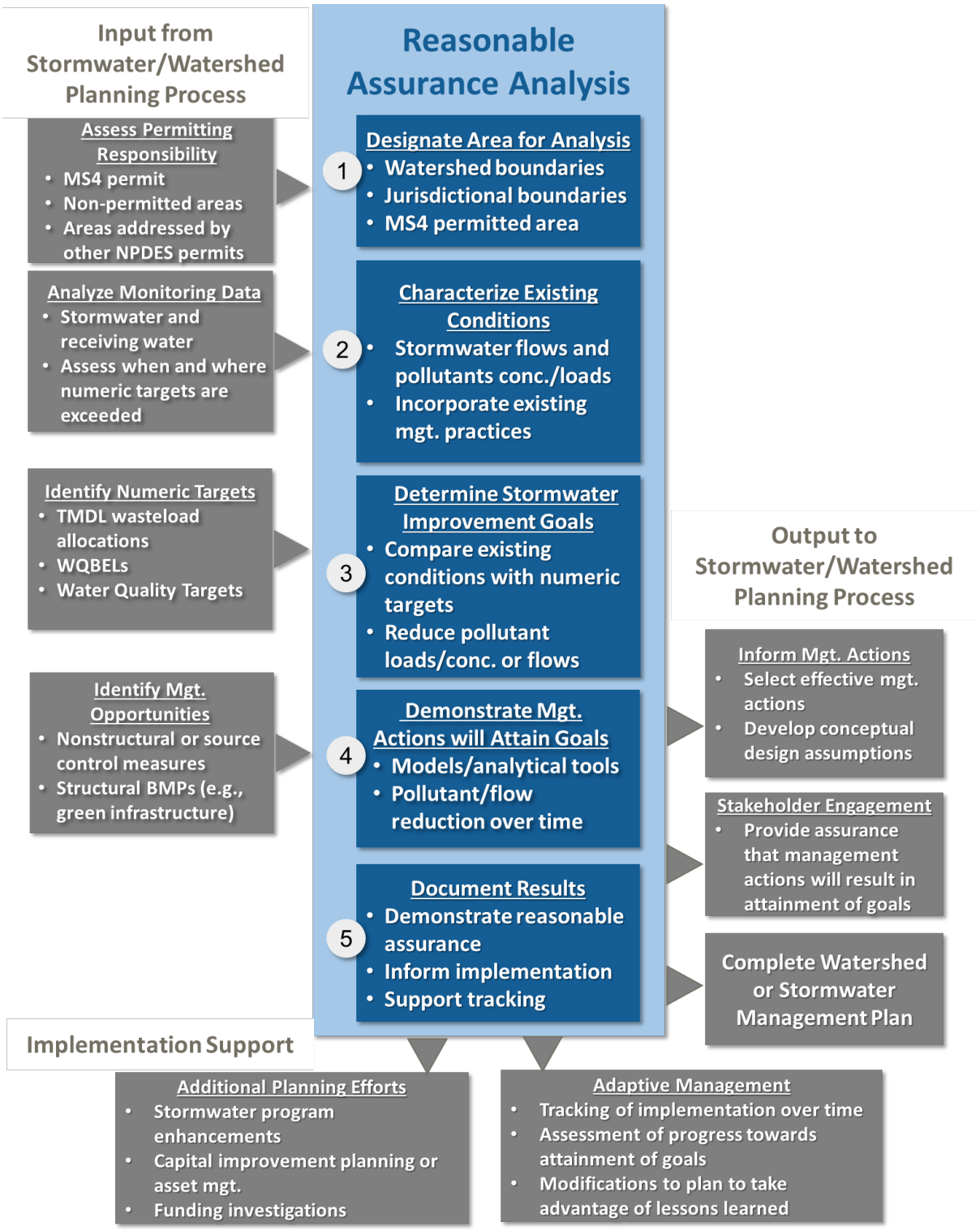


Figure 1-1. RAA Process Flow Chart (USEPA 2017).

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 City, 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).

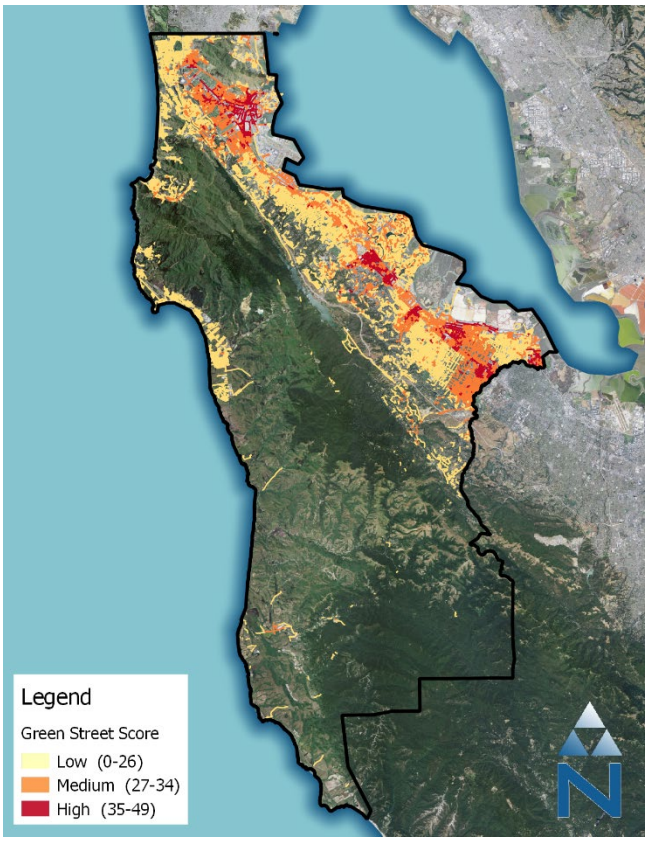


Figure 1-2. SRP Prioritized Green Street Opportunities.

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).

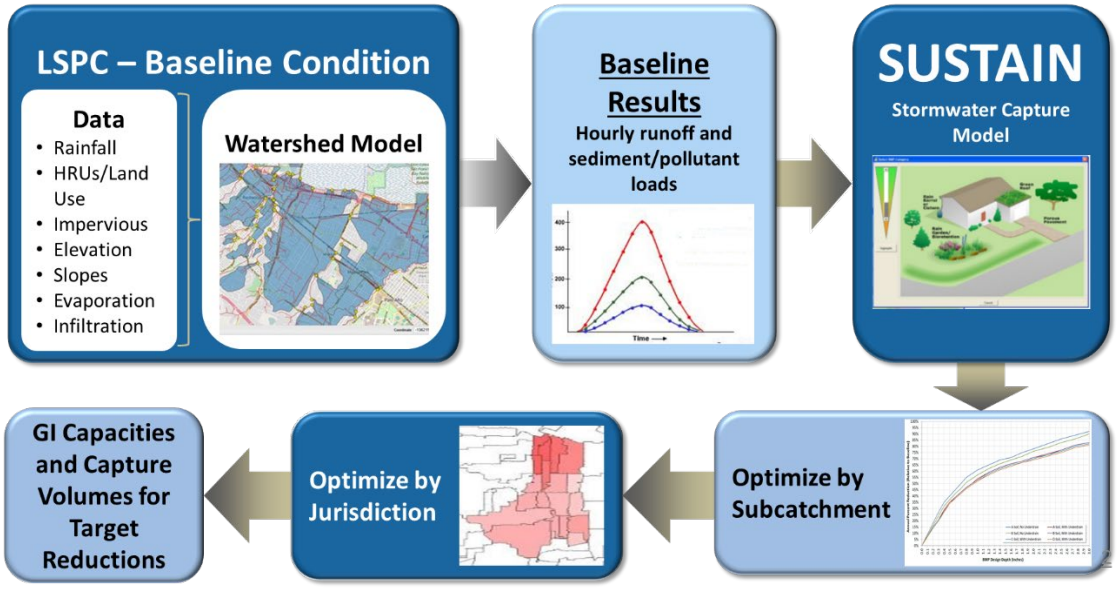


Figure 3-1. Modeling System Supporting the RAA.

