CITY OF PALO ALTO

GREEN STORMWATER INFRASTRUCTURE PLAN







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Permeable Pavement

CITY OF PALO ALTO • PUBLIC WORKS-WATERSHED PROTECTION 2501 EMBARCADERO WAY • PALO ALTO, CA 94303 • CITYOFPALOALTO.ORG/GSI • 650.329.2122 In compliance with Provision C.3.j.i. of the San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Order R2-2015-0049

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Stormwater Management Oversight Committee

Hal Mickelson (Chair) Dena Mossar (Vice Chair) David Bower Peter Drekmeier Marilyn Keller Bob Wenzlau Richard Whaley

CORE TEAM



City of Palo Alto

Brad EgglestonDirector, Department of Public Works
Phil BobelAssistant Director, Department of Public Works
Karin NorthManager, Watershed Protection Group, Department of Public Works
Pam Boyle RodriguezManager, Stormwater Compliance Program, Department of Public Works
Isabel ZacharczukAssociate Stormwater Engineer, Department of Public Works
Daren AndersonManager, Parks and Open Space, Department of Community Services
Jodie GerhardtManager, Planning, Department of Planning and Community Environment
Jon HospitalierAssistant Director, Department of Public Works
Michel JeremiasSenior Engineer, Department of Public Works
Walter PassmoreUrban Forester, Department of Public Works
Sylvia Star-LackManager, Office of Transportation

CONSULTANTS AND CONTRIBUTORS



EOA, Inc.



Santa Clara Valley Urban Runoff Pollution Prevention Program

Schaaf & Wheeler Schaff & Wheeler

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ABBREVIATIONS AND ACRONYMS

ABAG	Association of Bay Area Governments
BASMAA	Bay Area Stormwater Management Agencies Association
Вау	San Francisco Bay
BID	Business Improvement District
BPTP	Bicycle & Pedestrian Transportation Plan
Caltrans	California Department of Transportation
CFD	Community Facilities District
CIP	Capital Improvement Program
County	Santa Clara County
CPA	City of Palo Alto
CWSRF	Clean Water State Revolving Fund
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
GI	Green Infrastructure
GIS	Geographic Information System
GSI	Green Stormwater Infrastructure

Handbook	SCVURPPP C.3 GSI Handbook
IRWMP	Integrated Regional Water Management Plan
LID	Low Impact Development
MRP	Municipal Regional Stormwater NPDES Permit
ΝΑCTΟ	National Association of City Transportation Officials
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OOT	Office of Transportation
Р3	Public Private Partnership
PAUSD	Palo Alto Unified School District
PCBs	Polychlorinated Biphenyls
POC	Pollutant of Concern
PWE	Public Works Engineering
RAA	Reasonable Assurance Analysis
RFP	Request for Proposal
ROW	Right-of-Way
RWQCB/Regional Water Board	San Francisco Bay Regional Water Quality Control Board
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SDMP	Storm Drain Master Plan
SIP	Sustainability Implementation Plan
SFEP	San Francisco Estuary Partnership
SFHA	Special Flood Hazard Area
SFPUC	San Francisco Public Utilities Commission
SLR	Sea Level Rise
SOP	Standard Operating Procedure
SOFA	South of Forest Area
State Water Board/SWRCB	State Water Resources Control Board
STORMS	Strategy to Optimize Resource Management of Stormwater
SWMF	Stormwater Management Fee
SWMOC	Stormwater Management Oversight Committee
SWRP	Stormwater Resource Plan
TIF	Transportation Impact Fee
UBI	Utility Bill Insert
UFMP	Urban Forestry Master Plan
Valley Water	Santa Clara Valley Water District
VTA	Santa Clara Valley Transportation Authority
Watershed Protection	Department of Public Works, Division Environmental Services, Watershed
	Flotection Gloup

EXECUTIVE SUMMARY



The City of Palo Alto (City) envisions gradually integrating green stormwater infrastructure (GSI) measures into it's urban landscape while building on and learning from its existing installed measures. GSI is based on natural processes and serves as a complementary approach to a traditional (or gray) storm drain system for managing stormwater runoff. The following describes the variety of benefits provided by GSI:

- Direct benefits such as improving stormwater quality by reducing pollutants conveyed in stormwater to local creeks and the Bay; slowing and reducing flows to the storm drain system and receiving waters; and providing opportunities for rainwater capture and use; and
- Ancillary benefits, including reduced ponding and localized flooding¹; increased tree canopy; decreased urban heat island effect and climate change impacts; improved air quality; enhanced pedestrian and bicycle transportation facilities; and ecological habitat.

This Plan is the first phase in realizing the City's vision for integrating GSI into its urban landscape. This initial phase identifies and prioritizes GSI opportunities on City-owned properties to manage stormwater runoff on-site, utilizing pervious pavement, bioretention areas, and similar measures. The City's right-of-way, which includes streets, sidewalks, planter strips, and medians, can also be retrofitted with GSI as part of transportation improvement projects, creating "Green (or Sustainable) Streets." The idea of projects in the City's right-of-way is explored in this first phase; however, the future phase will involve the prioritization of right-of-way locations throughout the City; focus on implementation actions; and identify opportunities to increase GSI on private properties, both residential and non-residential.

The City is required to comply with the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit² in the San Francisco Bay Area (Order R2-2015-0049), also known as the Municipal Regional Permit (MRP), which became effective on January 1, 2016. The MRP applies to 76 municipalities and flood control agencies that discharge stormwater to the San Francisco Bay (Bay). Under the MRP and previous permits, new development and redevelopment projects on private and public property that exceed certain size thresholds have been required to mitigate stormwater quality impacts by incorporating site design, pollutant source control and stormwater treatment measures (also known as GSI). One of the requirements of the current MRP is to identify City (and potentially) private opportunities to proactively integrate GSI measures into streets, roads, parking lots, roofs, and other elements beyond the current threshold requirements. This Plan serves to meet MRP requirements and outlines how the City of Palo Alto aims to transform its storm drain infrastructure over time to slow the flow of stormwater runoff, increase infiltration into pervious surfaces, recharge groundwater (where feasible), increase irrigation and other uses of captured stormwater, and treat and remove pollutants.

The following serves to meet MRP requirements and describes key items to ensure successful Plan implementation.

PLAN DEVELOPMENT COLLABORATION

Internal collaboration during Plan development involved creating an interdepartmental GSI Workgroup, made up of Public Works, Planning & Community Environment, Development Services, Transportation, Utilities, and Community Services, that served as stakeholders of this Plan. External collaboration with the Stormwater Management Oversight Committee (SWMOC) was instrumental in developing the GSI Plan, with updates presented to the SWMOC on a regular basis. This Committee was formed to review proposed stormwater management capital improvements and operating programs to ensure consistency with the City's Stormwater Management Fee.

IMPLEMENTATION COMPONENTS

Implementation of this Plan entails the establishment of a transparent and collaborative legal and programmatic structure as well as user-friendly tools and systems, all of which will take time to develop. The following briefly describes major items addressed in the Plan as key implementation actions.

- 1. Updates to the City of Palo Alto Municipal Code
 - a. Implementation Authority

In parallel with the development of the Plan, updates to Palo Alto Municipal Code Chapter 16.11 (to be renamed Stormwater Compliance Management Program) were being prepared, both to provide appropriate implementation authority for

¹This Plan defines ponding and localized flooding as less than six inches; however, this definition may be amended after further research. In addition, after performance assessments, the City may find that GSI may be used in areas that have larger amounts of ponding. ²See Provision C.3.j. in the MRP for specific language regarding GSI requirements. the GSI Plan and to ensure overall compliance with the MRP.

b. Increase of Low Impact Development (LID) at Site Scale

One of the proposed Chapter 16.11 updates would increase the use of LID³, a management approach and set of (non-engineered) practices that can reduce runoff and pollutant loadings by managing runoff as close to its source(s) as possible.

2. Updates to City Plans and Programs

Per the MRP, the City is required to "adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of the GSI Plan." Based on an evaluation of City planning documents in regards to inclusion of GSI concepts and language, the Plan references documents that have already been updated; those that will be updated by end of calendar year 2020 (end of current MRP term); and those that will be updated at a later point. To ensure a smooth transition into Plan implementation, the City Manager will establish a policy to direct staff to consider GSI in its planning, design, and construction of capital improvement projects (CIPs) and maintenance of its assets.

Moreover, it will direct staff to include GSI language as documents are updated. The application of the Policy would vary according to varying Department responsibilities.

3. External Project Oversight

The SWMOC will provide a platform for residents and other members of the public to provide feedback and ideas throughout Plan implementation, as it did during its development. Their responsibilities may include making recommendations for consideration by staff; providing feedback on potential projects; and reviewing proposed policies.

4. GSI Project Feasibility Assessment

Staff will use a standardized process to assess the feasibility of integrating GSI into projects that will be fully vetted and adapted over time. The following briefly describes a proposed process:

 a. Meetings during capital improvement program (CIP) project scoping process to determine feasibility, placement and extent of GSI measures. Revisit project ideas at particular design phases, such as 30, 50, 75 and 90 percent.

- Evaluation of GSI feasibility using predetermined criteria, mapping software, and other tools, as well as professional judgment, a budget analysis, and staff collaboration.
- c. Assessment of an evolving project locations list, with prioritized projects considered through the City's yearly CIP planning process.
- Identification of potential opportunities by Public Works – Watershed Protection Group staff through regular plan review processes if not identified through a prior process.

5. Tracking Tools

Practical tools, such as a project checklist, will be available to evaluate the potential integration of GSI, document results and costs, and track the project from planning through design, construction, and maintenance. Not only will projects be evaluated by these tools, but the results will also be distributed to stakeholders via an annual progress report.

6. Details and Specifications

As part of creating a structured program, engineering design standards and specifications will be used, first for City projects, and then made available for use on private properties. A consultant will be retained to assist in the development of City-specific standards, which will be based on a Countywide Handbook and requirements from City departments. This will also allow staff to standardize typical City work practices and designs and assure consistency between various contractors.

7. Maintenance and Monitoring Manual

The long-term maintenance of GSI measures is as crucial to their life cycle as accurate design and construction. A Maintenance and Monitoring Manual will evaluate current practices; identify and schedule responsibilities; conduct effectiveness assessments using an adaptive management approach; set performance goals; assess training needs and opportunities; and identify potential partnerships with local organizations. Staff will apply this Manual to GSI measures on City property and in the right-of-way and provide it as guidance for private landowners.

8. Pilot Projects

a. CIP Projects

In support of the City's vision, staff will explore and implement pilot projects on City-owned parcels and rights-of-way to assess where and how GSI can be implemented in the future. The City will also consider pilot projects on properties identified as high priority per the process used in this GSI Plan, such as City-owned parking lots, and those that meet other Department needs, such as Urban Forestry's shade requirement.

b. Local Partnerships and Volunteer Programs

Partnering with local organizations will allow the City to leverage its resources and obtain additional support to offset high maintenance costs. The City is piloting a program with a local group, Grassroots Ecology, that will allow the group to draw upon its expertise to conduct non-mechanical maintenance tasks and investigate the use of native plants and pollinators to diversify plant palettes used in bioretention areas. In addition, the pilot will involve educating residents about GSI and training volunteers to monitor and provide minor maintenance support at local GSI measures.

NEXT STEPS – FURTHER EXPLORATION

The items below were identified by staff as necessary to ensure successful long-term implementation of this Plan, but need further exploration beyond the Plan development period with additional feedback from the public.

1. Right-of-Way Opportunities

The GSI Plan prioritizes City-owned properties but does not identify GSI project opportunities in the City's rights-of-way. A process will be determined to identify high priority areas as well as procedures to determine project opportunities when staff is evaluating street improvements and enhancements to bicycle and pedestrian features.

2. Project Cost Tracking

The need to track, document and evaluate life cycle costs and avoided costs (e.g., reduction in irrigation use) is important to determine the economic impacts and benefits of GSI Plan implementation. Next steps will involve 1) evaluating cost tracking tools; 2) establishing cost tracking procedures and data analysis methods; 3) determining which cost/benefit approach to use; 4) analyzing data over time that can be used to fortify project opportunity evaluations and budgeting; and 5) adapting systems over time.

3. Funding Analysis

A common concern for a municipal plan that establishes new requirements, particularly leading to new projects, is funding for both construction and maintenance. As such, staff will conduct a thorough funding analysis to evaluate funding options and assess costs of maintenance projects and of project construction costs. This analysis will increase understanding of both construction and maintenance costs for City facilities as well as identify and prioritize funding opportunities.

4. Performance Metrics

There is a clear need to determine what type of performance metric(s) should be used to establish appropriate goals and assess the effectiveness of GSI Plan implementation over time. Additional research will be conducted in coordination with regional efforts to identify the best metric for the City considering the availability of data, the cost of obtaining additional data and conducting a baseline analysis, and the work necessary to regularly conduct future analyses to evaluate progress over time.

5. Rating Tools

Evaluating and sharing the performance of the design, construction and maintenance of projects can help provide transparency regarding the use of public funds and encourages staff to continuously improve effectiveness. In order to holistically manage complex projects that can meet multiple objectives of various Departments, support the City's Comprehensive and Sustainability and Climate Action Plans (among others), and provide accurate, data-supported results to the public, performance rating tools will be evaluated to choose which best assesses performance of varying scales of GSI projects. Such a tool can be integrated into the GSI evaluation process and follow projects through the design, construction and maintenance phases.

6. Private Property Opportunities

The GSI Plan focuses on public property under the jurisdiction of the City. However, to increase the impact of GSI implementation City-wide, it is imperative to consider the establishment of additional requirements for private property; investigate of opportunities to encourage installation of GSI measures in the City's right-of-way; and creation incentives that will reward private property owners for installing and maintaining GSI beyond what is required. This Plan does not propose new requirements, but rather it sets the stage for increasing the scale of GSI implementation throughout the City. Staff will fully research private property opportunities post-acceptance of this Plan.



INTRODUCTION



1.1 CITY OF PALO ALTO'S VISION

The City of Palo Alto (City) has long been a leader in sustainability, in areas such as greenhouse gas emission reductions, zero waste, energy efficiency, wastewater quality, recycled water and urban forestry. This Green Stormwater Infrastructure (GSI)¹ Plan (Plan) supports and expands the City's commitment to sustainability by taking a first step in envisioning a better method of managing its stormwater at its source, decreasing water quality impacts to local creeks, Baylands, and the San Francisco Bay (Bay), and harnessing its benefits instead of treating it as a nuisance. This Plan establishes a guidance framework to integrate GSI measures into the City's urban landscape in combination with targeted, traditional (gray) storm drain system infrastructure improvements to manage intense, large storms. An increase of GSI measures throughout the City can achieve multiple direct and indirect benefits (see Section 1.3.1). Furthermore, the integration of GSI into the current storm drain system may provide cost-effective solutions when strategically planned and implemented. This Plan provides an opportunity to evaluate the use of and determine the balance of both green and gray approaches to manage the City's stormwater and at the same time provide other benefits to residents and others who work in or visit the City.

Due to its close proximity to the Bay and its changing tides as well as local geology, the City has experienced frequent flooding, from localized ponding issues at street intersections to much more significant amounts that have damaged private properties and public infrastructure. As a result, the City has been focusing on improving deficiencies in its gray storm drain system and maintaining it in optimal condition. However, the impervious nature of cities does not allow rain to infiltrate into the ground, and instead, increases the rate that stormwater runoff reaches receiving creeks and the Bay. These large volumes of water erode creeks and wash away important habitat for fish and macroinvertebrates that live in the creek and the Bay. Moreover, stormwater runoff picks up many different pollutants that are found on paved surfaces such as sediment, bacteria, oil and grease, trash, pesticides and metals. The pollutants originate from a variety of sources, including pet waste, lawn fertilization, cars, construction sites, illegal dumping and spills, and pesticide application. These pollutants create havoc in

the creeks and the Bay. The use of GSI can help mitigate the urbanization impacts to our City.

1.2 THE PURPOSE OF THIS DOCUMENT

This Plan is the first step (or phase) in working toward the City's Vision. This phase focuses on outlining how to implement the vision on City-owned properties by identifying an information-based, decision-making process to identify and prioritize City properties for potential future GSI project opportunities. In addition, this Plan defines GSI and Low Impact Development (LID) and provides examples that exist in Palo Alto; assesses project opportunities as part of City projects that are planned or proposed by City Departments; identifies prioritization criteria; provides background regarding Plan development; and sets a framework for implementation. The idea of projects in the City's right-of-way (e.g., streets, sidewalks and planter strips) is briefly explored; however, the next phase will assess project opportunities in right-of-way locations and prioritize them throughout the City, focus on various implementation actions and identify opportunities to increase GSI on private properties, both residential and non-residential.

Although this Plan focuses on retrofitting the City's current developed areas, it also notes the importance of the City's open space areas and Baylands, important natural (or green) infrastructure that helps infiltrate rain, protects the City from climate change impacts, and supports a variety of plant and animal species. These valuable resources are outlined in the Parks and Recreation Master Plan and the Baylands Comprehensive Conservation Plan. Therefore, this Plan focuses on Green Stormwater (or built) Infrastructure, which provides an important connection to the aforementioned plans.

In addition, this Plan meets the requirements of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP) for Phase I municipalities and agencies in the Bay Area (Order R2-2015-0049). One of the MRP's requirements is a GSI Plan and particular elements that are outlined in **Table 1.1**. This table also lists other sections that were included to ensure success of both the Plan's implementation and the GSI measures themselves.

¹Although the MRP uses the term green infrastructure (GI), the agencies within Santa Clara County, including the City of Palo Alto, prefer to use the term green stormwater infrastructure (GSI). Henceforward, the term GSI will be used.