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

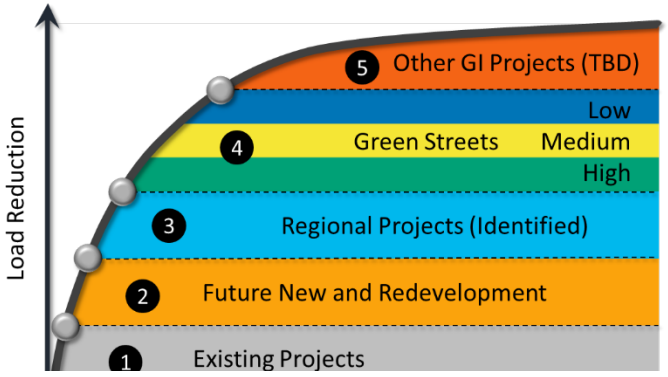


Figure 4-1. Example Implementation Recipe Showing General Sequencing of GI Projects.

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.

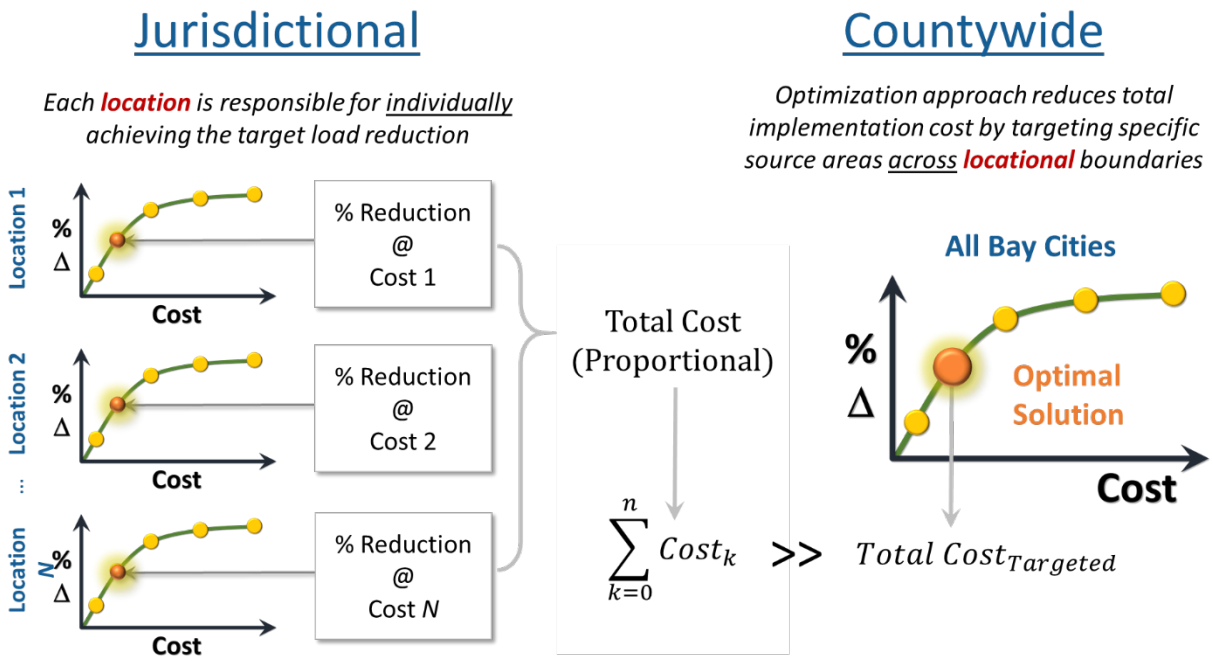


Figure 5-1. Jurisdictional vs. countywide approaches for cost-benefit optimization

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 City 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 City'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. The "Regional Project (Identified)" refers to the five regional projects currently under consideration by various cities throughout the County. Currently, none of the identified regional project drainage areas overlap with City of San Mateo area. "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 City of San Mateo. Table 5-2 provides details on that implementation plan for the 11 subwatersheds within the City'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.

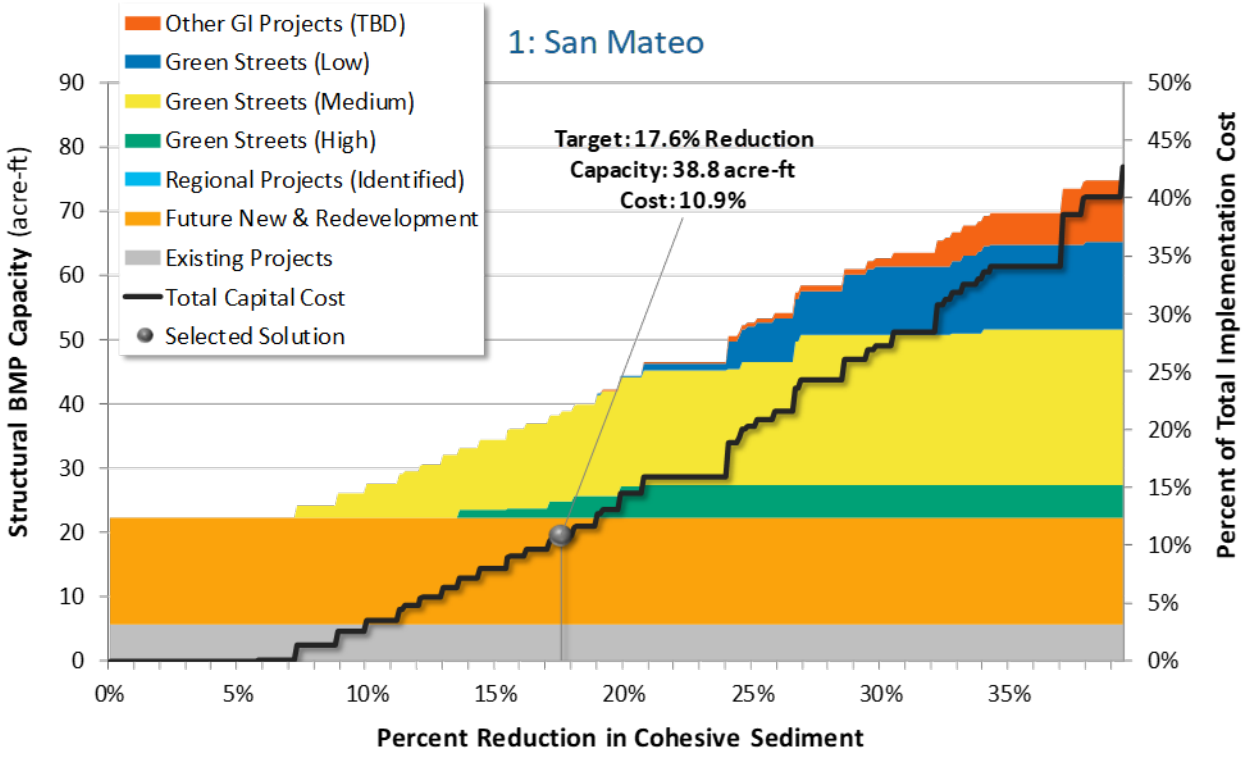


Figure 5-2. Scenario 1: Optimization summary for San Mateo (sediment target, with regional identified project).

Table 5-2. Scenario 1: GI implementation strategy for San Mateo (sediment target)

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)
230718	44%	0.03	0.01	--	--	--	--	--	--	0.00	**0.0**
230918	12%	71.11	67.38	0.21	1.89	--	3.18	--	--	--	**5.3**
231018	10%	21.68	20.07	0.07	0.55	--	--	0.88	--	--	**1.5**
231118	7%	7.15	5.48	--	0.10	--	--	0.37	--	--	**0.5**
231218	24%	171.55	153.18	3.76	6.04	--	0.00	2.86	--	--	**12.7**
231318	19%	116.56	80.36	1.08	3.54	--	0.12	2.48	--	--	**7.2**
231418	21%	20.59	13.26	--	0.17	--	--	1.01	--	--	**1.2**
231518	19%	62.34	46.54	0.21	2.30	--	--	1.95	--	--	**4.5**
231618	24%	88.54	56.51	0.09	1.34	--	0.11	3.51	--	--	**5.1**
231718	16%	16.34	11.99	0.19	0.44	--	--	0.61	--	--	**1.2**
231818	14%	7.86	2.28	--	0.15	--	--	0.43	--	--	**0.6**
Total	**18.0%**	**583.8**	**457.0**	**5.6**	**16.5**	**--**	**3.4**	**14.1**	**--**	**0.0**	**39.6**

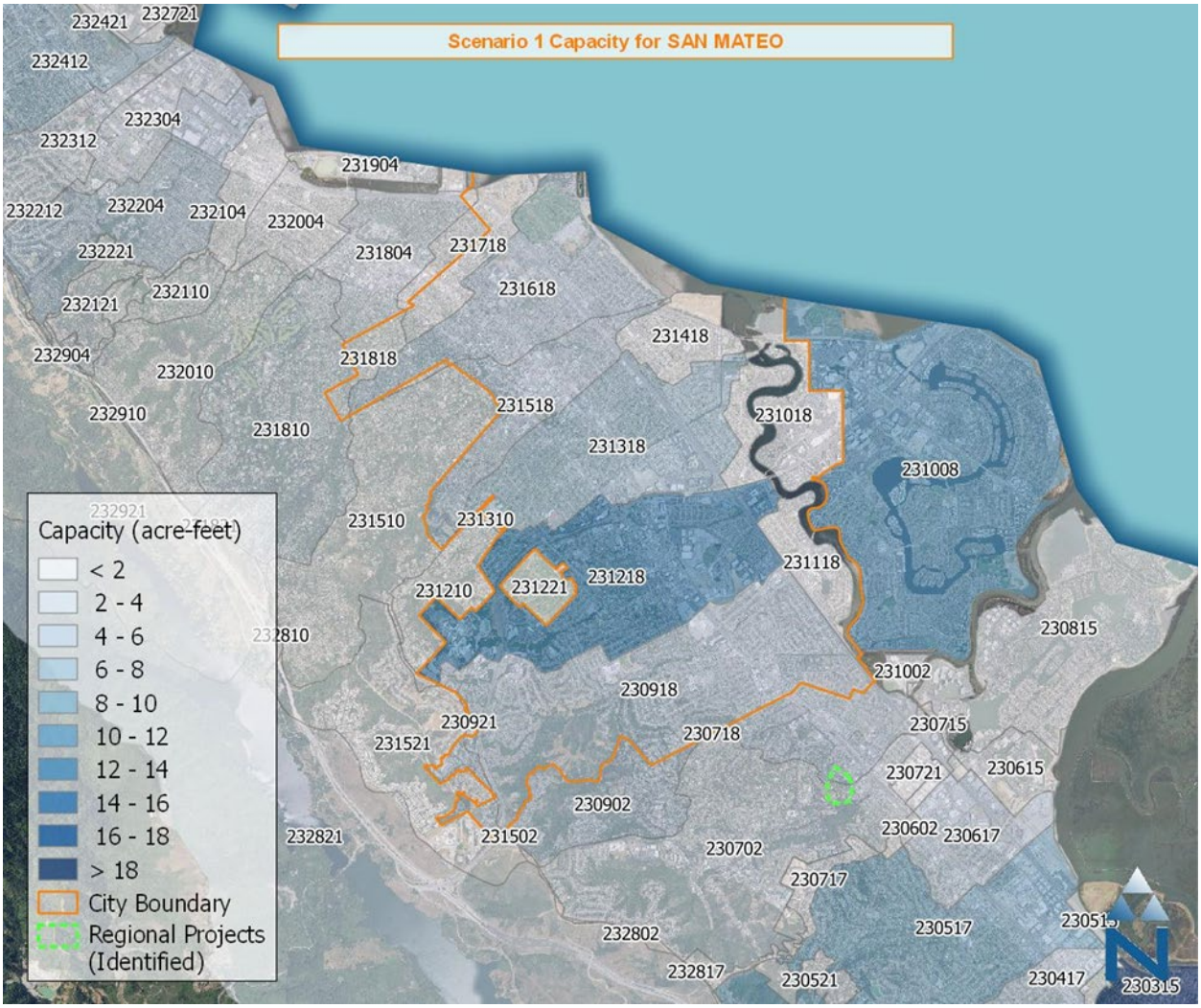


Figure 5-3. Scenario 1: Map of GI capacities within each subwatershed of San Mateo (sediment target).

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 583.8 acre-feet of stormwater managed in City of San Mateo for an average year. This 583.8 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.

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APPENDIX D – GI PROJECT CONCEPT FACT SHEETS

City of San Mateo - Regional Green Infrastructure Project Concept

San Mateo Public Works Corporation Yard

Project Description

The San Mateo Public Works Corporation Yard (Corp Yard) is a parcel located east of Pacific Boulevard and south of 19th Avenue at 1949 Pacific Boulevard. The site is adjacent to a concrete-lined stormwater drainage channel that begins at 19th Avenue and flows south parallel to Pacific Boulevard. The channel is fed by a 4-foot by 8-foot culvert under 19th Avenue, a 12-inch pipe from Leslie Street, and an 18-inch pipe from Pacific Boulevard. The drainage channel currently flows south to Borel Creek. The Corp Yard has a 1-acre parking lot that provides an opportunity for a regional green infrastructure (GI) project. This opportunity can be integrated into the City's current Master Plan improvements for the entire Corp Yard site.

The stormwater drainage channel adjacent to the site collects runoff from a 660-acre drainage management area (DMA). This DMA includes approximately 70 acres owned by the California Department of Transportation (Caltrans). The 660-acre DMA is made up of 348 acres within the City of San Mateo, 16 acres within the unincorporated County of San Mateo, and 297 acres within the City of Hillsborough. Runoff from the 1-acre parking lot at the Corp Yard will also be captured in this project.