TABLE 1.1: SUMMA	RY OF GSI	PLAN ELEMEN	VTS
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GSI Plan Elements	GSI Plan Section	MRP Requirement
Project Identification and Prioritization Mechanism	4	Х
Prioritized City-Owned Project Locations and Timeframes	Appendix O	Х
Project Tracking System	6	Х
Guidelines and Specifications	7	х
Integration with other Plans	8	х
Evaluation of Funding Options	9	х
Implementation Mechanisms	14	х
Outreach and Education	10	х
Impervious Surface Targets	5	х
Implementation Steps	15	
Maintenance and Monitoring Manual	14.6	
Plan Adoption	11	Х

1.3 GREEN STORMWATER INFRASTRUCTURE

1.3.1 INTRODUCTION

GSI is engineered or man-made infrastructure that is based on natural processes to manage stormwater runoff, typically attributed to unpaved surfaces such as vegetation and uncompacted soils. (**Figure 1.1**). GSI is an alternative to traditional, gray storm drain infrastructure, providing a pathway for rain and stormwater to infiltrate, to reduce and/or treat pollutants, and in some cases, to provide water use opportunities for irrigation or toilet flushing to lower demand on potable water, among other benefits. The following describes a variety of benefits:

- direct benefits such as improving stormwater quality by reducing pollutants conveyed to local creeks and the Bay; slowing and reducing flows to the storm drain system and receiving waters; and providing opportunities for rainwater capture and use; AND
- ancillary benefits such as reduced ponding and localized flooding²; increased tree canopy; decreased urban island effect and climate change impacts; improved air quality; enhanced pedestrian

FIGURE 1.1: Example of a Sustainable Stormwater Drainage System (managed with both Green and Gray Infrastructure)



Source: phillywatersheds.org

²This Plan defines ponding and localized flooding as less than six inches; however, this definition may be amended after further research. In addition, after performance assessments, the City may find that GSI may be used in areas that have larger amounts of ponding.

and bicycle transportation facilities; and ecological habitat.

GSI can be applied at various scales, from a parcel or street to a neighborhood or commercial area. At a larger scale, GSI can refer to the patchwork of larger areas that provides habitat, runoff reduction, cleaner water, and cleaner air. At a smaller scale, GSI refers to engineering systems that mimic the natural hydrologic cycle by capturing, storing, evapotranspiring, and treating water. Examples include, but are not limited to, landscape-based stormwater "biotreatment" or "bioretention" areas using soil and plants ranging in size from grasses and shrubs to trees; pervious paving systems (e.g., interlocking concrete pavers, porous asphalt, and pervious concrete); rainwater harvesting systems (e.g., cisterns); and other methods to capture and use stormwater as a resource.

Low Impact Development (LID), a subset of larger-scale GSI systems, focuses on designing a site to minimize impervious cover and the implementation of practices that can be employed at the parcel-level to control stormwater on-site. These type of practices focus on the infiltration³, evapotranspiration⁴ and the harvesting and use of rainwater. Site design can include

disconnecting downspouts and diverting site runoff to landscaping or other permeable features to infiltrate all or the majority of runoff (except that created by large or long-term storms), thereby managing the amount of pollutants and flows created on-site. These types of LID measures are generally not "engineered" with offsite soils or other especially chosen materials, but are rather a result of site and construction design.

1.3.2 GSI ON CITY RIGHT-OF-WAY

This Plan refers to the establishment of GSI on City-owned properties to manage stormwater runoff on-site at the parcel level, such as with pervious pavement and bioretention areas, to infiltrate runoff and minimize flows to the street and storm drain system. However, the City's rightof-way, which includes streets, sidewalks, planter strips, and medians, can also be retrofitted with GSI during transportation improvement or significant maintenance projects, creating "Green Streets." Green Streets are usually created using a street design approach in mind called "Complete Streets" (**Figure 1.2**), which incorporates all modes of travel equally, particularly to increase safety and access for bicyclists and pedestrians. Smart Growth America, an



FIGURE 1.2: Examples of a Street (top, before) Designed with a "Complete Street" Approach (below, after)

Source: urbanland.uli.org

³Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) defines "infiltration" as the use of filtration, adsorption, and biological decomposition properties of soils to remove pollutants prior to the intentional routing of stormwater runoff to subsurface storage for potential groundwater recharge.

4SCVURPPP defines "evapotranspiration" as the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues).

organization that focuses on strategic urban planning and development, provides helpful resources to fully understand this well-established approach.

California became the first state to adopt legislation supporting this design concept, with Governor Arnold Schwarzenegger signing Assembly Bill 1358 to establish the Complete Streets Act in 2008. The law, which took effect in 2011, requires cities and counties, when updating their general plans, to ensure that local streets and roads meet the needs of all users.

The integration of the goals of both Complete Streets and Green Streets has coined several new terms such as "Living Streets," "Better Streets," and "Sustainable Streets." This movement recognizes that environmentally and holistically-designed streets achieve multiple benefits: increased multi-modal travel and safety; clean water and air; climate change resilience and mitigation; placemaking and community cohesion; habitat; and energy savings. Types of GSI that might be used to create Green Streets include, but are not limited to, the following (**Figure 1.3**, *in clockwise order, starting at top left*):

- Bioretention planters in the planting area/strip between the curb and sidewalk or as a "bulb-out" to make a street more narrow or add a bicycle or pedestrian feature;
- Pervious pavement in sidewalks, pedestrian walkways or a bike or parking lane. Different types and designs may be used in streets where appropriate; and
- Trees planted to provide shade, cooling and pedestrian safety

This Plan focuses on identifying, creating and prioritizing GSI opportunities throughout the City at the parcel-scale. The second phase will focus on the street and neighborhood scale, with the intention of spreading and connecting these measures throughout the City over time.

FIGURE 1.3: Examples of Applications of GSI in a Street and Sidewalk





Sources: nacto.org (top left and right); foresthills.com (bottom)

1.3.3 TYPES OF GSI MEASURES

This Section describes types of GSI measures, some of which can be designed and integrated into a combination of applications to the: (1) property or site; and/or (2) City right-of-way (e.g. sidewalks) or private parking lots and walkways. Some of these features may be best placed within the City right-of-way in order to maximize resources and the amount of stormwater management. Although private property owners may use this Section as a general introduction, it should be noted that this Section focuses on the first phase of this Plan, City-owned property. This section provides descriptions and example figures of the following: (1) bioretention; (2) stormwater tree well filters and suspended pavement systems; (3) pervious pavement; (4) infiltration facilities; (5) rainwater harvesting and use facilities; and (6) green roofs.

The preservation, restoration and creation of open space and natural areas have been a City goal for many years. Per the City's "Comprehensive Plan 2030" (adopted in 2017), over one-third of the City's land area consists of designated Open Space and Public Conservation Land, with most located outside of the densely populated urban section of the City. Although a portion of this land is privately-owned, the majority is devoted to passive use that supports diverse ecosystems, natural assets and wildlife. Upland/foothill areas act like sponges, allowing rain to be intercepted by vegetation and infiltrate in soils, leading to a significant reduction in stormwater runoff to the downstream watershed. In addition, the City's Baylands, along the City's entire Bay shoreline, support the spreading of stormwater runoff over its marshlands and filtering of pollutants before flowing into the Bay. Thus, continuing to preserve and restore these open space areas is an important of aspect of managing stormwater with a non-gray approach; however, it is not intended to be a highlight of this Plan as they are not constructed or engineered to treat or retain stormwater.

Bioretention Areas

Bioretention areas (Figure 1.4), also known as biotreatment measures, are depressed landscaped areas that consist of a ponding area, mulch layer, especially-chosen plants, and a specific type of soil media composed of sand and compost, underlain by drain rock and an underdrain, if required. Bioretention is designed to retain stormwater runoff, filter runoff through biotreatment soil media and plant roots, and then either infiltrate runoff

FIGURE 1.4: Example of Bioretention Curb Extension in Seattle



Source: Seattle Public Utilities

to underlying soils if allowed by site conditions or release treated runoff to the storm drain system. In some cases, these systems are designed so that infiltration may occur but can also overflow to the storm drain system during large storms.

Bioretention areas may be placed in a variety of locations on parcels and within the street right-ofway. Planter strips between sidewalks and curbs may provide space for bioretention, and curb bulb-outs and curb extensions installed for pedestrian access and improved visibility and other transportation benefits can also provide opportunities for siting bioretention facilities. Parking lots can accommodate bioretention areas of most shapes in medians, corners, and pockets of space unavailable for parking.

Types of bioretention measures in the streetscape are called stormwater planters, stormwater curb extensions, and stormwater tree well filters (described in the following Section). The configuration of the street and sidewalk, the right-of-way width, and existing and intended uses of the right-of-way dictate which type of system is most appropriate and feasible. A stormwater planter⁶ is a linear bioretention facility in the public right-of-way along the edge of the street, in back of either the existing curb or sidewalk. They are deeper than landscaped areas along sidewalks and are designed to have a flat bottom with vertical (typically concrete) sides; however, they can also have sloped sides depending on the amount of space that is available and proximity to sidewalks or paved areas.

A stormwater curb extension (or bulb-out) 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. Stormwater curb extensions and bulb-outs have the added benefits of decreasing street widths and pedestrian crossing distances, and reducing vehicle speed, which can increase bicyclist and pedestrian safety.

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 bioretention areas.

Suspended pavement systems may be used to provide a larger underground treatment area and additional soil volume to allow for tree growth. These are structural systems designed to provide support for pavement while preserving or adding larger volumes of uncompacted soil for tree roots. They may be any engineered system of structural slabs placed on structural supports or commercially available proprietary structural systems⁷. These systems allow for use of a particular soil volume amount, as required by the City's Urban Forestry Section of the Public Works Department.

Stormwater tree well filters used with suspended pavements systems (**Figure 1.5**) are especially useful in settings between existing sidewalk elements where available space is at a premium or if the site location allows additional catchment of runoff from the adjacent street. 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 storm drain inlets, or allow runoff to enter through pervious pavers on top of the structural support.





Source: Deeproot

^eThe term "stormwater planter" is sometimes used to refer to tall vegetated planters placed next to buildings to capture roof runoff ⁷Various companies, such as GreenBlue Urban, Deeproot, and CityGreen, create comparable suspended pavement systems.

Pervious Pavement

Pervious pavement is hardscape that allows water to pass through into the ground below. It reduces or eliminates stormwater runoff by providing open pore spaces or joints through which water can enter a storage area filled with gravel prior to infiltrating into the underlying soils or directed to the storm drain via an underdrain. Types of pervious pavement include permeable interlocking concrete pavers (**Figure 1.6**), pervious concrete (**Figure 1.7**), porous asphalt (**Figure 1.8**), and grid pavement (**Figure 1.9**). Pervious pavement is often used in parking areas or on lowspeed residential roads with limited vehicle traffic that are not frequently used by larger heavy vehicles where bioretention is not feasible due to space constraints or if

FIGURE 1.6: Example of Permeable Interlocking Pavers



Source: stormwater.allianceforthebay.org/

FIGURE 1.7: Example of Pervious Concrete in Bellarmine School, San José



Source: EOA, Inc.

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 (as opposed to replacement with plant material).

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. There are two types of pervious pavers: Permeable Interlocking Concrete Pavers and Permeable Pavers. Permeable Interlocking Concrete Pavers allow water to pass through the joint spacing between solid pavers, while Permeable Pavers allow water to pass through the paver itself and therefore can have tighter joints.

FIGURE 1.8: Example of Porous Asphalt in Creekside Park, Los Gatos



Source: EOA, Inc.

FIGURE 1.9: Example of Grid Pavement



Source: NACTO

Infiltration Facilities

Where soil conditions and the height of the water table (or depth to groundwater) permit, infiltration facilities can be used to capture stormwater and infiltrate it into native soils. The two primary types are infiltration trenches (**Figure 1.10**) and subsurface infiltration systems (**Figure 1.11**). 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. Subsurface infiltration systems may be used beneath parking lots, playing fields 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 them. Storage can take the form of large-diameter perforated metal or plastic pipes, 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 1.10: . Infiltration Trench that Captures Runoff from Alley (City of San José Martha Gardens)



Source: sanjoseca.gov/index.aspx?NID=5722

FIGURE 1.11: Example of Subsurface Infiltration System



 ${\tt Source: conteches.com/stormwater-management/detention-and-infiltration/terre-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detention-arch-detentio$

Rainwater Harvesting and Use Facilities

Rainwater harvesting is the process of collecting rainwater from impervious surfaces and storing it for later use. Storage facilities that can be used to harvest rainwater include rain barrels, above-ground or belowground cisterns (**Figure 1.12**), open storage reservoirs (e.g., ponds), and various underground storage devices, such as tanks, vaults, pipes, and proprietary storage systems (**Figure 1.13**). The harvested 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 uses such as toilet flushing, heating and cooling, or industrial processing.

The three most common applications of rainwater harvesting systems are (1) collection of roof runoff from buildings; and (2) collection of runoff from at-grade surfaces; and (3) 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 mechanical pretreatment facilities to remove pollutants or microorganisms from stormwater prior to storage and use.



FIGURE 1.12: Aboveground Cistern in Mills College, Oakland

Source: EOA, Inc.



FIGURE 1.13: Subsurface Detention System (City of Philadelphia)

Source: Philadelphia Water Department

FIGURE 1.14: Green Roof Example



Source: Hydrotech

Green Roofs

Green roofs (Figure 1.14) 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 installed 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, at both commercial and residential scales given proper design, 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.

1.3.5 EXISTING GSI MEASURES ON CITY PROPERTY

The City has been a leader in the implementation of LID and GSI techniques since the early 2000s. It was one of the first cities in the Bay Area to establish a storm drain utility and adopt a property-based fee in 2005 for managing its drainage infrastructure and complying with water quality requirements. It was also one of the first cities to establish a Stormwater Measures Rebate Program (Rebate Program), introduced in 2008, for residents, businesses, and City departments. The Rebate Program provides rebates for capturing rainwater in rain barrels or cisterns, constructing or reconstructing driveways, patios, walkways, and parking lots with permeable pavement, and constructing green roofs.

Along with other Bay Area municipalities, the City has been requiring private developers to comply with permit requirements for installing stormwater treatment measures on their properties since 2003 (see Section 1.4). In addition, the City has constructed a number of LID and GSI facilities on City property and its rights-ofway. Descriptions of these facilities are provided below. Refer to Appendix H for a map of all GSI locations on City property.

Stanford/Palo Alto Community Playing Fields

The Community Playing Fields, also known as Mayfield Sports Park, is a soccer complex at the corner of Page Mill Road and El Camino Real that was funded by Stanford University and is operated by the City. Constructed in 2005, the project included two artificial turf playing fields that drain to a below-grade infiltration facility (rock dry well) on the site. The site also contains Permeable Interlocking Concrete Pavers in the plaza area between the fields and a vegetated swale in the parking lot along El Camino Real. These GSI measures were among the first of their kind, installed before regulatory requirements mandated their use, and served as an early example of green design to other communities (**Figure 1.15**).









Alma Street Infiltration Trench

To address flooding issues on Alma Street, this project involved installation of an infiltration trench along the west side of Alma, from Loma Verde to San Antonio (Figure 1.16). Roadway runoff drains through cuts in the asphalt curb into the trench and infiltrates into the soil. Completed in 2008, this was the City's first GSI project in a street right-of-way.

Southgate Neighborhood Green Street

The Southgate Neighborhood is a single-family residential neighborhood, which was designed in the 1920s to have a storm drainage pattern based on gutter flows, with no storm drain system infrastructure. Over time, drainage problems within the neighborhood resulted in extended stormwater ponding. The City decided to retrofit the neighborhood to improve

surface drainage and incorporate green street elements to improve water quality. The treatment measures include 16 bioretention areas, pervious pavement crosswalks, and a pervious pavement "paseo" (pedestrian walkway connecting two streets). The bioretention areas were incorporated into the street right-of-way and existing parkway strips (vegetated areas between the sidewalks and the streets) (Figure 1.17). Selected crosswalks were reconstructed using pervious pavement that intercept and infiltrate storm runoff. The project was completed in 2014. It was constructed using extra Rebate Program funds that had accumulated over several years, along with other funding sources.

Mitchell Park Community Center

The Mitchell Park Library & Community Center on Middlefield Road includes a two-story, 41,000 square



FIGURE 1.16: Alma Street Infiltration Trench

Source: Google Street View



FIGURE 1.17: Southgate Neighborhood Green Street: stormwater curb extension

Source: EOA, Inc.

foot library building and a 15,000 square foot singlestory community center and court yard. The project includes approximately 11,000 square feet of green roof, a living green wall, bioretention areas, pervious paving in a section of parking area, and rainwater harvesting (**Figure 1.18**). The project was completed in 2014, with the building receiving a Leadership in Energy and Environmental Design (LEED) Platinum certification. The project was funded by a bond measure (Measure N), passed in November 2008 by City of Palo Alto voters.

Rinconada Library

The rehabilitation of the Rinconada Library in 2014 preserved the historical character of the original 1958 Edward Durell Stone building, while adding a new program room and group study rooms to expand and enhance the facility's functionality. Special consideration was taken to preserve existing trees and not disturb existing site features. The project provided biotreatment areas that treat both on-site stormwater runoff (**Figure 1.19**) and groundwater pumped from underneath both the Library and the Art Center structures. The project was funded by a bond measure (Measure N), passed in November 2008 by City of Palo Alto voters.

Kellogg Avenue and Middlefield Road Intersection Improvements

Middlefield Road at Kellogg Avenue is a busy street with frequent pedestrian crossings to access Walter Hays Elementary School, the Junior Museum and Zoo, and Lucie Stern Community Center. To improve pedestrian



FIGURE 1.18:

Mitchell Park Community Center and Library: green roof; bioretention area in parking lot; and pervious pavement parking spaces

Source: Group 4 Architecture, Research + Planning, Inc. (top and bottom right) and EOA, Inc.

access at this intersection, curb bulb-outs at the ends of Kellogg Avenue and curb extensions on Middlefield Road were installed in 2018 to reduce the pedestrian crossing distance and increase pedestrian visibility to drivers. Four bioretention areas were constructed within the curb bulbouts and extensions (Figure 1.20).

Charleston/Arastradero Streets Corridor Project

The 2.3-mile Charleston/Arastradero Corridor is a residential-arterial road that is undergoing major modifications to reduce traffic speeds, provide safer conditions for pedestrians, bicyclists, and motorists, and beautify the streetscape. The project includes the installation of landscaped medians, curb extensions/bulb-outs, enhanced bicycle and pedestrian improvements, and traffic signal modifications. Five bioretention areas will be integrated into the traffic calming features. The expected completion date is 2020.