The proposed project would install a full trash capture system in-line with the culvert before flow enters the open drainage channel. This can be sited on the west side of the CalTrain corridor at 19th Avenue and Leslie Street, or on the east side where there is a 20-foot wide drainage easement. This trash capture system will use hydrodynamic separator(s), a debris separating baffle box, or an equivalent high flow capacity device that meets the State Water Board's requirement to trap all particles 5 mm or greater in size during the 1-year 1-hour storm event. Filtered flows will then drain to the open drainage channel.

Downstream of the trash capture system, an in-channel diversion structure will divert flows up to 13 cubic feet per second under Pacific Boulevard to a new suspended pavement stormwater treatment system in the Corp Yard parking lot. A suspended pavement system utilizes a modular support system, e.g., Silva Cells, to provide storage under the pavement for uncompacted soil filtration media, plant roots, and stormwater storage. Stormwater will enter the system at the top of the soil, allowing water to filter through the media. The system is overlaid with traditional pavement to maintain the function of a parking lot. Trees, which provide shade, air quality benefits, water interception, and other benefits, can be incorporated in the parking lot layout since the suspended pavement system allows tree roots to expand without damaging overlying pavement. The suspended pavement system will provide capture and treatment of the 85th percentile storm. Treated flows that have not infiltrated into the underlying soil will be diverted back to the drainage channel.

Project Metrics

WATERSHED CHARACTERISTICS

Drainage Management Area	**661 AC**
DMA % Impervious	**35.6%**
DMA within San Mateo City Limits	**348 AC**
Caltrans Area in DMA	**70 AC**

FACILITY INFORMATION

Suspended Pavement System w/ Filtration Media

Total Facility Area	**42,000 SF**
Storage Volume	**0.95 AC-FT**

DESIGN CRITERIA

Full Trash Capture Rate	**72 CFS**
Treatment Diversion Rate	**13 CFS**

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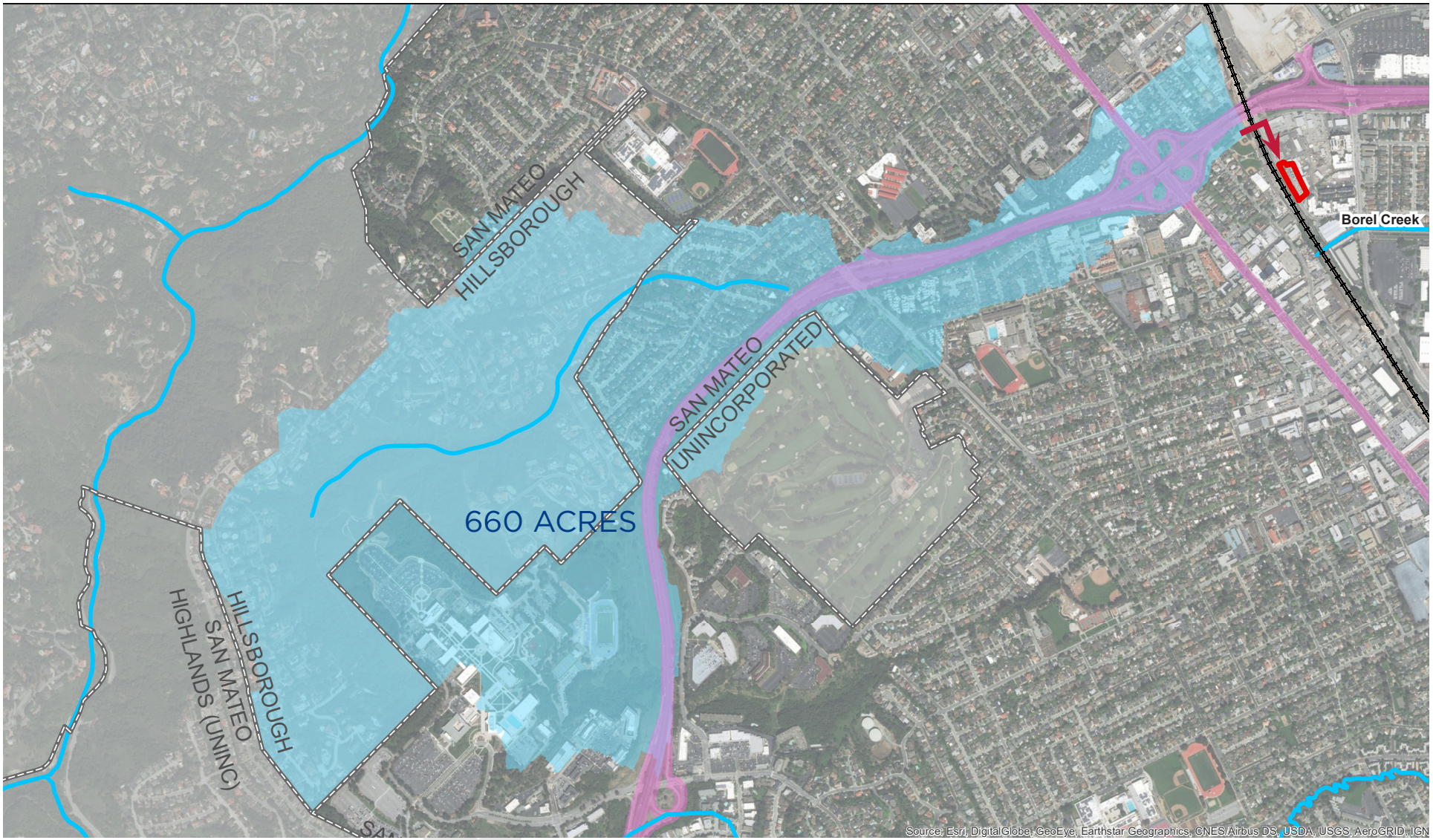
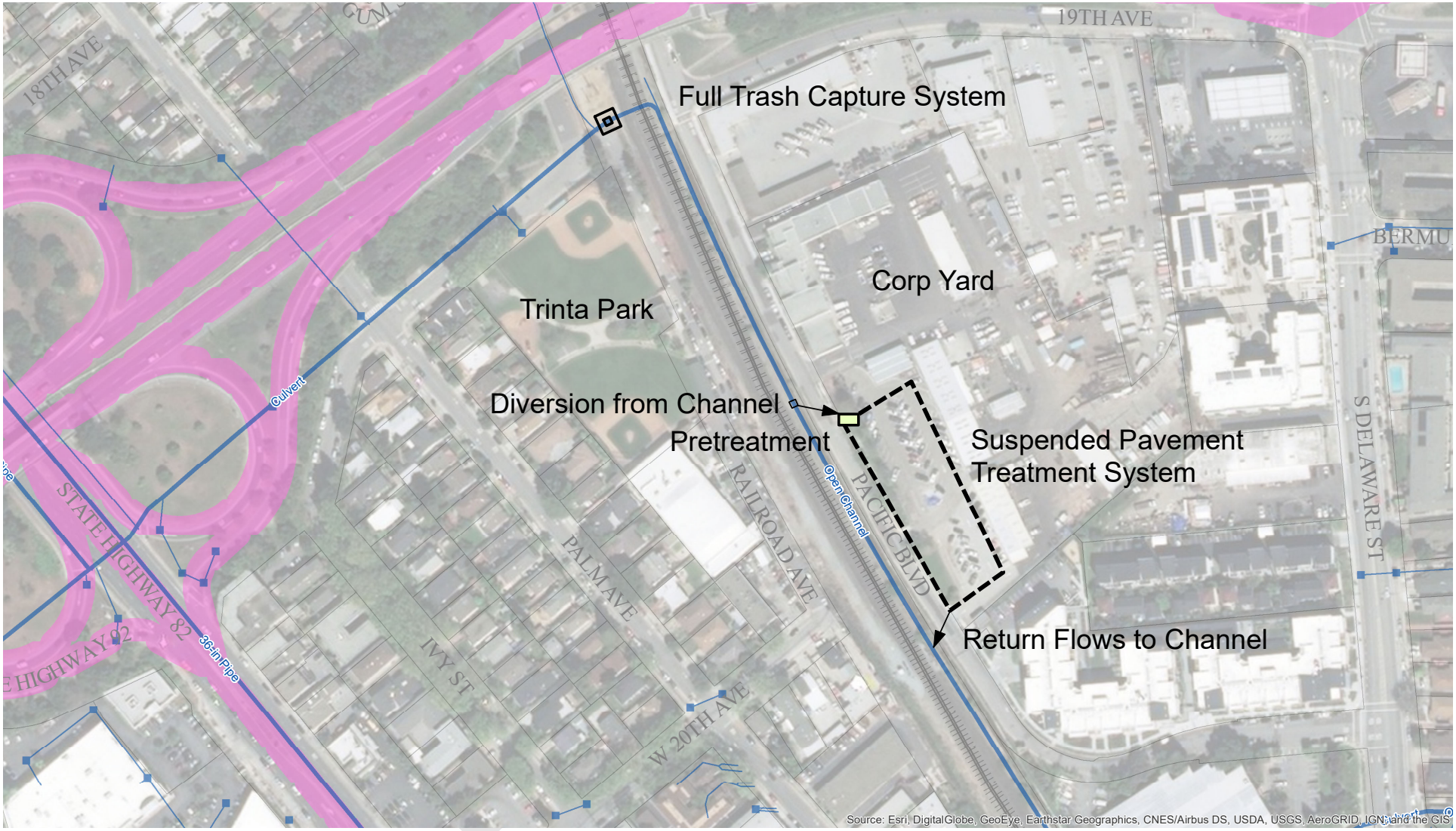
Project Site Drainage Area