GSI Projects Constructed in Partnership with the City

Grassroots Ecology, a local non-profit organization, recently completed a number of LID and native plant demonstration projects within the City, using grants from the Santa Clara Valley Water District (Valley Water) and partnerships with the City and the AmeriCorps Watershed Stewardship Program. These projects include:

- In 2018, a rain garden (a depressed area) with native plants was constructed to capture runoff from the parking lot while providing habitat for birds and insects. A 260-gallon rainwater storage cistern collects runoff from the roof of the event center and drains to the rain garden facility. A 55-gallon rain barrel was also installed to collect roof runoff for irrigation.
- In 2017, part of the park's lawn area was replaced with a native rain garden that provides habitat for birds and insects while keeping pollutants from entering the storm drain. This site demonstrates the use of a 200-gallon water harvesting system to capture rainwater off the roof of the public bathroom and drip-irrigate the stone-lined garden.
- In 2017, non-native Indian Hawthorn shrubs were replaced with a native rain garden that slows and sinks rainwater while providing habitat for birds and insects. This site showcases a 500-gallon tank that captures rainwater off the roof and feeds it into the stone-lined garden.



Rinconada Library: infiltration trench (left) and bioretention area

Source: EOA, Inc.





FIGURE 1.20: Kellogg Ave. & Middlefield

Rd. three-way intersection: stormwater curb extension

Source: EOA, Inc.

Other GSI Examples

The City continues to look for opportunities to include GSI measures in projects where feasible. For example, the City has also installed pervious pavement at the San Francisquito and Matadero Pump Stations, as well as in the El Camino Park parking lot. In addition, the City is planning or constructing a number of capital improvement program (CIP) projects that are required to install GSI measures per regional regulations (see Section 1.4), including the replacement of Fire Station #3 on Embarcadero Road, the new Public Safety Building on Sherman Avenue, the new California Avenue Parking Garage on Sherman Avenue, and the Highway 101 Pedestrian/Bicycle Bridge Project.

1.4 REGULATORY CONTEXT

1.4.1 FEDERAL AND STATE REGULATORY DRIVERS

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 (or storm drain systems) to local creeks, the 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 2000's, the EPA has recognized and promoted the benefits of using GSI to protect drinking water supplies and public health, mitigate overflows from combined and separate storm sewers, and reduce stormwater pollution from storm drain systems (like those in the City of Palo Alto). It has also encouraged the use of GSI by municipal agencies as a prominent component of their stormwater programs . The State Water Board and its Regional Water Boards followed suit in recognizing not only the water quality benefits of GSI, but also the opportunity to augment local water supplies in response to the impacts of drought and climate change. Moreover, the 2014 California Water Action Plan called for multiple-benefit stormwater management solutions and more efficient permitting programs . These Federal and State initiatives have influenced approaches in Bay Area municipal stormwater permits, as described in Section 1.4.2.

1.4.2 REGIONAL REGULATORY DRIVER: MUNICIPAL REGIONAL STORMWATER PERMIT

The City is subject to the requirements of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP) for Phase I municipalities and agencies in the Bay Area (Order R2-2015-0049), which became effective on January 1, 2016. The MRP applies to 76 large, medium and small municipalities (counties, cities, and towns) and flood control agencies that discharge stormwater to the Bay, collectively referred to as Permittees, as referenced in **Figure 3.2**.

Over the last 13 years, under the current MRP and previous permits, new development and redevelopment projects on private and public property that exceed certain size thresholds (known as "Regulated Projects") have been required to mitigate impacts on stormwater quality by incorporating site design, pollutant source control, stormwater treatment and flow control measures (also known as GSI) as appropriate. Regulated Projects include new development and redevelopment for certain project types that create and/or replace at least 5,000 square feet of impervious surface (e.g. auto service facilities, gas stations, restaurants, and uncovered parking lots), as well as new development and redevelopment that creates and/or replaces at least 10,000 square feet of impervious surfaces for all project types except singlefamily residential. LID measures, such as disconnecting downspouts and diverting site runoff to landscaping, have been required on most Regulated Projects since December 2011. Construction of new roads is covered by these requirements, but projects related to existing roads and adjoining sidewalks and bike lanes are not regulated unless they include creation of an additional travel lane.

1.4.3 REGULATORY REQUIREMENT ADDRESSED THROUGH THE GSI PLAN Provision C.3.j of the MRP requires the City to develop and implement a long-term GSI Plan for the inclusion

of measures into storm drain system infrastructure on City and private lands, including streets, roads, storm drains, parking lots, building roofs, and other elements. Per MRP requirements, the GSI Plan must be adopted by City Council by September 30, 2019. As previously stated, this phase of the Plan identifies how the City will move forward with integrating GSI into its own property, its right-of-way, and with the next phase focused on private project opportunities.

As part of the GSI planning process, Provision C.3.j.i.(1) required Permittees to adopt a Green (Stormwater) Infrastructure Plan Framework by June 30, 2017 and submit it to the Water Board by September 30, 2017. In compliance with this provision, the City completed a GSI Framework, which was signed by the City Manager and included tasks and timeframes that would be completed as part of the required elements of the GSI Plan.

While Provision C.3.j of the MRP contains the GSI program planning and analysis requirements, other provisions (C.11 and C.12) establish a linkage between public and private GSI features and required reductions in pollutant discharges. Permittees in Santa Clara County (County), collectively, must implement GSI 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 county-wide 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 GSI 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 GSI measure) over the same timeframes (2020, 2030, and 2040); these estimated targets are outlined in Section 5.0.

A key part of the GSI definition in the MRP is the inclusion of GSI measures at both private and public property locations. This has been done in order to plan, analyze, implement and credit GSI for pollutant load reductions on a watershed scale, as well as recognize all GSI accomplishments within a municipality. Thus, the next phase of the GSI Plan may also establish opportunities to include GSI measures at private properties or in conjunction with private development, in order to assist with meeting the target load reductions on a county-wide level as well as implement GSI on a larger scale.



CITY OF PALO ALTO DESCRIPTION AND BACKGROUND



2.1 BACKGROUND AND LAND USE

Incorporated in 1894 as the town to support Stanford University, the City of Palo Alto (City) is located in northern Santa Clara County, in the mid-peninsula region of the Bay Area. The City is located between forested foothills of the Santa Cruz Mountains to the southwest, and the Bay and adjacent Baylands to the northeast. The City can be described as a suburban residential community, with a vibrant economy in the high technology and medical sectors. The commercial and mixed-use areas serve as the focal points for, and are within walking distance of, residential neighborhoods. They also include important civic buildings, schools, and parks for community use. The employment districts are relatively large districts with job-generating office, technology, and light industrial uses.

The City's open space preserves in the southern foothills and the Baylands make up a large portion of land within the City limit. While the City has a total land area of 25.79 square miles, approximately 59 percent of this area is protected open space. Development in the City is concentrated within the Urban Service Area, which has a land area of 13.95 square miles. The main land use areas in the City's urban area can be categorized as residential neighborhoods, commercial centers and employment districts (**Figure 2.1**). There are about 35 residential neighborhoods in the City, which include single-family homes and multi-family structures. Of the estimated 28,500 housing units in the City, approximately 62 percent are single-family residential units.

2.2 SURFACE WATER BODIES AND NATURAL RESOURCES

The City is located within three main watersheds: San Francisquito, Matadero, and Adobe Creeks. All of the creeks flow to the Bay and at the City's Baylands.

- San Francisquito Creek forms the northern border of the City adjacent to Menlo Park and East Palo Alto. The main tributaries to San Francisquito Creek are Corte Madera Creek (in Portola Valley and Stanford), Bear Creek (in Woodside and Menlo Park), and Los Trancos Creek (in Portola Valley and Stanford).
- The Matadero Creek watershed includes Deer Creek, Arastradero Creek, the Stanford Channel, and Mayfield Slough. Except for the Stanford Channel, the watershed consists of natural channels upstream of El Camino Real. Downstream of El Camino Real to the Flood Control Basin, all of the creeks are engineered,

concrete channels adjacent to or in the backyards of residences.

• The Adobe Creek watershed drains south Palo Alto, Los Altos Hills, and Los Altos. Barron Creek is part of this watershed; it flows through south Palo Alto to meet Adobe Creek just before it enters the the Flood Control Basin. Both Adobe Creek and Barron Creek are mostly natural channels upstream of El Camino Real and are in engineered, concrete channels downstream of El Camino Real.

Surface water bodies in the City include ponds, lakes, creeks, and the Bay. Ponds and lakes include Boronda Lake in Foothills Park, and Arastradero Lake and John Sobey Pond in the Pearson-Arastradero Preserve. A freshwater marsh with open water habitat also occurs in the Emily Renzel Marsh portion of the Baylands Preserve.

The City is one of 3,400 cities in the United States that holds the Arbor Day Foundation's "Tree City USA" status due to its dense urban canopy and more than 300 different species throughout streets, parks, and other landscaped areas. Protecting, maintaining and enhancing the urban forest, as called for in the City's 2015 Urban Forest Master Plan, is a high priority for the City. In addition, the City encompasses a variety of natural plant communities within a densely built environment. The Baylands and undeveloped land in the western hills contain undisturbed plant communities and habitat for a variety of species. The following natural plant communities exist within the City's boundaries: (1) Annual Grassland (various locations); (2) Coastal Scrub (foothills); (3) Chamise Chaparral (foothills); (4) Forests (Redwood, Montane Hardwood-Conifer, Montane Hardwood in foothills); (5) Oak Woodland (foothills); and (6) Wetlands (Baylands).

2.3 GROUNDWATER RESOURCES

Although the City's major drinking water supplies are provided by the San Francisco Public Utilities Commission (SFPUC), the City maintains eight groundwater wells as an emergency water supply source and as a potential supply source for use during a prolonged drought. The groundwater quality of the City's wells is considered fair to good quality, but less desirable in comparison to SFPUC's supplies. Except for maintenance purposes, the City has not operated these wells since 1991¹.

The City is situated next to the southwest shoreline of the Bay, and shallow groundwater levels are highly influenced by its tides. The City has a shallow water



FIGURE 2.1: Land Use throughout the City (City of Palo Alto, Comprehensive Plan 2030, 2017)

table throughout much of the urban area with depth to groundwater levels from 5.0 to 20.0 feet below grade in most of the area east of El Camino Real. In addition, five main contaminated groundwater plumes as well as smaller ones are known to exist, as a result of historical land uses and chemical management practices (see **Figure 2.2**). Depth to groundwater and the presence of contaminated plumes are two factors that will influence the selection of locations and design of GSI measures and were considerations when prioritizing potential GSI project areas in the City.

2.4 TRANSPORTATION

Regional vehicular access to the City is provided by Interstate 280 passing through the western part of the City, Highway 101 passing along the eastern perimeter of the City, and State Route 82 (also known as El Camino Real), which passes through the heart of the City.

The Palo Alto Transit Center is a regional transit hub with connections to Caltrain, Santa Clara Valley Transportation Authority (VTA), San Mateo County Transit District, and Alameda-Contra Costa Transit District. Additionally, the City operates a free, public shuttle service, and Stanford University's Marguerite Shuttle provides free public bus service to destinations on the Stanford campus and at the Stanford Shopping Center.

The City has approximately 65 miles of existing bikeways and adopted a Bicycle and Pedestrian Transportation Plan in July 2012. In addition to





¹City of Palo Alto Urban Water Management Plan, 2015.

bikeways operated and maintained by the City, regional bikeways operated by VTA and San Mateo County provide connections to points throughout the City and beyond.

2.5 POPULATION AND GROWTH FORECASTS

According to the 2010 Census, the City has a population of 64,403². The City experienced relatively stable and slow population growth from 1970 to 2000

but has been growing significantly faster since 2000, a trend that is projected to continue. Between 2000 and 2013, the City was one of the fastest growing cities in the Santa Clara County (County), with an overall 13 percent increase (Comprehensive Plan, 2017). Estimates of future growth indicate a moderate and steady increase in population over the next 20 years. By the year 2035, the Association of Bay Area Governments (ABAG) estimates that the population of the City will reach 84,000.

²The California Department of Finance estimates the current population of the City to be 69,721 as of January 1, 2018.

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PLAN DEVELOPMENT AND COORDINATION



3.1 PLAN DEVELOPMENT OVERSIGHT AND STAFF INVOLVEMENT

The City's Watershed Protection Group (Watershed Protection) of the Public Works Department's Environmental Services Division, managed the development of the GSI Plan, with support from a consultant team. Collaboration during Plan development involved creating an interdepartmental GSI Workgroup, made up of various departments, including Public Works Engineering, Planning & Community Environment, Development Services, Utilities, and Community Services, that served as stakeholders of this Plan in some fashion.

Meetings facilitated by Watershed Protection staff were held periodically with the Workgroup, with small staff meetings held in-between to discuss pertinent topics in-depth. In addition, Watershed Protection staff attended various meetings to keep abreast of City projects that may be coordinated with the GSI Plan; developed relationships with project managers; gave presentations at Department staff meetings; and provided updates via email communications. Information obtained was imperative in helping to provide Plan direction, prioritize projects, outline City processes and obtain staff support across Departments. **Figure 3.1** is a word cloud depicting the various Departments that collaborated together throughout the development of this Plan. The size of the Department name correlates to the involvement of that Department within the Plan development, i.e. larger names signify the extent of involvement in the Plan development.

3.2 PUBLIC PARTICIPATION

There were several opportunities for public participation in the development of the GSI Plan. Updates on the development of the Plan were regularly presented at meetings with the Stormwater Management Oversight Committee (SWMOC), which was formed to review the expenditures of the proposed City's Stormwater Management Fee (SWMF). During the development of the Plan, six SWMOC, publicly-noticed meetings were held.

Furthermore, Watershed Protection staff presented at the Parks and Recreation Commission in November 2018 and again in January 2019, as well as the Planning and Transportation Commission in January 2019. These presentations were intended to provide background on the Plan and inform the Commissions of how the Plan aligns with the Commissions' respective goals. The GSI Plan was accepted by Council on May 13, 2019. In addition, a public meeting was held on March 26, 2019 to share the Plan with the public and obtain feedback before finalizing it. Commission and City Council meetings are also publicly-noticed.



SECTION 3

Finally, notification of both the 85 percent and 100 percent draft GSI Plan versions were sent out to key stakeholders and local organizations, including but not limited to, Grassroots Ecology, Peninsula Watershed Forum, and Save Palo Alto Groundwater. Moreover, a City webpage (www.cityofpaloalto.org/gsi) was established in July 2018 to provide information to the public during Plan development and implementation. The drafts of the Plan and the final Plan were posted on the website. Additional outreach efforts are described in Section 10.0.

3.3 SCVURPPP GUIDANCE AND INTER-AGENCY COORDINATION

The City is a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of thirteen cities and towns in the Santa Clara Valley, the County, and Valley Water that collaborate on stormwater regulatory activities and compliance. The City's Plan was developed with support from SCVURPPP, which included technical guidance, templates, and completion of certain GSI Plan elements at the county-wide level. SCVURPPP guidance and products are discussed in more detail in relevant Sections of the Plan.

The City worked with other SCVURPPP member agencies to review, approve and fund GSI-related technical guidance and products. City representatives regularly met with other agencies as part of SCVURPPP Management Committee meetings and C.3 Provision Oversight Ad Hoc Task Group meetings to discuss work products, issues and lessons learned related to Plan development and implementation.

The City, via SCVURPPP, also coordinated with the Bay Area Stormwater Management Agencies Association (BASMAA) on regional GSI guidance and received feedback through BASMAA from MRP regulators on GSI expectations and approaches. BASMAA members include other county-wide stormwater programs in Alameda, Contra Costa, and San Mateo Counties, and area-wide programs in the Vallejo and Fairfield-Suisun portions of Solano County, whose participating municipalities are permittees under the MRP. **Figure 3.2** illustrates this inter-agency coordination.



FIGURE 3.2: Inter-Agency Coordination

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PROJECT LOCATION IDENTIFICATION AND PRIORITIZATION MECHANISM



4.1 INTRODUCTION

To meet the requirements of the MRP, the City's GSI Plan must describe the mechanism by which the City identified, prioritized and mapped areas for potential and planned projects that may incorporate GSI components in different drainage areas within the City. This mechanism must include the criteria for prioritization and outputs that can be incorporated into the City's long-term planning and capital improvement processes. For the purposes of this Plan, Watershed Protection staff conducted a thorough assessment and prioritization of potential GSI project locations on City-owned properties. Locations within the right-of-way, areas such as streets and sidewalks, were identified as part of a county-wide effort; however, further prioritization of the City's rights-ofway will be conducted in the future by City staff as part of the next phase.

The prioritization process for City-owned properties involved two major steps. The quantitative prioritization mechanism used for the City's GSI Plan was based on the process used in the Santa Clara Basin Stormwater Resource Plan (SWRP). The SWRP was developed in 2018 by SCVURPPP, in collaboration with Valley Water, on behalf of SCVURPPP member agencies. It establishes a county-wide, watershed-based planning guide for stormwater and dry weather runoff capture and use projects on publicly-owned land and rightsof-way. The SWRP produced a list of prioritized project locations throughout SCVURPPP jurisdictions eligible for future State implementation grant funds as the first step of the prioritization process.

The second step in the prioritization process involved overlaying City-specific criteria, planning areas, upcoming City projects and local knowledge onto the county-wide results to align the results of the SWRP process with the City's priorities. The result is a list of proposed project locations for City-owned properties (**APPENDIX O**). The steps are described in detail in this Section.

Large private property owners in the City, such as Stanford and the Palo Alto Unified School District, are not required to create their own GSI Plans. Because the City does not have jurisdiction over these properties, they were not included in the prioritization process. However, the City will seek collaboration opportunities with these and other parties to integrate GSI throughout their jurisdictions.

4.2 STEP ONE: SWRP PRIORITIZATION SUMMARY

Building on existing documents that describe the characteristics and water quality and quantity issues within the Santa Clara Basin (i.e., the portion of the County that drains to the Bay), the SWRP identified and prioritized multi-benefit GSI project locations throughout the Basin. A metrics-based, modeling approach was used for quantifying project location benefits, such as volume of stormwater infiltrated and/or treated and quantity of pollutants removed. The analysis was conducted using hydrologic/ hydraulic and water quality models coupled with (map-based software) Geographic Information System (GIS) resources and other tools. The products of these analyses were a map of opportunity areas for GSI project locations throughout the Basin, an initial prioritized list of potential project locations, a limited list of project concepts across the Basin, and strategies for funding these and future projects.