San Mateo Public Works Corporation Yard Concept

Project Basemap

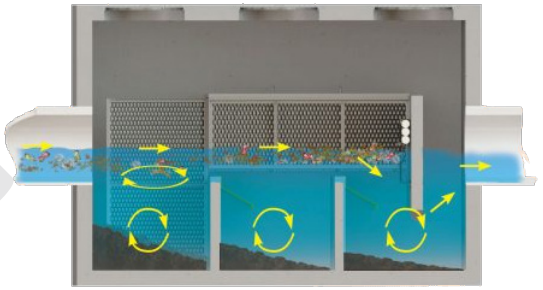


Full Trash Capture System
Drainage Channel Diversion
Pretreatment System
Suspended Pavement w Filtration Media
Catch Basin
Storm Drain
CalTrain
State Highways
Parcels

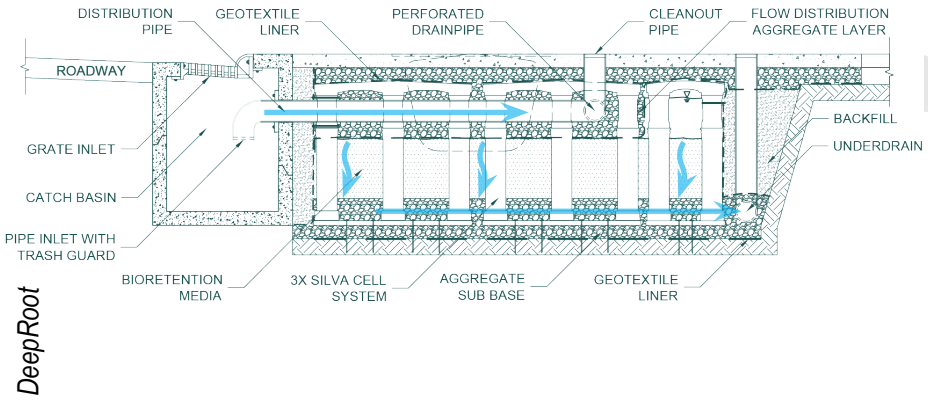
N

0 150 300 Feet

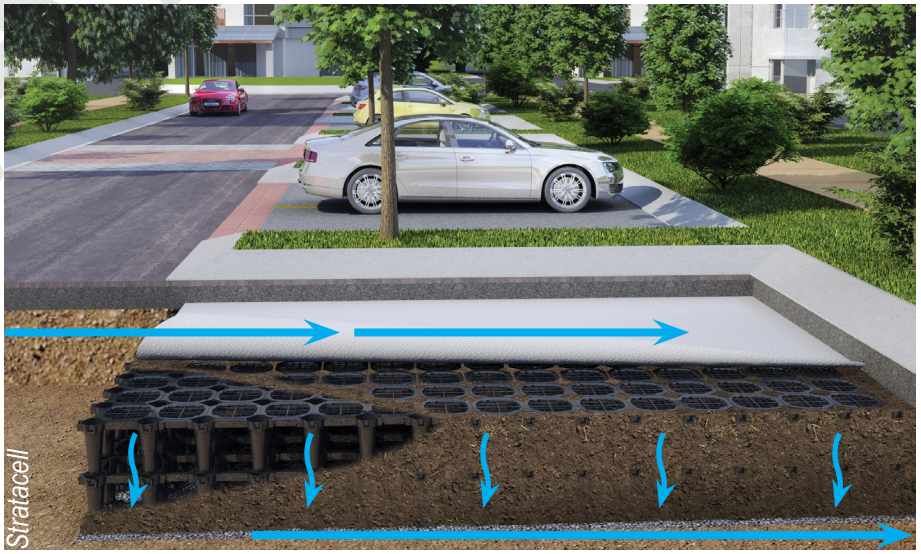
Existing Box Culvert Draining to Channel at 19th Ave and Pacific Blvd



Debris Separating Baffle Box for Trash Capture



Stormwater Components of Suspended Pavement System with Filtration Media



Suspended Pavement System with Filtration Media

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San Mateo Public Works Corporation Yard Concept

Budget-Level Cost Estimates

DESCRIPTION	UNIT COST	UNIT	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	$95,000	LS	1	$95,000
Debris Separating Baffle Box and Install	$325,000	LS	1	$325,000
Excavation & Offhaul	$70	CY	9,700	$679,000
Pump Station	$3,900,000	LS	1	$3,900,000
Diversion Pipe	$350	LF	110	$38,500
Pre-Treatment Device	$140,000	EA	1	$140,000
Suspended Pavement System Cells	$2,690,720	LS	1	$2,690,700
Filtration Media	$890	CY	2,600	$2,314,000
Drain Rock Subbase	$250	CY	500	$125,000
Parking Lot Area Drains	$1,500	EA	8	$12,000
Distribution Pipe and Bedding	$10	SF	44,000	$440,000
Underdrain with Cleanouts	$10	SF	44,000	$440,000
Pavement	$15	SF	44,000	$660,000
Overflow Outlet to Channel	$150,000	EA	1	$150,000
Trees and Plantings	$22	SF	2,200	$48,400
			CONSTRUCTION SUBTOTAL	**$12,009,000**
Mobilization (10% Construction)				$1,201,000
Contingency (30% Construction)				$3,603,000
Design (12% Total)				$2,018,000
			TOTAL PROJECT COST (DESIGN + CONSTRUCTION)	**$18,831,000**

- These are planning-level cost estimates ($2019) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

Additional Considerations

This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered include but are not limited to the following:

» Pumping. Stormwater will need to be pumped between the drainage channel diversion point and the top of the treatment facility. The Corporation Yard and surrounding area are relatively flat making it infeasible to gravity drain flows from the channel to the project location.

» Groundwater. Groundwater depth needs to be analyzed to ensure the proposed GI facility can provide a minimum 10-foot setback to the groundwater table.

» Future Improvements. The design and construction of the suspended pavement system will need to be coordinated with future improvements to the Corp Yard site. Setbacks to building foundations and utilities will need to be studied further once the Corp Yard improvement plans are advanced. If truck traffic loading is expected in the proposed GI location, the suspended pavement system should be relocated to an area in which heavy truck traffic will be prohibited. If a suspended pavement system is determined to be infeasible due to anticipated loading, a large surface bioretention facility can be considered with mechanical filtration of flows exceeding the bioretention capacity. Corp Yard planning shall look for additional opportunities to route more stormwater to an expanded suspended pavement system and/or integrate other GI technologies, e.g. bioretention planters along Pacific Boulevard, permeable pavement, and trash capture within drain inlets.

» Coordination. As multiple jurisdictions will benefit from this proposed project, the division of construction and O&M costs will need to be coordinated with Caltrans, County of San Mateo, and City of Hillsborough.

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City of San Mateo - Regional Green Infrastructure Project Concept

Detroit Drive Wastewater Treatment Plant Regional Project

Project Description

The San Mateo Wastewater Treatment Plant (WWTP), located at 2050 Detroit Drive, and the adjacent 1-acre vacant parcel were selected as a high priority location for a regional green infrastructure (GI) project. The WWTP currently has four abandoned clarifier tanks that make up 1.26 million gallons of storage. The WWTP is bordered by the channelized Leslie Creek to the south which outlets into the Marina Lagoon. A weir gate at the end of the creek is raised during the summer to maintain higher water levels within the lagoon and protect its water quality. The depth to groundwater is unknown at the site, however, a regional project at this site will rely on detention and filtration rather than infiltration to avoid impacts caused by high groundwater and/or potential contaminants within the underlying soil.

This project will divert flow directly from Leslie Creek. Diverted flow will be filtered through a trash capture system and pumped to the existing clarifier tanks for additional pre-treatment. Pre-treated flows will then be directed to a large surface bioretention system within the vacant parcel for additional treatment. The bioretention system will utilize custom high-rate soil filtration media that will provide increased treatment capacities. The design of this parcel could also incorporate a new pedestrian and bike path that connects to the existing bike path to the north, additional landscaping that helps screen the WWTP from the residential area, educational GI signage, and other community amenities.

Leslie Creek is weir controlled during summer months. However, this weir could also potentially be used during the rainy season to store stormwater flows in the creek prior to being pumped for treatment. This will allow the regional project to fully manage runoff from the 85th percentile design storm. This proposed concept assumes 1.0 million gallons of flow can temporarily be stored within Leslie Creek prior to being diverted and pumped for treatment which would elevate water levels in the creek approximately 5-inches. This use of the creek reduces the design treatment diversion rate from 72 cubic feet per second to 43 cubic feet per second, allowing for a smaller pump station and reduced cost. A detailed evaluation of the hydrology and storage capacity of Leslie Creek will be conducted during the design of this project to eliminate flood risks in the creek drainage basin during large storm events.

The drainage management area (DMA) of Leslie Creek is approximately 1,230 acres. This area includes approximately 73 acres of Caltrans drainage area. Surface runoff can be captured at the wastewater treatment plant to provide an additional 10 acres of impervious drainage area to create a total management area of 1,240 impervious acres.

Filtered stormwater could be redirected back into Leslie Creek, the Lagoon, or the Bay. Alternatively, it could be treated further and used to meet various non-potable demands at the WWTP and/or adjacent City parcels such as the following:

- Irrigation of WWTP landscape, nearby school and park fields south of Leslie Creek
- Street sweeping/dust control truck filling station
- WWTP tank/equipment cleaning
- Toilet flushing for new restroom facilities included in WWTP upgrade

If future WWTP upgrades include recycled water treatment and distribution facilities, it may be possible to route the filtered stormwater to this system prior to the disinfection stage of the treatment process.

Project Metrics

Watershed Characteristics

Drainage Management Area	**1,240 AC**
DMA % Impervious	**59.4%**
DMA within San Mateo City Limits	**1,227 AC**
Caltrans Area in DMA	**73 AC**

Facility Information

Pre-Treatment Storage

Storage Volume	**3.9 AC-FT (1.26 MG)**

Bioretention

Total Facility Area	**19,000 SF**
Storage Volume	**0.5 AC-FT**

Design Criteria

Leslie Creek Stormwater Storage	**3.1 AC-FT (1.0 MG)**
Treatment Diversion Rate	**43 CFS**