The process began by identifying and screening City-owned parcels and public rights-of-way. GSI project location opportunities were categorized as LID, regional, or green streets projects. LID projects were defined as GSI facilities that are built on a parcel to treat runoff generated from impervious surfaces on that parcel. Regional projects were defined as larger-scale GSI projects intended to collect and treat runoff from a larger drainage area, including runoff from on-site and off-site areas. LID project location opportunities were identified on parcels with an area less than or equal to 0.25 acres, whereas regional GSI opportunities were identified on parcels with an area greater than 0.25 acres. Green street project location opportunities were defined as GSI project retrofit opportunities in the public right-of-way along existing street segments.

4.2.1 PARCEL-BASED PROJECT OPPORTUNITIES

The initial screening criteria for LID and regional project locations were ownership (focusing only on City-owned parcels), land use, and site slope. The screened parcels were then prioritized based on physical characteristics, proximity to flood-prone areas, proximity to potential pollutant sources, whether they were located in a priority development area, whether they were within a defined proximity to a planned project, and whether the project was expected to have other benefits such as augmenting water supply, providing water quality source control, re-establishing natural hydrology, creating or enhancing habitat, and enhancing the community. Prioritization metrics for LID project scoring is available in the SWRP.

Key metrics for regional project locations were the size of the parcel, size of the drainage area, and proximity to a storm drain (from which stormwater and dry weather flows could be diverted). The result of parcel prioritization was a list of potential project locations based on this criteria. This list was reviewed and updated by the City as part of Step Two (Section 4.3).

4.2.2 GREEN STREET PROJECT OPPORTUNITIES

The screening criteria for green streets projects in the public right-of-way were ownership, surface material, slope, and speed limit. The screened public right-of-way street segments were then prioritized based on physical characteristics, proximity to storm drains, proximity to flood-prone areas, proximity to potential pollutant sources, whether they were located in a priority development area, whether they were in proximity to a planned project, and whether the project was expected to have other benefits (similar to LID and regional projects).

The initial prioritization process resulted in too many potential green street project opportunities within the Santa Clara Basin. In order to identify the optimal locations for green street projects, the SWRP identified and mapped those street segments in each municipality's jurisdiction with scores in the top 10 percent of ranked green street opportunities. A limited number of street segments from the top 10 percent of potential locations were reviewed by the City (Section **4.3**). The remaining street segments will be reviewed in a future phase.

4.3 STEP TWO: CITY PRIORITIZATION SUMMARY FOR **CITY-OWNED PARCELS**

Watershed Protection staff followed a comprehensive process to further prioritize parcel-based project locations and certain Department projects that are not parcel-based, such as the Storm Drain Master Plan, beyond the SWRP regional level, so that the identified project locations met specific City needs. Projects from the Utilities Department were not prioritized during this phase due to various utility

conflicts that are described in Section 7.0; however, maps of the Utilities projects that are currently outlined in the Fiscal Year 2019 Adopted Capital Budget document are included in Appendices Q – T. While streets were prioritized in the SWRP (Step One), staff did not further prioritize street project locations with additional City-specific criteria during this first phase. However, staff reviewed the streets prioritized as "high" by the SWRP; staff will further review streets surrounding key development areas and parcel-based project locations identified as "high" priority in the future.

4.3.1 OVERVIEW OF CITY PRIORITIZATION STEPS

Watershed Protection staff followed Steps A-G to conduct the City-specific prioritization for potential project location opportunities. This Section provides additional detail to each of these steps.

- A. Updated SWRP proposed parcel (regional and LID) list.
- B. Developed prioritization criteria based on SWRP criteria, data review and staff recommendations.
- C. Determined which criterion should result in a higher prioritization based on the importance of project location characteristics. Then created categories for each criterion to match those characteristics.
- D. Identified a value for criteria categories, with high-priority characteristics receiving a larger value than low-priority characteristics.
- E. Compared each project location against the criteria categories and assigned the appropriate value for each criterion to the project location based on its characteristics.
- F. Totaled the values for each project location.
- G. Calculated the 85th percentile to designate the "high priority" project locations. Calculated the 25th percentile to designate the "low priority" project locations. The remaining projects were designated as "medium priority" project locations.

Part A: Updated SWRP Proposed Parcel (Regional and LID) List

City staff adapted the parcel project location list from the SWRP effort described in Step One to create a draft comprehensive City-specific project location list to be regularly updated. As required

TABLE 4.1: PLANNED CITY-OWNED GSI MEASURES

Project Name	Project Type	Type of GSI Project	Location
Highway 101 Pedestrian/ Bicycle Overpass	Design	Combination	Highway 101 corridor north of San Antonio Road interchange by Adobe Creek
California Ave Area Parking Garage (Lot 7)	Construction	Parcel	350 Sherman Avenue
Downtown Parking Garage (Lot D)	On hold	Parcel	375 Hamilton Avenue
Public Safety Building (Parking Lot 6)	Design	Parcel	Parking Lot C-6 (250 Sherman Avenue)
Charleston / Arastradero Corridor	Construction	Street	Charleston/Arastradero Road from Fabian Way to Miranda Avenue
Fire Station 3 ⁷	Construction	Parcel	799 Embarcadero Road

⁷ Fire Station 3 is currently under construction and has an anticipated completion date by Fall 2019.

by the MRP, the City has maintained a list of planned public projects that include GSI for the last three fiscal years (15-16, 16-17, and 17-18. **Table 4.1** includes the currently planned projects that will include GSI. City staff ensured these projects were included in the overall parcel list.

All projects in the Fiscal Year 2018 Adopted Capital Budget document were assessed for GSI project location potential. If a project was determined to have potential, even that of 'low,' it was added to the existing project list. In addition, other sources such as the Bike and Pedestrian Transportation Plan, the Storm Drain Master Plan and all City-owned properties were evaluated to determine inclusion in the list.

Once the list of potential project locations was compiled from various sources, staff analyzed these project locations by viewing locations on Google Earth, mapping projects in GIS, and by discussing projects with other City staff. Mapping these potential GSI project locations allowed staff to view their proximity to planned GSI projects, key development areas¹ as well as other pertinent criteria.

Part B: Developed Project Location Prioritization Criteria

Next, staff developed the list of criteria to be compared against each potential project location

included in the updated project location list (Part A). This criteria, outlined in **Table 4.2**, was a combination of the SWRP prioritization method, as well as new criteria that was deemed significant throughout GSI Workgroup meetings and discussions with City staff. All project locations were compared against this criteria to ultimately produce a prioritization of high, medium, and low priority project locations.

This section outlines each criterion (bulleted) and provides an explanation for why that criterion was selected. This information led to choosing the categories and allocated values presented in **Table 4.3** (for those with the green categories listed below).

Project Status

Planned CIP projects and bikeway projects included in the FY 2018 Adopted Capital Budget document received a higher priority than non-planned projects according to the FY 2018 Adopted Capital Budget. Since the CIP document identifies projects that are incorporated within the City's long-term budget, they received a higher priority than projects that do not yet have allocated funding.

Prioritization Criterion	Criterion Categories
Project Status	Planned in FY18 Adopted Capital Budget
	Not planned in FY18 Adopted Capital Budget

¹Key development areas are locations throughout the City that provide opportunities for comprehensive planning between mixed-use buildings, housing, transportation, and GSI. See Appendix C for more information.

Proximity to Proposed Bikeway Projects

Project locations that are adjacent to a proposed bikeway project according to the City's Bicycle and Pedestrian Transportation Plan (2012) received a higher priority than project locations that are not adjacent to any proposed bikeway projects. Since the Bicycle and Pedestrian Transportation Plan identifies projects with a higher likelihood of being implemented, there is a greater opportunity for coordinating projects with GSI measures on-site. Refer to Appendix A for a map of these proposed bikeway projects.

Prioritization Criterion	Criterion Categories
Proximity to Proposed Bikeway Projects	Adjacent to a proposed bikeway project
	Not adjacent to a proposed bikeway project

Parcel Area

Parcels that are greater than or equal to 0.25 acres received a higher priority than parcels that are less than 0.25 acres. Parcels that are at least 0.25 acres provide an opportunity for implementing a stormwater runoff capture or treatment project that can treat a larger drainage area, whereas parcels that are less than 0.25 acres are more limited to on-site projects.

Prioritization Criterion	Criterion Categories
Parcel Area	> 0.25 acres
	< 0.25 acres

Land Use (Current)

Parcels with a current land use dedicated to parking and transportation received the highest priority due to the large amounts of impervious cover associated with these land uses.

Parcels with a current land use dedicated to commercial use, public parks, office parks, SOFA I/ II-designations², and major institutions received the next highest priority. Parcels with commercial use, office parks, and major institutions³ typically include larger amounts of impervious surface on-site. SOFA I/II areas may not have as high amounts of impervious areas as parking lots; however, they can be ideal candidates for regional GSI projects that align with other community benefits. Public parks can be ideal candidates for larger GSI projects, such as stormwater retention on-site, due to the larger amounts of pervious surface accessible in parks.

Parcels with a land use dedicated to residential use, open space, public conservation land, or schools received the lowest priority. The MRP does not provide the City jurisdiction over the Palo Alto Unified Public School District (PAUSD), and as such, PAUSD is not required to comply with the GSI requirements under Provision C.3 of the MRP. However, voluntary or partnership GSI project opportunities exist at many PAUSD properties and will be explored in the future.

The open space and public conservation land areas within the City are considered a lower priority since most have a parcel slope greater than fifteen percent, which presents additional design challenges for GSI measures. Furthermore, these areas already provide, by design, natural processes that result in a reduction of stormwater runoff and pollutants. Residential spaces are also included in this lower priority category, since residential properties typically include smaller parcel areas with smaller drainage areas and contribute less pollutants than higher priority land uses.

Prioritization Criterion	Criterion Categories
Land Use (Current)	Parking lots and transportation
	Commercial, public parks, office parks, SOFA I/II, and major institutions
	Residential, open space, public conservation land, and schools

• Land Use (Historic)

Project locations that had an "industrial" land use designation in 1980, or project locations that were adjacent to a parcel that had an "industrial" land use designation in 1980, received a higher priority than non-industrial land uses from this 1980 time period, as past industrial uses have been linked to various pollutants that caused significant

²SOFA encompasses a nine block area located south of Forest Avenue. The City developed two SOFA Coordinated Area Plans—SOFA I and SOFA II—to define future land uses and guide development in this area.

³Major institutions are defined as governmental uses and lands that are either publicly-owned or operated as non-profit organizations.

impacts to the environment. These parcels are identified as "old industrial" in Appendix B. Since pollutant sampling data is not available on a widespread scale throughout the City, parcels with an industrial land use in 1980 serve as a proxy for potential pollutant indicators. Implementing GSI measures can assist with filtering out and treating any legacy pollutants that may have resulted from past industrial uses.

Parcels identified as "old urban" in Appendix B include parcels that depict urbanized areas in 1980. Parcels identified as "open space" in Appendix B include undeveloped land. These historic land uses are included in Appendix B, but they were not used for prioritization.

Prioritization Criterion	Criterion Categories
	"Industrial" in 1980
Land Use (Current)	Not "industrial" in 1980

Key Development Areas

For the purpose of prioritization in this Plan, key development areas were defined as existing commercial areas or area(s) in midst of planning efforts (i.e., North Ventura Coordinated Area Plan). Projects that are located within one of the key development areas throughout the City—California Ave. Priority Development Area, Downtown Business Improvement District, North Ventura Coordinated Area, and SOFA I/II areas received a higher priority than projects located outside one of these areas. Refer to Appendix C for a map of these areas.

Prioritization Criterion	Criterion Categories
Key Development Areas	Located within key development area
	Located outside of key development area

Localized Ponding

City staff identified areas of localized ponding during various GSI Workgroup and small meetings. Projects that are located within an area identified to have localized ponding following rain events (of no particular size) received a higher priority than projects located in an area without ponding. The former also tend to be in areas with a higher water table. Refer to Appendix D for a map of these areas.

Prioritization Criterion	Criterion Categories
Localized Ponding	Located within areas of localized ponding
	Located outside of areas of localized ponding

• Flood Zone Designation

Project locations that are outside of a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA), including Zones D and X, received a higher priority than areas located within an SFHA. FEMA defines a SFHA as the area where the National Flood Insurance Program's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Project locations within an SFHA that are further inland from the Bay, including Zones A, AO, and AH, received the second highest priority. Project locations that are within an SFHA and also alongside the Bay are more likely to have clay soils, which do not allow for infiltration or detention. As a result, project locations closer to the Bay received lower priority. Refer to Appendix D for a map of these areas.

FEMA defines each flood zone as the following:

- Zone X is an area between the limits of the 100-year and 500-year floods. According to FEMA, a 100-year flood is a flood event that has a 1 percent chance of being equaled or exceeded in any given year. A 500-year flood is a flood that has a 0.2 percent chance of being equaled or exceeded in any given year.
- o Zone D is a moderate risk flood area with possible but undetermined flood hazards.
- Zone A is a high risk flood area subject to inundation by the 1 percent annual chance flood event generally determined using approximate methodologies (i.e. no depths or base flood elevations are shown within these zones).
- Zone AO is a high risk flood area subject to inundation by the 1 percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average flood depths are between one and three feet.
- Zone AH is a high risk flood area subject to inundation by 1 percent annual chance shallow flooding (usually areas of ponding) where

average flood depths are between one and three feet.

- Zone VE is a high risk flood area subject to inundation by the 1 percent annual chance flood event with additional hazards due to storm-induced velocity wave action.
- Zone AE is a high risk flood area subject to inundation by the 1 percent annual chance flood event determined by detailed methods (i.e. base flood elevations are provided for these areas).

Prioritization Criterion	Criterion Categories
Flood Zone Designation	FEMA-designated Zones X and D
	FEMA-designated Zones A, AO, and AH
	FEMA-designated Zones VE and AE

• Trash Generation Designation

The City has four trash generation designations, including very high, high, moderate, and low. The MRP defines "very high" areas as areas that generate greater than 50 gallons/acre/year of trash; 'high" areas that generate 10-50 gallons/acre/year of trash; "moderate" areas that generate 5-10 gallons/acre/ year of trash; and "low" areas that generate less than 5 gallons/acre/year of trash. Refer to Appendix E for a map of these areas.

Project locations that are adjacent to parcels with a "very high" trash generation designation received the highest priority; project locations that are adjacent to parcels with a "low" trash generation designation received the lowest priority. Since certain GSI measures can act as trash capture devices if designed and maintained properly, prioritizing GSI in higher trash generation areas may assist with lowering the trash generation designation.

Prioritization Criterion	Criterion Categories
Trash Generation Designation	Very high
	High
	Moderate
	Low

• Proximity to Groundwater Plume Approximate Limits

Projects that are located at least 500 feet outside of a groundwater plume approximate limits received a higher priority than projects located on or within 500 feet of the groundwater plume approximate limits. Projects located within 500 feet of a groundwater plume approximate limits received lower priority, since project locations within these areas require additional design considerations for any proposed GSI measures in order to minimize impacts to the plume. Refer to Appendix F for a map of these areas.

Prioritization Criterion	Criterion Categories
Proximity to Groundwater Plume Approximate Limits	Located at least 500 feet outside of a groundwater plume approximate limits
	Located within a groundwater plume approximate limits

Co-location with Existing City-owned GSI Measures

Projects located within 500 feet of an existing City-owned GSI measure received a higher priority than projects located outside of a 500-foot buffer surrounding GSI measures based on the potential for increased stormwater retention in a connected area. Refer to Appendix G for a map of these Cityowned GSI measures.

Prioritization Criterion	Criterion Categories
Co-location with Existing City-owned GSI Measures	Located within 500 feet of an existing City-owned GSI measure
	Located more than 500 feet away from an existing City- owned GSI measure

Groundwater Recharge Area

Projects located within a groundwater recharge area under the jurisdiction of Valley Water and at least 500 feet away from a contaminated groundwater plume approximate limits received a higher priority than projects that did not meet both of these criteria due to the fact that the Valley Water's Groundwater Management Plan recognizes that stormwater management opportunities may act as a source of groundwater recharge.

Prioritization Criterion	Criterion Categories
Groundwater Recharge Area	Located within a designated groundwater recharge area <i>and</i> located at least 500 feet outside of a groundwater plume approximate limits
	Located outside of a designated groundwater recharge area

While many of these City-specific criteria (Step One) overlapped with the SWRP prioritization criteria, there were several SWRP metrics that were not included within the City prioritization (Step Two) due to the various reasons listed below:

Proximity to Geotracker Site

Staff utilized City-specific groundwater plume data in place of utilizing the State's GeoTracker data as used in the SWRP. Although both the SWRP and City-specific groundwater plume data were based off of Geotracker data, the staff analysis was more restrictive by prioritizing project locations that were more than 500 feet outside of a groundwater plume approximate limits. GeoTracker is the State's data management system utilized for sites that impact, or have the potential to impact, water quality in California, with an emphasis on groundwater.

Proximity to PCB Interest Area

City staff utilized historic industrial land use data as a proxy for PCB indicators, since PCBs sampling data is not available on a widespread scale throughout the City.

• Distance from Storm Drain

The SWRP analysis used a county-wide data set of storm drains that are 24 inches or more in diameter, and prioritized regional project opportunities that are located close to those storm drains. However, it is possible to divert water to smaller-scale GSI projects from storm drain pipes that are smaller than 24 inches. Thus, the City staff did not utilize distance from a 24inch storm drain as a prioritizing criterion.

• Drainage Area Estimate and Drainage Area Slope

After reviewing the FY 2018 Adopted Capital

Budget and other City plans, staff added several new projects to the prioritization list that were not initially included in the SWRP project list. Since these projects were added after the SWRP evaluation process, staff does not have drainage area data (including drainage area slope) to compare for all projects. To ensure consistency, the data was not used at all in the City's process.

Hydrologic Soil Group

According to the SWRP initial project prioritization, approximately 94 percent of the soil throughout the City and the County for the identified project locations consists of Hydrologic Soil Group C/D⁴. Due to the lack of heterogeneity, staff did not utilize Hydrologic Soil Group as a prioritizing factor.

Imperviousness Percent

City staff considered using percent imperviousness as a criterion. Although imperviousness data was not calculated for each parcel, general knowledge and mapping research were used to assess approximate imperviousness. Parcels with parking and transportation as a primary land use were prioritized as the highest priority based on the high amount of impervious cover for these parcels.