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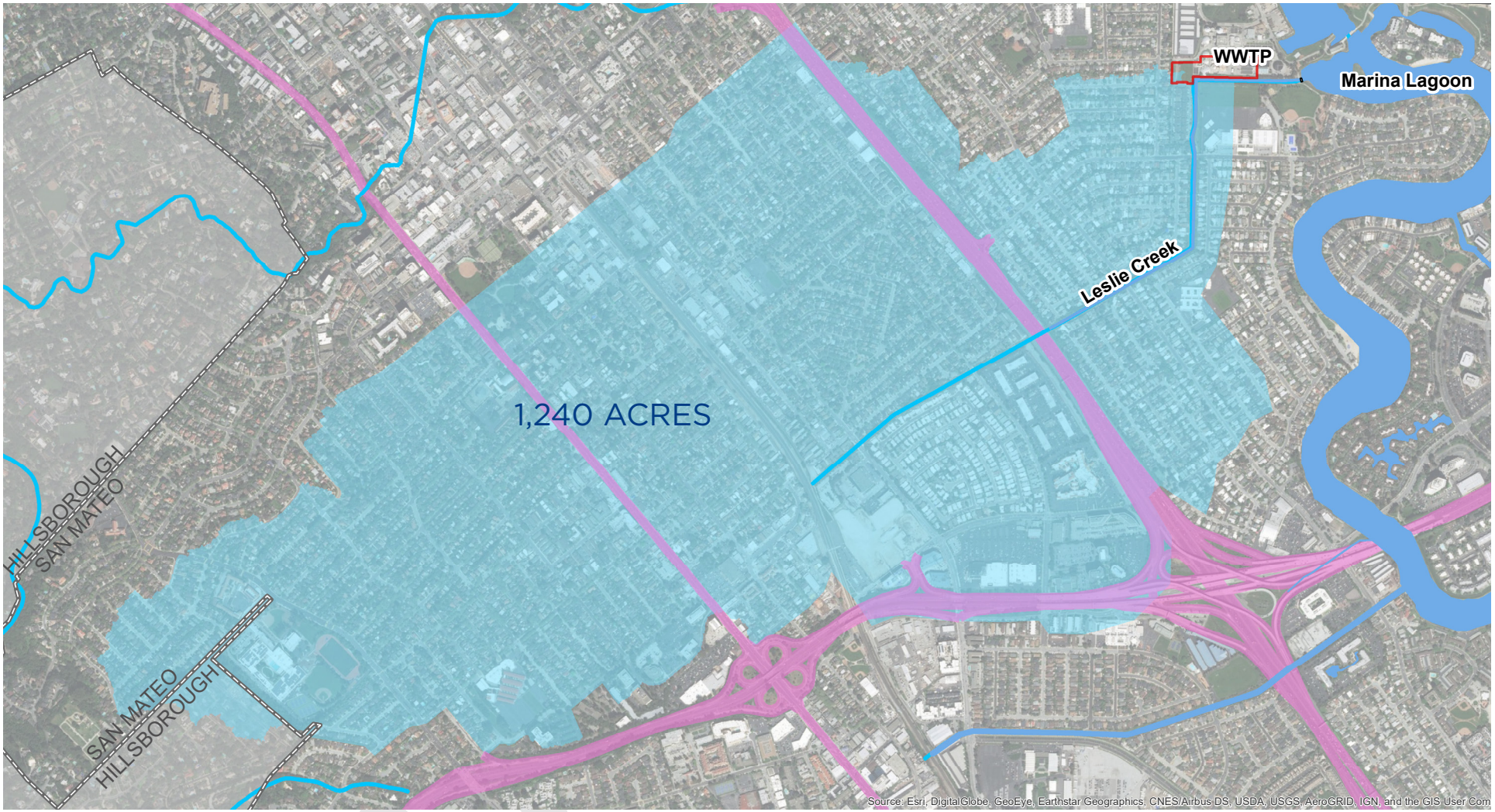
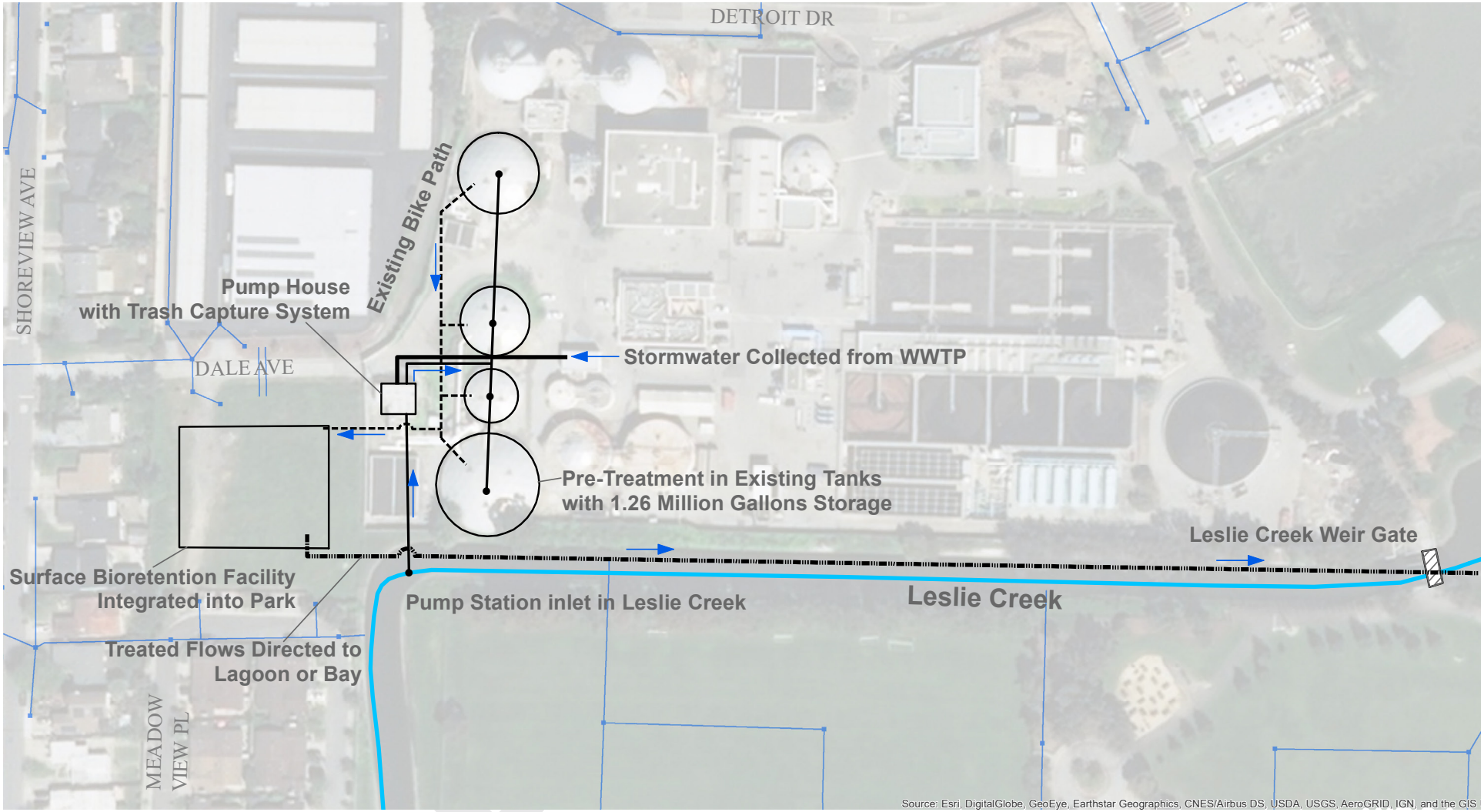
Project Site Drainage Area



Detroit Drive Wastewater Treatment Plant Concept

Project Basemap



Proposed Pipe (PreTreated Flows)
Proposed Pipe (Treated Flows)
Proposed Facility
Catch Basin
Stream
Proposed Pipe (Pumped Creek Flows)
Proposed Pipe (Onsite Collection)
Weir Gate
Storm Drain
Flow Direction

N

0 100 200 Feet

Leslie Creek Looking Upstream from Weir Gate

Weir Gate and Pump House at Leslie Creek Connection to Lagoon

View of Four Abandoned Clarifier Tanks

Example Regional Bioretention System

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Detroit Drive Wastewater Treatment Plant Concept

Budget-Level Cost Estimates

DESCRIPTION	UNIT COST	UNIT	QUANTITY	SUBTOTAL
Utilities Protection/Relocation	$120,000	LS	1	$120,000
Flow Diversion Structure	$300,000	EA	1	$300,000
Pump Station	$7,000,000	LS	1	$7,000,000
Debris Separating Baffle Box	$175,000	LS	1	$175,000
Clarifier Tank Retrofit and Replumbing	$65,000	LS	4	$260,000
Distribution Piping and Structure	$450	LF	1,200	$540,000
Excavation & Disposal	$140	CY	5,400	$756,000
Earthwork Land Forming	$50	CY	800	$40,000
High Performance Bioretention Soil	$1,098	CY	1,100	$1,207,300
Mulch	$438	CY	117	$51,200
Underdrain	$10	SF	19,200	$192,000
Drain Rock Subbase	$250	CY	710	$177,400
Liner and Install	$3	SF	19,200	$57,600
Outflow Structure w Pipe to Lagoon	$300,000	LS	1	$300,000
Bioretention Planting and Mulch	$22	SF	19,200	$422,400
Interpretive Signage Allowance	$10,000	LS	1	$10,000
Smart Control Weir System	$1,000,000	LS	1	$1,000,000
			CONSTRUCTION SUBTOTAL	**$12,609,000**
Mobilization (10% Construction)				$1,261,000
Contingency (30% Construction)				$3,783,000
Design (12% Total)				$2,118,000
			TOTAL PROJECT COST (DESIGN + CONSTRUCTION)	**$19,771,000**

• These are planning-level cost estimates ($2019) for design and construction. Soft costs for City administration and project management and post-construction operations and maintenance are not included. Other factors that may affect the cost of future construction include escalation and market conditions.

Additional Considerations

This project concept is planning-level and subject to revision as additional information becomes available. Factors to be considered include but are not limited to the following:

» Pumping. Stormwater will need to be pumped from the creek to the pre-treatment tanks. Additional pumping may be required to divert water from the pre-treatment tanks to the bioretention facility.

» Creek and Lagoon Hydrology and Ecology Study. A comprehensive study of the creek, lagoon, and drainage basin shall be conducted in order to yield a multi-benefit resilient solution that:
- restores natural circulation of water through the system while maintaining critical recreational and hydrologic functions;
- decreases long-term maintenance requirements and costs;
- provides natural systems and improves habitat along waterways;
- improves water quality within the creek and lagoon;
- provides flood protection where needed;
- considers climate change/sea level rise impacts; and
- coordinates with future development of project area.

» Permitting. This project removes flows from Leslie Creek approximately 1,000 feet upstream of where it drains to the Marina Lagoon. Leslie Creek is designated as having existing beneficial uses, including warm freshwater habitat, wildlife habitat, and recreational use.

» Trash Capture Feasibility and Credits. The Water Board requires full trash capture prior to the stormwater entering a water body so it is uncertain how trash capture will be credited for this project. Due to the very large DMA the full trash capture peak flow rate of 400 cfs would require a very large pump station that would likely be cost prohibitive to construct and operate. This project concept has assumed that only partial trash capture is feasible and has been sized to meet the water quality criteria. Additional studies and coordination with the Water Board are needed to evaluate the feasibility of obtaining trash capture credits and the cost implications.

» Stakeholder Coordination. Outreach should be conducted with neighborhood residents and Bayside Academy stakeholders. Consideration of water reuse should be coordinated with the Parks Department and School District.

» Soil Contamination. Potential hazardous soil may be present which would increase excavation and offhaul costs.

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APPENDIX E – PUBLIC OUTREACH STRATEGY

The City of San Mateo's GI Public Outreach Strategy includes four steps as defined below.

Step 1 - Identifying Target Audiences for GI

The City has identified the following categories as target audience for their GI communication:

- City of San Mateo residents
- City of San Mateo property owners (homeowners and commercial property owners)
- City of San Mateo school age children
- City staff (Engineering, Planning Departments, etc.)
- Elected officials (mayors, council members, etc.)
- Stakeholder groups (*City to identify groups or expand definition and associated tasks, if desired*)

Step 2 - Identifying Communication Goals for the Target Audiences

The City has the following goals for each target audience:

- City of San Mateo residents and property owners
    - Increase general awareness of benefits from GI and Low Impact Development (LID), including healthy neighborhood opportunities.
    - Increase property owner support for local GI projects
    - Encourage property owners to use LID techniques on their properties
- City of San Mateo school age children
    - Increase awareness of basic stormwater drainage and water quality concepts and simple ways to collect and treat stormwater
- Municipal staff
    - Increase general awareness of benefits from GI and Low Impact Development
    - Encourage/require identification of GI opportunities and implement in upcoming capital improvement projects where feasible
    - Encourage/require identification and implementation of GI opportunities in private new and redevelopment sites.
- Elected officials
    - Increase awareness of GI measures, benefits, and requirements
    - Build support for incorporating GI language into planning and policy documents.
    - Build support for the GI Plan
    - Build support for integrating GI features in capital improvement projects

Step 3 - Identify Key Messages and Outreach Mechanisms

Outreach to department staff, managers, and elected officials is crucial to getting their support for the GI Plan and the transition from traditional to "green" stormwater management. For residents, property owners and stakeholders, outreach is important in order to achieve public acceptance of GI projects, particularly when these might cause a temporary inconvenience, and potentially also for support of funding efforts.

Broadly, outreach messages will inform the audience about the GI requirements, what local agencies are doing to implement the GI requirements, and the benefits from GI projects. Separate materials may be required for outreach related to specific GI projects within the City.

Step 4 - Identify Outreach Tasks

To the extent possible, the City will utilize and leverage the outreach material and efforts developed by SMCWPPP as part of the 5-year Plan, as well as existing outreach mechanisms that the City is utilizing. For example, the City provides information on current and upcoming (GI) projects to the general public via their website[31] and has previously hosted "Taste and Talk Series" forums.

The SMCWPPP plan includes measurable activities that fall under one or more of the following general categories:

- Social media
- Online outreach, including website, blog and newsletters
- Outreach campaign research and development
- Outreach campaign implementation
- Media relations (recognition from and coverage by local media outlets)
- Community events and cleanups
- Collateral material development
- Partnership outreach and engagement
- School education programs
- Awards
- Brand identification
- Front counter interaction with Public

GI outreach and education material produced to date by SMCWPPP includes the following:

- Green Streets webpage (https://www.flowstobay.org/content/about-sustainable-streets-and-green-infrastructure), including a map of green infrastructure projects throughout San Mateo County, and green infrastructure blogs[32]
- Flows to Bay high school contest including workshop opportunities
- Stormwater Pollution Prevention Teacher Toolkit incorporating GI concepts

[31] For example, https://www.cityofsanmateo.org/3925/4th-Avenue-and-Fremont-Street-Green-Infr

[32] For example, https://www.flowstobay.org/blog/future-green-infrastructure; https://www.flowstobay.org/blog/connecting-dots-climate-change-green-infrastructure; https://www.flowstobay.org/blog/greeninfrastructure

- Workshop, web page and social media posts related to rain barrels and the County rain barrel rebate program.
- *Green Infrastructure for a Sustainable San Mateo County* fact sheet and poster.

SMCWPPP is in the process of developing additional materials to support GI Plan outreach. The materials are being created for the purpose of educating elected officials and management in order to build support for GI Plan adoption and to position plans as an integrated solution to a number of problems. A model PowerPoint presentation for City Council and upper management audiences has been prepared and is available for member use. Additional materials are expected to be completed in 2019 and may include social media posts and other collateral as desired by SMCWPPP members.

Additional SMCWPPP resources that could be used for outreach include two posters, titled S*ustainable Green Streets and Parking Lots*[33] and *Opportunities for Green Streets and Parking Lots*[34] that were created to promote the 2009 version of the "San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook".

[33] https://www.flowstobay.org/files/greenstreets/Sustainable_poster.pdf
[34] https://www.flowstobay.org/files/greenstreets/Opportunities_poster.pdf