Parcel Slope

City staff did not prioritize projects on parcels greater than fifteen percent due to the additional design challenges associated with these parcel slopes. Parcels with less than fifteen percent slope were not prioritized differently compared to one another, since the exact parcel slope does not offer significant advantages as long as the slope is less than fifteen percent. However, staff may still consider project locations with slopes higher than fifteen percent in the future if other site considerations are optimal. Refer to Appendix H for a map of parcel slope greater than 15 percent throughout the City.

• Located in Disadvantaged Community Per the Bay Area Integrated Regional Water Management Plan, the City does not have any information regarding disadvantaged communities, defined by the California Department of Water Resources as communities

⁴Hydrologic soil groups are categorized based on their drainage properties, with Soil Group A representing the most well-drained soils and Soil Group D representing the least well-drained soils.

in which the median household income is less than 80% of the statewide average, in the City. As a result, staff did not consider this criterion in the City-specific prioritization.

Located in Community of Concern⁵
 None of the City projects identified in the SWRP were located in a Community of Concern. As a result, staff did not consider this criterion in the City-specific prioritization.

Parts C – E: Identified Prioritization Criteria Values

Once Watershed Protection staff determined the criteria and respective categories, staff

allocated points to each project location per criteria category based on what category a parcel fit into, as described above. For example, if the project location fit within higher-prioritized criteria category, that project location would be assigned the larger value. Staff reviewed each project location and assigned the appropriate value based on the project location characteristics. The criteria categories and assigned values used for these steps in the process are outlined **Table 4.3** in this Section.

Parts F – I: City Prioritization Results

After assigning the appropriate criteria values for each project location characteristic, staff totaled the values

Criteria	City- Specific	SWRP
Project Status	Х	
Proximity to Proposed Bikeway Projects	Х	
Parcel Area	Х	х
Land Use (Current)	Х	х
Land Use (Historic)	Х	
Key Development Areas	Х	
Localized Ponding	Х	
Flood Zone Designation	Х	х
Trash Generation Designation	Х	
Proximity to Groundwater Plume Approximate Limits	Х	
Co-location with Existing City-owned GSI	Х	
Groundwater Recharge Area	Х	
Proximity to Geotracker Site		х
Proximity to PCB Interest Area		х
Distance from Storm Drain		х
Drainage Area Estimate and Drainage Area Slope		х
Hydrologic Soil Group		х
Imperviousness Percent		х
Drainage Area Estimate		х
Parcel Slope		х
Located in Disadvantaged Community		х
Located in Community of Concern		х

TABLE 4.2: GSI PROJECT LOCATION PRIORITIZATION CRITERIA

⁵The Metropolitan Transportation Commission defines communities of concern as census tracts that have a concentration of both minority and low-income households, or that have a concentration of three or more of the following six factors but only if they have also have a concentration of low-income households: limited English proficiency, zero-vehicle household, seniors 75 and over, people with one or more disabilities, single-parent family, or severely rent-burdened household.

for each project location to determine one final value per project location. Once completed, staff calculated the following percentiles based on the distribution of the final values to designate priority levels:

- "High priority" project locations: 85th percentile or higher
- "Medium priority" project locations: 26th 84th percentiles
- "Low priority" project locations: 25th percentile or lower

"High priority" project locations include the project locations deemed to hold the most potential for installing GSI measures, based on a number of characteristics described in this Section. While these associated priorities will be beneficial in guiding efforts for assessing potential locations of GSI measures,

Prioritization Criteria	Criteria Category	Assigned Value
Drojost Status	Planned in FY18 Adopted Capital Budget	3
	Not planned in FY18 Adopted Capital Budget	1
Proximity to Proposed	Adjacent to a proposed bikeway project	3
Bikeway Projects	Not adjacent to a proposed bikeway project	1
Parcel Area	> 0.25 acres	3
	< 0.25 acres	1
	Parking lots and transportation	5
Land Use (Current)	Commercial, public parks, office parks, SOFA I/II, and major institutions	3
	Residential, open space, public conservation land, and schools	1
	"Industrial" in 1980	3
Land Use (Historic)	Not "industrial" in 1980	1
	Located within key development area	3
Key Development Areas	Located outside of key development area	1
Localized Ponding	Located within areas of localized ponding	3
	Located outside of areas of localized ponding	1
	FEMA-designated Zones D and X	5
Flood Zone Designation	FEMA-designated Zones A, AO, and A	3
	FEMA-designated Zones VE and AE	1
	Very high	3
Trash Generation Desig-	High	2
nation	Moderate	1
	Low	0
Proximity to Groundwater	Located at least 500 feet outside of a groundwater plume approximate limits	3
Plume Approximate Limits	Located within a groundwater plume approximate limits	1
Co-location with Existing	Located within 500 feet of an existing City-owned GSI measure	3
City-owned GSI Measures	Located more than 500 feet away from an existing City-owned GSI measure	1
Groundwater Recharge	Located within a designated groundwater recharge area <i>and</i> located at least 500 feet outside of a groundwater plume approximate limits	3
Area	Located outside of a designated groundwater recharge area	1

TABLE 4.3: PRIORITIZATION CRITERIA VALUES

the priorities are subject to change with the City's infrastructure and community needs. As such, the list of prioritized project locations will be reviewed annually per the City's approved yearly Capital Annual Budget, updates to other City Plans (Section 8) and to accommodate other changes, such as in funding or project status. The final prioritized project location list and associated maps are available in Appendices A – O. **Figure 4.1** is an overview of the prioritized project locations throughout the City.



FIGURE 4.1: City-Owned Properties and Proposed/Planned Projects Prioritized by Location⁶

⁶See Appendices A – O for additional maps and table of prioritized locations.

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IMPERVIOUS SURFACE TARGETS



5.1 BACKGROUND

The MRP requires the City to predict the levels of redevelopment and the associated green stormwater infrastructure (GSI) implementation¹ that will occur in the City by 2020, 2030, and 2040 on retrofitted² both City-owned and private properties. The following predictions are based on a high-level, data-based modeling scenario carried out by SCVURPPP, which conducted this work for all municipalities that participate in its program area (all Santa Clara County municipalities that discharge into the Bay). Predictions are based on data of past development, the City's Comprehensive Plan 2030 and direction from the Planning Department; however, estimating the future development market is complex and based on various assumptions and unknowns. Thus, these should only be used as indications of potential GSI implementation in the future. City staff will work to refine these preliminary estimates over time, as systems are put in place to better document redevelopment and the amount of associated GSI measures.

This approach includes two phases, both of which have been implemented and are described in this Section:

- Predicting the Anticipated Level of Future GSI Implementation via Redevelopment of Privateand City Parcels – A non-spatial analysis was conducted to predict future GSI implementation on City- and privately-owned parcels within the City's jurisdiction, based on the rate of redevelopment that has occurred over the past 10 years in the City of Palo Alto.³ This phase provides a prediction of the cumulative acres of land in 2020, 2030, and 2040 that are anticipated to be addressed via GSI measures installed on City and privately-owned parcels.
- 2) Identifying the Location of Future GSI Implementation and Developing Impervious Surface Retrofit Targets – Subsequent to Phase I, a spatial analysis was conducted to derive impervious surface targets for GSI retrofits associated with these parcels, as required by the MRP. Phase II provides a prediction of the land use

of the parcels that are anticipated to be addressed via GSI measures by 2020, 2030, and 2040.

5.2 PHASE 1 – PREDICTING THE ANTICIPATED LEVEL OF FUTURE GSI IMPLEMENTATION

The goal of this Phase was to identify levels of GSI implementation predicted to occur by 2020, 2030 and 2040 via the redevelopment of City- and privatelyowned parcels regulated by new and redevelopment requirements in Provision C.3 of the current MRP (described in Provision C.3). This Provision requires projects that create (i.e., new development) or replace (i.e., redevelopment) at least 10,000 square feet of impervious surfaces (e.g., roofs, parking lots and walkways) includes GSI, which treats runoff created on-site to protect water quality of local creeks and the Bay. Thus, large redevelopment projects result in additional GSI implementation over time.

For future redevelopment predictions, the 10year timeframe of 2009 to 2018 was used, as it is considered to be typical of future redevelopment (2019-2040 in the Bay Area). A total of 267 acres were redeveloped in the City during the 2009-2018 timeframe⁴, resulting in a rate of 26.7 acres per year. However, because of expected drops of future non-residential redevelopment in the City (per the Comprehensive Plan), staff chose to use a rate of 15.0 acres per year for this analysis (i.e., to estimate the amount of impervious surfaces created per the rate of future redevelopment). This rate (15 ac/yr.) was applied to the 2020, 2030, and 2040 milestones outlined in the MRP in order to estimate the amount of GSI that will be installed. These estimates assumed that the amount of installed GSI equaled that amount of acres being redeveloped (i.e., 15 acres being redeveloped = 15 acres of GSI being installed), as GSI is designed to treat the entire parcel at which it is located.

Although 267 acres were redeveloped in the City during 2009-2018, only 240 acres have been identified to have included GSI. Thus, 240 acres were used as a baseline (or "best" estimate) for the amount of GSI that is expected to have been installed

⁴Total area addressed by parcel-based redevelopment projects that included GSI (excludes green street projects).

¹For the purpose of this Section, GSI-associated redevelopment projects include those that are either privately or City-owned and parcel-based (i.e., no green streets, or GSI in the right-of-way, are included in the predictions). All predictions assume that all redevelopment projects would be regulated by new and redevelopment requirements in the current MRP (i.e., Provision C.3, which requires GSI (or stormwater treatment) for certain size projects).

²Retrofitted means land that does include GSI triggers MRP requirements when redeveloped and must install GSI to treat runoff created on-site at the time of redevelopment. ³All information on GSI measures and land area addressed by GSI in the Santa Clara Valley was accessed through the SCVURPPP GSI database, which is currently under development and will be accessible by City staff in late 2019.

Year	Low ¹ (ac)	Best ² (ac)	High³ (ac)
Existing GSI (installed 2009-December 31, 2018)	-	240	-
2020	255	270	285
2030	330	420	510
2040	405	570	735

¹Low estimate – projected from 50% of "Best Estimate";

²Best estimate – rate of redevelopment based on 10-year average (2009-2018); and

³High estimate – projected from 150% of "Best Estimate"

through the end of 2018. **Table 5.1** shows that 240 acres was used as a starting point to estimate the amount of GSI that will be redeveloped at each of the milestones mentioned. It provides the outputs of the analysis and represents the total acreage known to be addressed by GSI based on the baseline of 240 and applies the rate of 15 ac/yr. to estimate cumulative land area addressed by GSI in 2020 (270 acres), 2030 (420 acres), and 2040 (570 acres) on City and private parcels. Furthermore, the same rate is used to estimate both the "low" (i.e., 50% < "best") and "high" (i.e., 150% > "best") estimates to account for a range of potential redevelopment levels and account for uncertainty in the "best" estimate.

5.3 PHASE II – IDENTIFYING THE LOCATION OF FUTURE GSI IMPLEMENTATION AND DEVELOPING IMPERVIOUS SURFACE TARGETS

As previously mentioned, the MRP requires the City to develop (and include in its GSI Plan) targets for the amount of impervious surface in the City that will be retrofitted via GSI by 2020, 2030 and 2040. The estimated amounts of future GSI implementation developed via Phase I provides a starting point for addressing these needs. However, to develop impervious surface retrofit targets, the general types of land use that may be redeveloped were analyzed as different types of land uses are assumed to have varying ranges of associated percent imperviousness. Thus, estimating the general locations of redevelopment allowed an estimate of impervious targets by land use. The process and assumptions used to predict future locations of GSI implementation (i.e., the general locations of the 15.0 ac/yr.) are described in this Section, including the results of the analysis.

5.3.1 POTENTIAL FUTURE GSI IMPLEMENTATION Applicable Land Areas Subject to Future GSI Requirements

Additional City-owned and private parcels subject to MRP requirements to install GSI (due to 10,000 square feet or more of impervious surfaces) were considered to be conceptually available for redevelopment with GSI. Using land use data compiled and improved by SCVURPPP over the past 10 years, particular land uses that do not have to meet the MRP requirement; parcels with existing GSI; and those parcels that are planned to be or are being actively redeveloped were excluded from the analysis. The following categories were excluded from the impervious surface targets analysis:

- Already contains GSI (240 acres)
- Known (planned/active) redevelopment projects (38 acres)
- Residential (~4,060 acres)
- Open space and large pervious areas, such as parks and undeveloped urban areas⁵ (~7,380 acres)
- City schools (K-2), colleges and universities (~220 acres)
- Freeways/expressways (~195 acres)
- Roadways/streets (~325 acres)

⁵Undeveloped urban areas were excluded from the analysis of potential locations for GSI implementation because they are largely pervious and therefore do not fit the intent of the MRP requirement to develop and include targets for the amount of impervious surface that will be retrofitted.

- Railroads lines and stations (~50 acres)
- Utilities water/wastewater/electrical substations (~25 acres)
- Airports (~ 90 acres)
- Federal Veterans Affairs (VA) Hospital (~65 acres)

The remaining parcels that were not excluded are primarily commercial, industrial, retail, and highdensity residential land uses. The outcome is that there are approximately 880 additional parcels totaling 1,500 acres that were identified as areas subject to the MRP that may be redeveloped and have potential for GSI implementation by 2040.

Identifying which Parcels are likely to Undergo Redevelopment

Based on the redevelopment rates calculated in Phase I, a total of 300 acres of land within the City is anticipated to be redeveloped with GSI measures between 2020 and 2040 based on the "best" estimate (**Table 5.1**). Consequently, only a portion of the area available for redevelopment (1,500 ac) is predicted to actually redevelop by 2040 based on the rate of redevelopment used for the City in this analysis (15 ac/yr.).

To assist in identifying the subset of land areas available for redevelopment that have a higher probability of being redeveloped and addressed via GSI measures by 2040, information on the characteristics of land areas recently redeveloped in the Santa Clara Valley were used to develop a model for predicting redevelopment potential. Although it is not possible to precisely determine the exact locations where GSI will be implemented in the future, predicted locations are needed to establish impervious surface retrofit targets required by the MRP.

To develop the predictive model, the following factors/ characteristics of parcels redeveloped in the Santa Clara Valley between 2002 and 2017⁶ were evaluated to determine if they should be considered when predicting future GSI implementation:

- 1. Date of initial development or previous redevelopment
- 2. Existing land use type
- 3. Size of parcel

4. Proximity to other/prior redevelopment areas Data from 2002-2017 for all of Santa Clara County was used when evaluating these factors to increase the size of the dataset. Factors determined to be most important in predicting locations of future GSI implementation in Santa Clara Valley are shown in **Table 5.2**, A "randomization" factor was also included in the process to identify parcels that will likely redevelop by 2040. Adding a randomization factor adjusted for inappropriate skewing of predicted redevelopment towards large industrial parcels.

CLARA VALLET		
Characteristic	Weighting Factors	Justification
Age of Previous Development/ Redevelopment	0 to 1	Parcels built in the 1990s are projected to redevelop at a lower rate than parcels developed prior to this date. Parcels built after 2000 are not projected to redevelop between 2020 and 2040.
Land Use	0.43 to 0.76	Parcels with certain land uses are redeveloping at higher rates, compared to others. The weighting factor for each land use was adjusted such that the parcels selected for redevelopment are in the same proportion to those previously redeveloped between 2002 and 2017.
Parcel Size	0 to 1	Between 2002 and 2017, larger parcels have redeveloped at a higher rate than smaller parcels.

TABLE 5.2: SUMMARY OF WEIGHTING FACTORS FOR EACH CHARACTERISTIC IDENTIFIED AS ANIMPORTANT VARIABLE TO PREDICT THE LOCATION OF FUTURE GSI IMPLEMENTATION IN SANTACLARA VALLEY

⁶Because the Santa Clara redevelopment data evaluation was completed before 2018 redevelopment data were available, the evaluation was completed using data from the 2002 and 2017 timeframe.

5.3.2 LOCATION AND TIMING OF FUTURE GSI IMPLEMENTATION

Using the current land uses of the predicted locations of GSI implementation developed via the redevelopment model described in Section **5.3.1** and associated impervious surface percentage coefficients for each land use type, estimates of the amount of impervious surface that could be retrofitted with GSI on City- and privately-owned parcels were developed. **Table 5.3** lists the impervious surface percentage for each land use class, based on impervious surface coefficients typically utilized, and the estimated impervious surfaces for City and private parcel-based projects that are predicted to be retrofitted by 2020, 2030 and 2040 in the City via new GSI implementation. These predictions should be considered first-order estimates and are subject to revision as information improves over time. Estimates of impervious surface retrofits due to future GSI projects conducted in the City right-of-way will also be added in the future.

TABLE 5.3: ACTUAL (2002-2018) AND PREDICTED (2019-2040) EXTENT OF IMPERVIOUS SURFACE RETROFITSVIA GSI IMPLEMENTATION ON CITY- AND PRIVATELY-OWNED PARCELS BY 2020, 2030, AND 2040.

		Retrofits via GSI Implementation									
Land Use	% of Area Imperviousª	2002-18		2019-2020		2021-2030		2031-2040		Total (2002-2040)	
		Total Area (acres)	Impervious Area (acres)	Total Area (acres)º	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)	Total Area (acres)	Impervious Area (acres)
Commercial	83%	113	94	9	7	73	60	96	80	290	241
Industrial	91%	34	31	4	4	61	56	15	14	115	105
K-12 Private Schools	67%	2	2	0	0	6	4	10	6	18	12
Residential - High Density	82%	30	24	0	0	14	11	5	4	49	40
Residential - Low Density	47%	20	10	0	0	3	2	0	0	24	11
Retail	96%	20	19	2	2	4	4	21	20	47	45
Urban Parks	20%	18	4	0	0	1	0	1	0	20	4
Open Space ^ь	1%	3	0	0	0	2	0	1	0	6	0
	Totals	240	183	16	14	164	137	149	124		
	Cumulative ^d	240	183	256	197	420	334	569	458	569	458

^aSource: Existing Land Use in 2005: Data for Bay Area Counties, Association of Bay Area Governments (ABAG), January 2006

^bDevelopment totals from 2002-2018 may include new development of open space and vacant properties.

^cThe total area for 2019-2020 is based on measures that are currently under construction or planned to occur prior to 2020 and not the Phase I redevelopment rate and may therefore deviate from the "Best" acres presented for 2020 in Table 5.1.

^dTotals in this table differ slightly from predictions presented in Table 5.1 due to the inclusion of entire parcels in this table, as opposed to more generic "land areas" projections presented in Table 1.

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PROJECT TRACKING SYSTEM



As part of implementing the GSI Plan, the City must establish a process for tracking and mapping completed public and private projects, as well as making the information available to the public. The City will also provide data to SCVURPPP for countywide tracking of completed public and private GSI projects. These tracking systems are described in more detail in this Section.

6.1 CITY-WIDE PROJECT TRACKING SYSTEM

The City currently utilizes an internal tracking system to manage stormwater program inspections and enforcement actions. In calendar year 2019, the City will update its internal tracking system to a cloudbased stormwater compliance software, which will allow the City to manage a comprehensive database of GSI and other stormwater treatment measures. This new, map-based, software will allow staff to complete inspection reports in real-time in the field; sync inspection sites with GIS data for accurate location data and additional knowledge of sites; integrate with planning and asset management systems within the City (including Accela and Maintenance Connection); schedule inspections and automatic follow-up actions; and have access to more comprehensive metrics. Moreover, the City will have the ability to export relevant data to be uploaded into the county-wide project tracking system, described in Section 6.2.

6.2 COUNTY-WIDE PROJECT TRACKING SYSTEM

SCVURPPP developed a centralized, web-based data management system, with a connection to GIS platforms for tracking and mapping all GSI projects in the Santa Clara Valley. The County Database provides a centralized, accessible platform for municipal staff to efficiently and securely collect, upload, and store GSI project data, and enhances SCVURPPP's ability to efficiently and accurately calculate and report water quality benefits associated with GSI projects. It also allows portions of the GSI project information to be made publicly available.

6.2.1 DATA COLLECTION PROCESS

The primary GSI data collection process is implemented at the City level. City staff will collect and manage information on GSI projects using the data management systems described in Section 6.1. City staff will then directly enter project data into the County Database through a web-based data entry portal for individual projects or upload data for multiple projects in batch using standardized formats with its new stormwater software.

6.2.2 DATA OUTPUT

The County Database has the capability to output information required for regulatory annual reports as well as data needed to calculate pollutant loads reduced, runoff volume reductions, and impervious area reduced. Maps displaying project locations and other related attributes such as pollutant generation, watershed boundaries, and water bodies can also be produced.



GUIDELINES AND SPECIFICATIONS



The MRP requires that the Plan include general design and construction guidelines, and standard specifications and details (or references to those documents) for incorporating GSI components into projects within the City. These guidelines and specifications should address the potential different street and project types, as defined by 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.

The City, along with other SCVURPPP agencies, helped fund and provided input to the development of county-wide guidelines by SCVURPPP to address the MRP requirements and guide the implementation of GSI Plans. The resulting SCVURPPP GSI Handbook¹ (Handbook) is a comprehensive guide to planning and implementation of GSI projects in public streetscapes, parking lots and parks. The City intends to use this Handbook as a reference when creating City-specific guidelines and specifications to meet the needs of the various departments. The contents of the Handbook are described in the following Sections.

7.1 DESIGN GUIDELINES

Part 1 of the Handbook provides guidance on selection, integration, prioritization, sizing, construction, and maintenance of GSI measures. It includes sections describing the various types of GSI, their benefits, and design considerations; how to incorporate GSI with other uses of the public right-ofway, such as bicycle and pedestrian infrastructure and parking; and guidelines on utility coordination and landscape design for GSI. In addition, the Handbook also provides guidance on post-construction maintenance practices and design of GSI to facilitate maintenance.

Part 1 also contains a section on proper sizing of GSI measures. Where possible, GSI measures should be designed to meet the same sizing requirements as Regulated Projects, or those projects required to have GSI per MRP Provision C.3. In general, the treatment measure design standard is capture and treatment of 80 percent of the annual runoff (i.e., capture and treatment of the small, frequent storm events). However, if a GSI measure cannot be designed to meet this design standard due to constraints in the public right-of-way or other factors, the City may still wish to construct the measure to provide some runoff reduction and water quality improvement and achieve other benefits (e.g., decreasing street widths and pedestrian crossing distances). For these situations, the Handbook describes regional guidance on alternative design approaches developed by BASMAA for use by MRP permittees².

7.2 DETAILS AND SPECIFICATIONS

Part 2 of the Handbook contains typical engineering details and specifications that have been compiled from various sources within California and the U.S. and modified for use in Santa Clara County (see **Figure 7.1** for an example detail). The Handbook includes details for pervious pavement, stormwater planters, stormwater curb extensions, bioretention in parking lots, infiltration measures, and stormwater tree wells, as well as associated components such as edge controls, inlets, outlets, and underdrains. It also provides typical design details for GSI measures in the public right-of-way that address utility protection measures and consideration of other infrastructure in that space.

7.3 INCORPORATION OF TYPICAL GSI DETAILS AND SPECIFICATIONS INTO CITY STANDARDS

The City's engineering standards for both the Departments of Public Works and Utilities were reviewed as part of developing a process and recommendations for incorporation of the GSI details and specifications from the Handbook into the City standards. The standards include definitions and technical specifications for elements (such as sidewalks and curb and gutters) that may affect the implementation of GSI in the City. Consequently, the City will need to create its own GSI specifications (based on those recommended by SCVURPPP) that incorporate requirements from these City departments as well as others.

¹The SCVURPPP GSI Handbook is available online at http://scvurppp.org/scvurppp_2018/swrp/resource-library/. ²BASMAA, 2018. Guidance for Sizing Green Infrastructure Facilities in Street Projects.





7.4 INPUT FROM CITY OF PALO ALTO STAFF

Two meetings were held with staff from different City departments in October 2018 to obtain additional feedback regarding City-specific GSI guidelines and standards for both public and private projects. The meeting goals included the following:

- Provide information on GSI, the City's GSI Plan, and available resources.
- Review examples of SCVURPPP typical GSI details and compare them to the City's existing details.
- Obtain input regarding a process for incorporating the GSI details and specifications into City departmental standards, such as for Public Works and Utilities.

• Use input to inform a Scope of Work to contract a consultant to create City-specific GSI specifications.

The following is a summary of the input received from City staff during the two meetings in October:

- Develop an index of standard conditions for GSI measures based on staff input.
- Outline a process for integrating GSI into public rights-of-way, with a focus on smaller transportation projects.
- Review and, if needed, improve the plan review process for GSI projects in the public right-of-way. Ensure that all projects in the right-of-way are reviewed by the Utilities Department and other departments as needed.
- Ensure that the design team for GSI projects

³Typical Details for Site-Specific Design Specifications and Design Guidelines (SFPUC): https://www.sfwater.org/Modules/ShowDocument.aspx?documentID=9101.

has experience with the construction and implementation of GSI projects.

- Develop a flow chart to evaluate the feasibility of a potential project in the right-of-way based on field conditions and the presence of utilities.
- Include funds for utility relocation in a GSI project's budget.
- Document lessons learned from both completed GSI projects in the City, and effective details and specifications utilized throughout those completed projects.
- Include maintenance and its associated funding as a significant consideration for integrating GSI in City projects. These considerations should include maintenance issues, such as evaluating the effort required for maintaining plant types and removing stains on permeable pavers.
- Evaluate and integrate differing edge conditions, such as curbs, into the standard drawings.

- Integrate GSI considerations into the Underground Service Alert (USA dig alert) protocols.
- Ensure as-builts of utility locations are available to all departments and GSI designers. Integrate utility standards within GSI standards.
- Include all departments in the development of GSI standards within City standards.

The information collected during these workshops will inform the City's Scope of Work to contract a consultant that will assist the City in creating Cityspecific guidelines and specifications following the acceptance of the Plan. These will not only meet MRP requirements, but will also allow public and private GSI projects to be designed and constructed consistently. Consequently, the projects will be able to be monitored, maintained and inspected using standardized protocols to ensure long-term effectiveness.



INTEGRATION WITH CITY PLANS AND DOCUMENTS



8.1 REGULATORY REQUIREMENTS

To ensure effective implementation of the Plan, the City's planning documents and policies should include adequate wording to align with the Plan and ensure integration per the City's vision with respect to GSI. The MRP states that the GSI Plan "shall contain" various elements, including integration per the wording below. Consequently, various City planning documents across Departments were evaluated to determine to what extent they were aligned with the Plan.

- "(h) A summary of the planning documents the Permittee has updated or otherwise modified to appropriately incorporate green infrastructure requirements, such as: General Plans, Specific Plans, Complete Streets Plans, Active Transportation Plans, Storm Drain Master Plans, Pavement Work Plans, Urban Forestry Plans, Flood Control or Flood Management Plans, and other plans that may affect the future alignment, configuration, or design of impervious surfaces, including, but not limited to, streets, alleys, parking lots, sidewalks, plazas, roofs, and drainage infrastructure. Permittees are expected to complete these modifications as a part of completing the Green Infrastructure Plan, and by not later than the end of the permit term.
- (i) To the extent not addressed above, a work plan identifying how the Permittee will ensure that green infrastructure and low impact development measures are appropriately included in future plans (e.g., new or amended versions of the kinds of plans listed above)."

8.2 CITY PLANNING DOCUMENTS

Several City planning documents address different elements related to GSI, including land use, transportation, sustainability, conservation, urban forestry, environmental leadership, infrastructure, and housing. A thorough review of the planning documents found that none prevent the implementation of GSI projects within the City. Moreover, some planning documents already contain language to support the GSI Plan. However, various plans need to be better aligned with the GSI Plan to require the integration of GSI and use of the various tools, specifications and guidelines addressed in this Plan and through subsequent implementation.

8.3 SPECIAL PLANNING AREAS AND SPECIFIC PLANS

Specific plans (as well as comprehensive area and master plans) are valuable tools for coordinating multiple planning, design, infrastructure, utilities and GSI elements. This type of approach optimizes shared amenities, efficient use of resources and ensures that various planning goals can be met at a workable scale. Watershed Protection staff is currently participating in both the development of the City's North Ventura Coordinated Area Plan and the co-design by both the City and PAUSD of the Cubberley Master Plan in order to integrate GSI and LID approaches throughout the planning areas. Watershed Protection will continue to be actively involved in these type of efforts, such as the upcoming Downtown Coordinated Area Plan, to ensure adequate integration with the GSI Plan vision.

8.4 FUTURE INTEGRATION OF GSI LANGUAGE

Table 8.1 lists all City plans that were reviewed for GSI integration as well as documents currently in development. It also provides a general timeline regarding updates to improve integration with this Plan. Additional details regarding the extent of GSI language already included within each plan are provided in Appendix P.

Per the MRP, language supporting GSI will need to be added to these plans during their next update. Watershed Protection staff will support the City's plan development process when revising or updating existing planning documents or when developing new planning documents in order to ensure that GSI requirements and policies are incorporated. The implementation process described in Section 14.0 will help ensure this requirement is met.

8.5 REGIONAL PLANS

The City is also working with SCVURPPP, Valley Water, and other agencies to integrate and coordinate several large-scale planning efforts related to stormwater management and GSI throughout the Bay Area, including the following:

• Santa Clara Basin Stormwater Resource Plan (SWRP) – A collaboration between SCVURPPP and Valley Water during 2017-2018, the SWRP supported municipal GSI Plans by identifying and prioritizing potential multi-benefit GSI opportunities on a

TABLE 8.1: CITY PLANS/POLICIES AND STATUS OF GSI INTEGRATION

Title	Last Approved/ Updated	Projected Update	Includes Language to Support GSI					
PLANS/POLICIES IN PLACE								
Bicycle and Pedestrian Transportation Plan	July 2012	Unknown	Yes					
City Parks Sustainability Review	2014-2015	Unknown	Yes					
Comprehensive Plan 2030	June 2017	Unknown	Yes					
Department of Public Works Strategic Plan (2016-18)	December 2015	Unknown	Yes					
Parks, Trails, Natural Open Space and Recreation Master Plan	September 2017	Unknown	Yes					
Sea Level Rise Adaptation Policy	March 2019	N/A (to be followed by Implementation Plan)	Yes					
Sewer System Management Plan	November 2017	Fall 2019	No					
Storm Drain Master Plan	June 2015	Unknown	Yes, but needs expansion					
Sustainability and Climate Action Plan	November 2016	2020	Yes					
Sustainability Implementation Plan	December 2017	2020	Yes					
Urban Forest Master Plan	May 2015	2020	Yes					
Urban Water Management Plan	June 2016	2021 (estimate)	No					
	PLANS IN PROGRES	55	'					
Baylands Comprehensive Conservation Plan (BCCP)	Not yet adopted; estimated fall 2019	In Progress	To be included					
Cubberley Community Center Co-Design Master Plan	Not yet adopted; estimated summer 2019	N/A (New effort)	To be included					
North Ventura Coordinated Area Plan	Not yet adopted; estimated summer 2020	N/A (New effort)	To be included					
Sea Level Rise Implementation Plan	Not yet adopted; estimated summer 2020	N/A (New effort)	To be included					
Tree and Landscape Technical Manual	Not yet adopted; estimated Fall 2019	In Progress	To be included					

high level for both parcels owned by the various municipalities and street rights-of-way throughout the Basin (i.e., Santa Clara Valley). Inclusion of these potential project locations in the SWRP projects allows them to be eligible for State bond-funded implementation grants. The SWRP includes a list of prioritized GSI opportunity locations for each SCVURPPP agency, including the City of Palo Alto. The GSI Plan builds on the SWRP output to further identify, evaluate, and prioritize potential opportunities, while developing the comprehensive long-term GSI implementation roadmap for the City.

 Reasonable Assurance Analysis (RAA) – To meet MRP requirements, SCVURPPP initiated a countywide effort to develop an RAA to estimate baseline PCB and mercury loads in stormwater discharges to the Bay from its member agencies' jurisdictions, determine load reductions to meet assigned load allocations, and set goals for the amount of GSI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GSI. The RAA is planned for completion by September 2020, and some results from the efforts to date have informed this GSI Plan.

- One Water Plan Valley Water's Watershed Division is leading an effort to develop an Integrated Water Resources Master Plan to identify, prioritize, and implement activities at a watershed scale to maximize established water supply, flood protection, and environmental stewardship goals and objectives. The One Water Plan establishes a framework for long-term management of Santa Clara County water resources, which eventually will be used to plan and prioritize projects that maximize multiple benefits. The One Water Plan incorporates knowledge from past planning efforts, builds on existing and current related planning efforts; and coordinates with relevant internal and external programs. The One Water Plan has five goals:
- "Valued and Respected Rain" Manage rainwater to improve flood protection, water supply, and ecosystem health.
- o "Healthful and Reliable Water" Enhance the quantity and quality of water to support beneficial uses.
- "Ecologically Sustainable Streams and Watersheds" – Protect, enhance and sustain healthy and resilient stream ecosystems.
- o "Resilient Baylands" Protect, enhance and

sustain healthy and resilient Baylands ecosystems and infrastructure.

 "Community Collaboration" – Work in partnership with an engaged community to champion wise decisions on water resources.

Tier 1 of the effort, for which a draft plan was completed in 2016, is a county-wide overview of major resources and key issues along with identified goals and objectives. Tier 2 (2016 to 2020) will include greater detail on each of the County's five major watersheds. Efforts related to the Coyote Watershed are in progress.

• The Bay Area's Integrated Regional Water Management Plan (IRWMP) – The Bay Area IRWMP is a comprehensive water resources plan for the Bay region that addresses 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. It provides a venue for regional collaboration and serves as a platform to secure state and federal funding. 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 Santa Clara Basin SWRP was submitted to the Bay Area IRWMP Coordinating Committee and incorporated into the IRWMP as an addendum. As SWRP projects are proposed for grant funding, they will be added to the IRWMP list using established procedures.



EVALUATION OF FUNDING OPTIONS



The total cost of GSI includes costs for planning, capital (design, engineering, construction) and ongoing expenditures, including operations and maintenance (O&M), utility relocation, and measure replacement. It is likely that no single source of revenue will be adequate to fund implementation of GSI, and a portfolio of funding sources will be needed. There are a variety of approaches available to help fund up-front and long-term investments. This Section discusses the City's current stormwater management funding sources as well as a list of potential future options to complement the current funding. This list is a starting point, while Watershed Protection staff develops a thorough funding strategy to implement this Plan.

9.1 CURRENT STORMWATER MANAGEMENT FEE FUNDING

In April 2017, City of Palo Alto property owners demonstrated their high level of commitment to stormwater issues by voting to approve the continuation of a new Stormwater (known as Storm Water when passed) Management Fee (SWMF), which became effective June 1, 2017. The SWMF funds routine stormwater system maintenance and operation that helps keep the City's stormwater infrastructure at peak performance and provides for stormwater system improvements that prevent street flooding. Moreover, the SWMF also provides approximately seven percent (\$505,000 for fiscal year 2019¹) annually for GSI projects and "innovative" type projects, such as the City's residential and commercial incentive rebates for installing GSI measures such as cisterns, rain barrels, and pervious paving. The fee also funds stormwater pollution prevention programs and other projects necessary to meet MRP requirements. In FY 19-20, GSI funds will be used to help fund the construction of GSI measures as part of City projects and obtaining consultant support to complete additional items determined necessary to implement the GSI Plan. Funding from the SWMF can help jumpstart GSI projects, and, more importantly, leverage funding sought from granting agencies and foundations. Figure 9.1 outlines how the fee is allocated annually by percentage.



FIGURE 9.1: STORMWATER MANAGEMENT FEE ALLOCATIONS (FISCAL YEAR 2019)

¹Fiscal year 2019 lasts from July 1, 2018-June 30, 2019. Note that the Fee is adjusted for inflation annually, with each increase approved by City Council.

9.2 EVALUATION OF ADDITIONAL FUNDING OPTIONS

As required by the MRP, the City conducted an evaluation of potential private and public funding options for design, construction, and long-term maintenance of prioritized GSI projects. Sources of information used as references for the City's evaluation of funding options included:

- SCVURPPP's GSI Funding Options Guidance (2018);
- San Mateo City/County Association of Governments' Potential Funding Source Analysis and Recommendations (2014); and
- California Stormwater Quality Association's Stormwater Funding Barriers and Opportunities (2017).

This Section provides a brief description of the different funding options evaluated by the City as part of preparing the Plan. Note that these options are not presented in an order of priority or importance.

9.2.1 ALTERNATIVE COMPLIANCE

Alternative compliance allows a developer flexibility to build or contribute financially to an off-site stormwater treatment system when unable to meet stormwater treatment requirements or when it is more beneficial for water quality to provide stormwater treatment or flow controls off-site. Provision C.3.e.i of the MRP allows the following alternative compliance options:

- Construction of a joint stormwater treatment facility that treats combined runoff from two or more Regulated Projects;
- Construction of a stormwater treatment system offsite (on public or other private property) that treats an equivalent amount of impervious surface and provides a net environmental benefit;
- Payment of an in-lieu fee (for capital and O&M expenses) for a Regional Project or municipal stormwater treatment facility on other public or private property.

Another type of alternative compliance program is a credit trading program. Credits are created by one property owner and traded with other property owners. The program is typically managed by a government agency and can create incentives to treat stormwater in excess of the permit requirements on regulated sites, while also creating incentives to install systems that treat stormwater on non-regulated sites. The current MRP does not specifically mention credit trading programs, but such a program could be developed in consultation with the Regional Water Board as a form of alternative compliance.

Each alternative compliance option creates obligations for City staff in addition to benefits and drawbacks for the City and developer. In addition, some of the options may require updates to an agency's municipal code in order to implement them.

The City currently allows alternative compliance approaches within its jurisdiction but like most other Bay Area agencies, it does not have an established in-lieu fee or credit trading program. The City will consider these approaches in the future as they become more widely used and accepted and as local models for in-lieu fee and credit trading programs become available.

9.2.2 BALLOTED APPROACHES

As a result of the passage of Proposition 218 in 1996, the California Constitution requires voter or property-owner approval to levy new taxes or fees for stormwater management. Parcel taxes, propertyrelated fees, general obligation bonds and other special taxes are the basic types of balloted measures appropriate for stormwater funding. Other types of balloted measures include Infrastructure Financing Districts (requires 2/3 vote of affected properties) and motor vehicle license fees (now considered a tax requiring a 2/3 vote). Since the City already has the SWMF, a property-related fee established via a Proposition 218 process, it does not intend to pursue any other types of balloted approaches at this time.

9.2.3 BENEFIT ASSESSMENT AND COMMUNITY FACILITIES DISTRICTS

Local governments can levy benefit assessments on property owners to pay for public improvements and services that specifically benefit their properties. The amount of the assessment is directly related to the amount of benefit the property receives. For example, all property owners in a watershed could be assessed to fund stormwater runoff management programs that provide direct benefit to properties within that watershed. Assessments are not taxes or fees, and must be approved by a weighted majority of the affected property owners that cast votes.

Many municipalities currently have localized special tax and assessment districts that fund the maintenance and operations of various types of local infrastructure, including Community Facilities Districts (CFDs), "Mello-Roos Districts," and Landscaping and Lighting Assessment Districts. CFDs may be appropriate for capital-intensive spending in a relatively small area, such as "green street" development.

Both CFDs and benefit assessments are very effective and manageable, but are primarily a tool for new development and are commonly used for larger residential developments throughout California. Most importantly, they are routinely established during the residential development phase, while the developer owns all the property, because establishment is more politically challenging (requiring a balloting of all impacted property owners) after the homes have been sold.

The viability of these funding mechanisms depends on the level of remaining potential development or redevelopment in the City. However, parcels in CFDs and Benefit Assessment Districts need not be contiguous. In other words, the municipality can create revenue districts and require new development to be annexed into the districts as a condition of development.

Benefit Assessment Districts and CFDs are typically used to pay for the annual O&M of something that benefits the paying property, like a local GSI installation. Care should be taken to clearly differentiate between what activities are funded by the CFD levy and a property-related fee/tax, so that both can be collected from the impacted property. CFDs are generally preferred over benefit assessments, because they provide slightly broader flexibility in use and are slightly less expensive to annually administer.

The City may consider a benefit assessment or community facility district in the North Ventura neighborhood or other area of major redevelopment as a potential mechanism for funding GSI construction and/or maintenance.

9.2.4 BUSINESS IMPROVEMENT DISTRICTS

A Business Improvement District (BID) is a mechanism in which businesses and property owners tax themselves and manage the funds to build or maintain certain assets. The BID can be set up and administered by the community members or a local agency. The City current administers a BID in downtown Palo Alto (managed by the Palo Alto Downtown Business and Professional Association) and assesses an annual fee paid by all businesses within the District. The fee varies based on the type, location, and type of business. The City will consider whether there are any areas within its jurisdiction in which a BID supporting GSI would be appropriate.

9.2.5 DEVELOPMENT IMPACT FEES

A municipality may enact a development impact fee that is paid by an applicant seeking approval of a development project. This type of fee is used to defray all or a portion of the cost of public facilities related to the development project. Under state law, a development impact fee is not a tax or special assessment, and therefore is not subject to voter approval. However, municipalities must carefully prepare and enact a development impact fee program to ensure it meets the requirements in California Government Code §§ 66000-66025 (the Mitigation Fee Act). The City considers implementing development impact fees to be a potential source of funding for GSI capital projects.

In lieu of an impact fee, the City may consider requiring developers to install GSI measures in the public right-of-way adjacent to development or redevelopment projects as part of project conditions of approval. For example, if a redevelopment project necessitates improvements to the sidewalk or curb and gutter along its street frontage, this may create an opportunity for integration of GSI along the frontage, in addition to the on-site stormwater treatment the project would be required. In this example, the City could explore partnering options for maintenance as well.

9.2.6 GRANTS

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

- California Water Resources Control Board Proposition 1 Stormwater Implementation Grant Program²;
- US EPA: Bay Water Quality Improvement Fund;
- California Department of Water Resources: Integrated Regional Water Management Program Implementation Grants;
- California State Parks: Land & Water Conservation Fund and Rails-to-Trails Programs;

²As 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. The Santa Clara Basin SWRP contains a list of prioritized potential parcels and street segments within the City that would be eligible for funding.
- California Department of Forestry and Fire Protection: Urban and Community Program;
- Strategic Growth Council: Urban Greening Program;
- California Office of Emergency Services 404 Hazard Mitigation Grant Program;
- Caltrans Cooperative Implementation Agreements or Grants Program;
- One Bay Area Grant Program (transportation projects).

The City has sometimes used grants as a source of funding and will consider applying for grants to help fund GSI projects in the future. Furthermore, private grant programs will also be explored.

9.2.7 INTEGRATION WITH TRANSPORTATION PROJECTS

The complete streets and green streets movements have brought more attention to incorporating environmental mitigation elements, such as GSI, into traditional transportation projects. The resulting multi-benefit projects demonstrate how transportation funding can be leveraged to satisfy stormwater goals cost-effectively. Typically, there are three approaches to integrating GSI funding into transportation projects:

- Opportunistic: Piggy-backing onto transportation grants, or looking for particular sources of transportation funding (e.g., the State Transportation Improvement Program – Transportation Enhancement) that are allowed to be used for both streetscape or bike/pedestrian improvements and stormwater treatment.
- 2. Planning and Budgeting: Coordinating with the various City departments that are involved with long-range planning and/or the development of CIP projects that are transportation-related and evaluating ways to allocate additional funding for GSI elements.
- 3. Grant-related: Coordinating grants from multiple sources for a single GSI/transportation project.

The City has used some of these approaches in the past and is continuing to look for opportunities to incorporate GSI into transportation projects and leverage transportation funding.

The City has a City-wide Transportation Impact Fee (TIF) that is assessed against a development project that will have traffic impacts on the City. The amount of the fee is designed to recover some of the costs to the City of mitigating that impact, usually through investment in capital projects. The TIF is designed to recover approximately 4-5 percent of the costs associated with relieving traffic congestion from new development through 2025. Transportation-related CIP projects partially funded by these fees may incorporate GSI in the future.

9.2.8 LONG-TERM DEBT INSTRUMENTS

While long-term debt financing is not an additional source of revenue, it is a way for local agencies to obtain funding to jumpstart projects. This approach provides a large injection of capital, which can greatly accelerate public right-of-way improvements such as GSI implementation and storm drain pipeline rehabilitation. General Obligation (GO) Bonds and Certificates of Participation (COPs) are popular methods of funding physical improvements intended to last longer than the repayment period. These mechanisms have low interest repayment rates but incur administrative costs. COPs are not secured and do not need voter approval.

The California Clean Water State Revolving Fund (CWSRF) is one option for long-term debt financing at low interest rates. The debt can be secured by various revenue sources including parcel and other special taxes, fees and assessments. Since its inception in 1989, the CWSRF has provided below-market rate financing for the construction of wastewater treatment and water recycling facilities and other types of pollution control solutions. Eligible projects now include the planning, design, and/or construction of publicly-owned stormwater capture and treatment facilities. The CWSRF also has principal forgiveness loans available for "Green Project Reserve" (GPR) projects that address water or energy efficiency, mitigate stormwater runoff, or encourage sustainable project planning, design, and construction (including GSI projects). The GPR program has a principal forgiveness of 50 percent of actual GPR eligible costs or 75 percent of GPR eligible planning costs, with a maximum loan forgiveness amount of \$4.0 million.

The City has used CWSRF financing for past wastewater and recycled water projects and will consider this mechanism for GSI projects.

9.2.9 PUBLIC-PRIVATE PARTNERSHIPS (P3s)

P3s have the potential to help communities optimize their limited resources through agreements with private parties to help build and maintain their public infrastructure. P3s have successfully designed, built, and maintained many types of public infrastructure such as roads and drinking water and wastewater utilities across the U.S. Only recently have agencies begun to explore the use of P3s specifically for stormwater management or to meet Clean Water Act requirements.

In California, P3-enabling legislation was enacted by the state in 2007, and since then, several agencies have used P3s for public infrastructure projects, such as Caltrans with the Presidio Parkway (Doyle Drive) approach to the Golden Gate Bridge in San Francisco and the State of California judicial system with a courthouse in Long Beach.³ However, todate, there does not appear to be any P3s that have been developed in the state for the explicit purpose of implementing GSI, possibly because few agencies have stormwater fees that can be leveraged in a P3 program. The City has such a fee and may be able to consider the P3 model for funding a major GSI project.

9.2.10 REALIGNMENT OF MUNICIPAL SERVICES

"Realignment" of stormwater program services to other, more readily-funded services such as water, sewer and refuse collection is a means of leveraging existing resources within the constraints of Proposition 218. Under Proposition 218, water, sewer and refuse collection fees are exempt from the voter approval requirement. A number of public agencies in California have identified stormwater program elements that may legally qualify for inclusion in the water, wastewater or refuse collection categories and have established new or increased fees, and/ or re-negotiated existing franchise agreements for such services. An agency should only realign services where there is a clear connection to sewer, water, and/or refuse collection services⁴.

Potential applications related to GSI include realigning a portion of the costs to:

- Capture and infiltrate urban runoff to the water service provider on the basis of recharging groundwater supplies that are or will potentially be tapped for drinking water.
- Capture and infiltrate urban runoff to the water service provider on the basis that such runoff is a direct byproduct of water usage (e.g., irrigation leading to runoff). Ideally, the fees for such services

will be largely borne by properties that overuse water, creating urban runoff.

• Capture urban runoff to the sewer provider on the basis of reducing wet weather infiltration and inflow to sewer pipes.

The City currently uses this option to some extent and will consider different ways to align current services in the future.

9.2.11 VOLUNTEER PROGRAMS

Some municipalities have programs for engaging the community with GSI. Typically, engagement includes installation and/or maintenance of landscaping in stormwater bioretention facilities. These programs can benefit the agency by reducing maintenance staff time for paid agency workers or contractors. However, the burden of setting up, administering, training volunteers and tracking results can create a net cost to the agency, and volunteers may not be reliable in the long run for these activities. Partnerships with established volunteer agencies can help alleviate these burdens. Other benefits can include public education and building support for stormwater fees, which can make the programs more valuable.

The City has had success partnering with Grassroots Ecology (formerly Acterra) and Canopy to get citizens involved with construction of rain gardens and rain barrels, tree planting, and maintenance of landscaped features and trees, and will continue to encourage these joint efforts. However, volunteer labor is not expected to offset a significant amount of the funding required to construct and maintain GSI facilities.

9.2.12 SUMMARY OF GSI FUNDING OPTIONS Table 9.1 summarizes funding strategies that will be considered by the City as potential funding sources as the Plan is implemented. For each type of funding mechanism, the table provides a brief overview and specifics related to GSI, requirements for employing the mechanism, pros and cons, and applicability to funding planning, capital, and/or long-term O&M costs. This table will be refined over time.

⁴It should be noted that AB 2403, signed by Governor Brown in 2014, amended Section 53750 of the California Government Code to clarify that stormwater management activities that benefit or enhance local water supplies can be included in water service fees (which are not required to gain voter approval). AB 2403 appears to broaden the definition of water under Proposition 218 and may help to facilitate programs and projects that use stormwater for water supply.

³For other examples of P3s in California, see: https://en.wikibooks.org/wiki/Public-Private_Partnership_Policy_Casebook.

TABLE 9.1: POTENTIAL GSI FUNDING STRATEGIES FOR THE CITY

TYPE OF FUNDING OPTION	REQUIREMENTS	PROS	CONS	APPLICABLE USE
Alternative Compliance: Allows developers the flexibility to build, or fund through payment of an in-lieu fee, off-site stormwater treatment systems for Regulated Projects or set up credit trading programs. Leverages development activities to build and maintain GSI systems.	Stormwater can be treated off-site if there is a net water quality benefit. Credits must be calculated using a standardized metric for water quality or quantity benefit.	 Gives flexibility to site GSI systems in locations that optimize pollutant loading reduction and other benefits to the community. 	 Can be difficult to come up with viable alternative locations for GSI installations. 	• Planning
		 Allows for off-site stormwater treatment when stormwater management requirements can't be met within a Regulated Project site. 	 Can be difficult to quantify how much a developer should pay upfront for long-term maintenance costs that the municipality will bear. 	• Capital
		 An in-lieu fee and/or credit trading system can be used to achieve additional retrofits and installation of GSI. 	 May require agencies to modify the stormwater sections of their municipal codes to allow for the creation and/or use of the desired options/programs. 	• O&M
			 Multi-benefit opportunities of on-site GSI (e.g., traffic calming, heat island, bike lanes, etc.) will be lost when GSI is implemented at a different location. 	
Benefit Assessment and Community Facility Districts: Typically used to build and/or maintain facilities for the benefit of a specific area. Could be used for GSI improvements and/or services.	Established through new development projects as a condition of approval or through a balloting of all impacted property owners.	 Can be used to fund maintenance and operations. 	 Requires property owners and/ or businesses to agree that the need is present and that they should be (at least partially) responsible for funding it. 	• Capital
			 Administrative workload required to implement on small distributed/ localized areas for a citywide program may not be cost-effective. 	• O&M
Business Improvement Districts: Businesses and property owners tax themselves and manage the funds to build or maintain improvement such as GSI assets.	Can be set up and administered by the community members.	 Can provide sense of ownership and pride in the neighborhood when results are visible. 	 Can burden businesses, property owners and others to the extent that they are unwilling to approve other funding measures. 	• Planning
				CapitalO&M
Development Impact Fees: paid by an applicant seeking approval of a development project. Could potentially be used to fund retrofits of adjacent public ROW with GSI as part of development or redevelopment projects.	Impact fee program must meet the requirements in California's Mitigation Fee Act.	 Cost for retrofitting streets can be leveraged through development activities. 	 If a fee is found to not relate to the impact created by the development project, or to exceed the reasonable cost of providing the public service, then the fee may be declared a "special tax" subject to approval by a 2/3 majority of voters. 	• Planning
			• Cannot be used for O&M.	Capital
			 Revenue generated is fairly small and may not be sufficient for anything substantial. 	

TABLE 9.1: POTENTIAL GSI FUNDING STRATEGIES FOR THE CITY (CONTINUED)

TYPE OF FUNDING OPTION	REQUIREMENTS	PROS	CONS	APPLICABLE USE
Grants: one time funds that require an application from a funding agency. Could be used to plan, design and/or build GSI.	Application, reporting, coordination, and grant deliverables.	 Can fund programs or systems that would otherwise take up significant general fund revenues. 	 Usually a one-time source of funding. 	
			• May need to create new programs and systems for each grant.	
			 Usually have strings attached for matching funds and other requirements. 	• Planning
			 Little control over timing of applications and payment can lead to difficulties in coordination with other programs and grants. 	• Capital
			• Can be very competitive and resource intensive to apply.	
			• No guarantee of success.	
			 Post-project O&M costs must be borne by the agency. 	
Integration with Transportation Projects: transportation funding is leveraged to cost- effectively include stormwater quality elements. Installation and maintenance of GSI facilities can be part of integrated roadway programs	Make the connections between roadways and drainage systems that are green and complete, where allowed by conditions of the funding source.	 Roadway projects have more funding than stormwater programs and are generally more popular with the public. 	 Roadways have been designed in certain ways with expectations of costs and purposes for decades. 	
		• Complete and green streets may be more popular with the public than traditional car- focused streets.	 Many roadways are in poor condition, and there is not enough funding to fix them all. 	• Planning
		 Green streets may be less expensive than traditional streets based on a life cycle cost analysis. 	 GSI is perceived as an "added" cost, which could reduce the number of roadways that can be maintained. 	• Capital
			 Transportation funding is often restricted to certain roadway construction elements. 	
Long Term Debt: Borrow money up-front against a dedicated stream of revenue projected over the life of the program. Can borrow money from future revenues to construct GSI systems in the present.	No voter approval. Municipality's credit rating may be a factor.	• Well understood process of raising funds.	• Need a dedicated stream of revenue to pay off debt.	• Planning
		 Allows acceleration of improvements to compliance deadlines. 	 If the general fund is used, can put the general fund at risk. If jurisdiction cannot make the payments, credit rating will be downgraded jeopardizing other programs. 	• Capital

TABLE 9.1: POTENTIAL GSI FUNDING STRATEGIES FOR THE CITY (CONTINUED)

TYPE OF FUNDING OPTION	REQUIREMENTS	PROS	CONS	APPLICABLE USE
Public-Private Partnerships (P3s): agreements or contracts between a municipality and a private company to perform specific tasks. Can provide for the design, construction and maintenance of GSI systems over a long period.	Stormwater fee or other source of stable revenue over the life of the P3 contract.	 Leverages public funds, while minimizing impacts to a municipality's debt capacity. 		
		 Access to advanced technologies. 		• Planning
		 Improved asset management. 	• Stormwater fee or other source of stable revenue over the life of the P3 contract is required.	• Capital
		 Draws on private sector expertise and financing. 	 Contracts out to the private sector the construction and maintenance of GSI systems, possibly removing some municipal control. 	• O&M
		 Benefits local economic development and "green jobs." 		
		 Relieves pressure on internal local government resources. 		
		 Implementation timeline is faster. 		
Realignment of Municipal Services: municipalities shift costs to programs where revenue can be increased such as sewer, water and trash. Could be used to plan, design, build and/or maintain GSI where there is a nexus between programs	Leverage funding from other departments for stormwater activities, or reassign the stormwater activity to another department.	• A means of leveraging existing or new resources funded by non-balloted fee structures.	 Bureaucratic issues can be difficult to overcome. 	• Planning
			 Sewer, trash and water may be controlled by different agencies that may not be able to coordinate or share resources. 	• Capital
			 There may be political restrictions to significant increases in rates. 	• O&M
			 Not clear if resource can be realigned to fund stormwater programs. 	
Volunteer Programs: Provide community- based volunteer labor for specific tasks, such as helping build or maintain GSI facilities.	Administration, training, tracking and monitoring of volunteers.	 A low-cost source of labor. 	• Can be time intensive for staff to set up and administer.	Planning
		 Educational program for community. 	 May not be dependable in the long run. 	• Capital
		 Can build support for a stormwater fee or other funding source. 	 May result in loss of municipal control depending on program specifics. 	• O&M

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SECTION OUTREACH AND EDUCATION



One of the most important steps in the development of the GSI Plan was educating and developing relationships with department staff, managers, residents and elected officials regarding the purposes and goals of GSI, the required elements of the GSI Plan, and steps needed to develop and implement the GSI Plan. Implementation success will be much more likely if Watershed Protection staff obtains complete buy-in and commitment to the Plan as a new stormwater management approach from staff across City Departments as well as members of the public. Outreach and education tasks that Watershed Protection staff carried out (beginning in FY 15-16) and those that will continue through the GSI Plan development and implementation process are described in this Section. A summary of these outreach efforts is outlined in Figure 10.1.

10.1 INTER-DEPARTMENTAL MEETINGS

Watershed Protection staff consistently met with various departments, in both small- and large-scale settings throughout this GSI planning process. These meetings focused on discussing GSI requirements, obtaining early and frequent feedback, and building connections to work together in GSI planning/design, implementation, maintenance, and monitoring strategies and requirements.

For smaller-scale meetings, Watershed Protection staff met with relevant staff and management from individual departments to discuss the GSI Plan as it related to that specific group in order to obtain their feedback and perspective. Obtaining this individualized feedback from City departments will ultimately ensure that the design,

FIGURE 10.1: City-wide Outreach and Education Efforts



In addition to these individual meetings, Watershed Protection gathered a GSI Workgroup consisting of Department Managers and Supervisors that regularly met to help with the development and implementation of the GSI Plan. This Workgroup initially met in March 2017 to discuss development of the Framework for this GSI Plan and overall permit requirements. This Workgroup continued to meet during the GSI Plan development, with support from a consultant team, on a regular basis until the Plan was finalized. Watershed Protection staff also invited the Workgroup to provide feedback on the GSI Plan Scope of Work before it was sent out to potential consultants. Communication was consistently maintained via email outside of these meetings as well.

Throughout these small- and large-scale meetings, Watershed Protection staff asked for feedback regarding project opportunities to incorporate GSI. With assistance from Department staff and per MRP requirements, Watershed Protection staff analyzed both proposed and planned capital projects for opportunities to incorporate GSI before and during the development of the GSI Plan. To submit with the MRP Annual Report, Watershed Protection maintained a list of planned and constructed public projects that included GSI for the last three fiscal years (15-16, 16-17, and 17-18) and will continue to do so until the end of the permit term (approximately January 2020). In turn, staff will also update project location prioritization lists on a regular basis.

10.2 EXTERNAL COORDINATION EFFORTS

Watershed Protection staff conducted outreach efforts to the public through various committees and external partnerships. The City coordinates with SCVURPPP on a comprehensive outreach and education program. The key audiences of this program include: the general public (e.g. county-wide, and in the neighborhood or municipality where GSI projects are located); the development community (e.g. developers, engineers, landscape architects, and contractors); and elected officials. In addition to coordinating with SCVURPPP on their outreach and education program, City staff participates in SCVURPPP committees and workgroups that coordinate county-wide GSI activities through which Permittee representatives provide guidance and feedback on documents and other products. These documents and products (e.g. SCVURPPP C.3 GSI Handbook) are circulated through the City's Workgroup when appropriate to encourage staff feedback and input that is then shared with SCVURPPP.

Watershed Protection staff has also provided several presentations to City committees made up of a diverse group of residents, including the Parks and Recreation Commission and the Planning and Transportation Commission, regarding the GSI Plan. In addition, various meetings have been held with the SWMOC in the past year to obtain guidance and direction during the development of the Plan. Meetings will continue during the implementation of the GSI Plan as well.

Public Works Engineering and Watershed Protection staff have also assisted with outreach by working with a local, non-profit organization, Grassroots Ecology, to develop small-scale GSI projects in local neighborhoods and educate residents about rain harvesting and stormwater measures.

10.3 TRAINING

Watershed Protection staff worked closely with SCVURPPP in both the development and training for the GSI Plan. City staff highly promoted the SCVURVPPP training workshops involving the GSI Plan, and continues to encourage staff to attend upcoming trainings. A list of these workshops is outlined below:

- "Developing Your Green Infrastructure Program and Identifying Opportunities to Turn Gray to Green" on April 25, 2016, at the Campbell Community Center in Campbell, to educate municipal staff on the GSI requirements in the MRP. The workshop included presentations on developing and implementing municipal GSI Plans, review of public projects for identifying GSI opportunities, and a group exercise to review an example CIP project list for GSI opportunities. The workshop also included an optional field trip to the Hacienda Avenue Green Street in Campbell.
- "Low Impact Development and Green Infrastructure

 Meeting New Requirements" on June 9, 2016, at the Mitchell Park Community Center in Palo Alto. The workshop covered basic C.3 training, updates on new requirements in the MRP, a panel on C.3 implementation, vendor presentations on pervious paving and stormwater treatment products, and an afternoon session on design, construction and

maintenance considerations for pervious paving. The workshop also included a tour of the LID features of the Mitchell Park Community Center.

- "Green Infrastructure Design and Implementation" on April 19, 2017, at the Quinlan Community Center in Cupertino. The workshop included presentations on GSI design guidelines; implementing GSI projects; integrating GSI into other public works projects such as bicycle and pedestrian facilities; overview of the forthcoming SCVURPPP GSI Handbook; and GSI landscape and maintenance considerations.
- "Green Stormwater Infrastructure Handbook Details: Pervious Pavement, Infiltration Trenches and Utility Protection and Coordination" on April 10, 2018, at the Mitchell Park Community Center in Palo Alto. The purpose of the workshop was to review and receive input on typical details compiled for the SCVURPPP GSI Handbook Part 2. The workshop included breakout sessions for group discussion and a panel of utility agency staff to discuss dealing with utility conflicts when designing and constructing GSI projects.
- "Green Stormwater Infrastructure Handbook Details: Stormwater Curb Extensions, Stormwater Planters and Stormwater Tree Well Filters" on April 24, 2018 at the Quinlan Community Center in Cupertino. The purpose of the workshop was to continue to review and receive input on typical details compiled for the SCVURPPP GSI Handbook Part 2. The workshop included breakout sessions for group discussion and special presentations on lessons learned on GSI construction projects and design of suspended pavement systems to enhance stormwater tree well filters.

In addition, SCVURPPP conducted a workshop on the SWRP and GSI project planning and implementation for local builders, developers, and engineering consultants on November 29, 2018. The workshop also included an overview of the SCVURPPP GSI Handbook. A total of 36 consultants attended the workshop. This training for the development community was part of the Proposition 1 planning grant that Valley Water received on behalf of SCUVRPPP to develop the SWRP.

City staff provides training for residents as well. Utilities staff partners with local agencies to conduct annual workshops to educate and encourage residents to install LID features to reduce runoff, reduce pollutants, and utilize rainwater for non-potable use.

10.4 INFORMATIONAL

Watershed Protection staff provides outreach to both residents and elected officials through various formats, including utility bill inserts (UBIs), workshops, and factsheets. In both 2016 (**Figure 10.2**) and 2018 (**Figure 10.3**), the City developed and sent out new informational UBIs regarding GSI to approximately 26,000 residential accounts each year. The UBI in 2016 focused on GSI measures that are more applicable for installation on residential properties, whereas the UBI in 2018 focused on GSI measures that are more applicable for installation on public parcels.

Watershed Protection staff also developed a City webpage² focused on GSI, where various types of GSI information is stored including, but not limited to, both UBIs, the GSI Framework, and, when completed, the accepted GSI Plan. Staff will continue to provide outreach materials to the general public regarding the GSI Plan and benefits, as well as available City rebates for residents to implement small GSI features on private property via UBIs, the webpage, and email distribution lists.

SCVURPPP has supported the City and other municipalities by providing outreach on a Countywide scale. For the public, SCVURPPP developed a factsheet titled "Greening our Streets, Roads, and Parking Lots" that is posted on SCVURPPP's Watershed Watch website, distributed at events, and used by member agencies to educate their residents. SCVURPPP also developed a set of informational graphics on types of GSI features and how they are integrated into neighborhoods. These can be accessed on the Watershed Watch Green Streets webpage¹ or from the City's GSI webpage. This Green Streets webpage is promoted in Watershed Watch online advertisements to educate residents on LID/GSI features that they can integrate into their yards and garden components, and generate support for future green street projects. Residents can also access a map of all installed GSI features in the Santa Clara Valley.

For elected officials, SCVURPPP developed a factsheet titled "Integrating Green Stormwater Infrastructure into Public Streets, Roads, Buildings, and Parking Lots," as well as a brief presentation for agencies' use in conducting outreach to elected officials on GSI.

WHAT IF PALO ALTO STREETS WERE **DESIGNED TO REDUCE STORM RUNOFF AND** WATER POLLUTION WHILE ADDING BEAUTY?

In natural landscapes, rain soaks into the soil which slows the speed of runoff and filters pollutants. In urban areas, "impervious" surfaces such as roofs, concrete and asphalt interrupt this natural process, This increases flooding risks and pollution that washes into creeks and San Francisco Bay. "Green storm water infrastructure" mimics nature by slowing, spreading, sinking and filtering runoff. The Municipal Regional Stormwater Permit requires Palo Alto and other Bay Area agencies to develop a Green Storm Water Infrastructure (GSI) Plan by September 30, 2019 and identify locations for GSI implementation.

What Green Storm Water Infrastructure Looks Like.

PERVIOUS concrete, asphalt, and pavers reduce runoff by letting rain percolate into soil below. These surfaces can be used in crosswalks, sidewalks, plazas, driveways, parking spaces and emergency vehicle access lanes.





BIORETENTION PLANTERS

are areas landscaped with native plants and underlain with layers of soil and crushed rock. These planters filter and treat storm runoff that is directed into them.

RAINWATER CISTERN Cisterns capture rainwater so that

it can be used for irrigation. Rainwater Cistern in Coldwater Canyon Park, Beverly Hills. Photo courtesy of TreePeople.org



GREEN ROOFS are attractive and allow rainwater to soak into vegetation instead of running off the building. Green roofs also reduce heating and cooling costs and reduce heat-island effects. oof installation on Mitchell Park Library. Palo Alto



The City of Palo Alto offers commercial and residential rebates to install pervious surfaces, rain barrels and cisterns and green roofs. Visit cityofpaloalto.org/stormwater or call (650) 329-2295 to learn more.

with disabilities who require accommodations to access City facilities, services or programs, or who would like information on the City's compliance ericans with Disabilities Act (AOA) of 1990, may contact the City's ADA Coordinator at (650) 329-2550 (voice) or email ada@chyofpaloatho.org 11/16 on 100% post-consumer recycled pages, blacehed without chrinin. with the Ame

Palo Alto's Storm Water Management ram Reduces **Flooding and** tects Creeks.

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PREVENTING STREET FLOODING relies on the smart design of City storm drain infrastructure and streetscapes that slow, spread and sink storm water runoff. The health of Palo Alto creeks depends on programs that keep litter, leaf debris, sewer overflows, and construction and industrial pollutants from entering our watershed. Since 2005, Palo Alto's Storm Water Management Program fees have funded seven high-priority storm drain pipeline and pump station capital improvement projects, a precedent-setting green infrastructure project (see reverse side), and more than 100 rebates to property owners for rainwater catchment, permeable driveways, and green roofs.



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SECTION

ACCEPTANCE OF THE GSI FRAMEWORK AND PLAN



Watershed Protection staff was committed to interdepartmental collaboration during the development of both the GSI Framework as well as the Plan. Staff engaged various City Departments to create an allinclusive GSI Plan through GSI Workgroup and small staff meetings and provided various documents and updates via email communication. In addition, staff had the opportunity to provide feedback at various stages of Plan drafts, including the 50 percent, 85 percent and final draft. Finally, the SWMOC was involved throughout the process, and local nonprofit organizations and members of the public were provided access to copies of the 85 percent and final versions for review. The City's GSI Framework (or outline) was based on the framework template provided by SCVURPPP. The template outlined the steps to develop the GSI Plan and involve City staff in the process. The GSI Plan Framework was approved by the City Manager on June 30, 2017.

The development of the GSI Plan was carried out from Fall 2017 through Spring 2019. In addition to involvement and support of staff and the SWMOC, the Plan was also presented to the Parks and Recreation and Planning and Transportation Commissions in late 2018/early 2019. It was then presented to and accepted by Council in May, 2019. Refer to **Figure 11.1** for relative dates of this process.



FIGURE 11.1: GSI Plan Acceptance Timeline

GSI Plan Timeline





12.1 AUTHORITY TO IMPLEMENT GSI PLAN

As part of the Plan process, the City reviewed its existing ordinances and other legal mechanisms related to the implementation of MRP requirements in order to identify documents that needed to be updated or modified to provide sufficient legal authority to implement the Plan. In parallel with the development of the Plan, the City's Municipal Code Chapter 16.11, titled Stormwater Compliance Management Program (previously titled Stormwater Pollution Prevention), was updated, both to provide this aftorementioned authority and to ensure overall compliance with the MRP. The Municipal Code Chapter 16.11 update was adopted by City Council in Fall 2019.

12.2 STORMWATER MUNICIPAL CODE UPDATE—A STEP TOWARD INCREASING SITE-SCALE LID

One of the updated requirements in Chapter 16.11¹ is in regards to LID, described in Section 15.5 as a management approach and set of practices that can reduce runoff and pollutant loadings by managing runoff as close to its source(s) as possible². The current MRP requires implementation of a minimum LID practice on all project sites (including residential) that create or replace at least 2,500 square feet of impervious surface (collectively over the entire site). With the Chapter 16.11 update, the threshold has been decreased from 2,500 square feet to 2,000 square feet. Moreover, because single-family homes are not required by the MRP to implement GSI as are other project types, single-family residential projects that create or replace 2,500 square feet or more of impervious surface and are located on a parcel with area greater than 10,000 square feet or more will have to implement additional LID practices (four or more).

As an overall site design approach, LID can usually be applied as individual small-scale stormwater management practices (isolated LID practices) at less than the cost of GSI. Such site design measures include diverting runoff from sidewalks, driveways and parking lots to landscaping instead of to a drainage pathway leading to the curb and gutter, and, thus, the City's storm drain system. This new requirement is a step toward a new overall approach to treat stormwater runoff with a combination of gray and green infrastructure throughout the City. Refer to Municipal Code language for details.

¹Ch. 16.11 is currently being updated, and it is anticipated that City Council will adopt the new language by July 2019. ²https://www.epa.gov/sites/production/files/2015-09/documents/bbfs2terms.pdf



CHANGE OF CITY PERSPECTIVE— POLICIES AND PROGRAMS



An important aspect of GSI Plan implementation is a change of staff perspective regarding project management—considering sustainability, GSI and LID at the forefront of every design for every size construction and maintenance project. This perspective has been regularly discussed with the SWMOC, Workgroup and other City staff meetings. It can become part of a standardized approach the includes a collaborative and transparent process, manageable assessment and tracking tools and guidance that meet MRP requirements, and adequate funding that also supports the City's structure and decision-making framework.

Moreover, per the MRP, the City is required to "adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of the GSI Plan." In addition to the legal changes mentioned in Section 12, policies can be established to direct the integration of GSI in CIP projects; street/sidewalk/alley construction and improvements; small- and large-scale bicycle and pedestrian safety projects; and operation and maintenance practices. This way, each public project can provide multiple benefits, increase asset values, meet sustainability goals, and support inter-departmental coordination. The following describes examples of adjustments to the City approach and perspective to implement this Plan and meet MRP requirements. It is not prioritized and will be phased-in following Plan acceptance by City Council.

13.1 UPDATES TO CITY PLANS AND PROGRAMS VIA A CITY MANAGER'S POLICY

Per the MRP (refer to Section 8 for permit language), the City must update or modify all of its planning documents to incorporate GSI requirements, particularly those that affect the future of any impervious surfaces on City property and in the right-of-way as well as the "gray" storm drain infrastructure. These updates must occur by the end of the Permit term, approximately the end of calendar year 2020, or must be included in a work plan to be updated when feasible. As noted in Section 8 as well as Appendix P, some documents are not anticipated to be updated within this time period. Thus, an interim policy will be adopted at the City Manager's (CM) level to direct staff to conduct work responsibilities with GSI in mind. The application of the policy would vary according to Department responsibilities, from managing projects to maintaining assets.

The Sections below highlight key plans or programs that support the establishment of GSI throughout the City that are anticipated to be included in the City Manager's Policy. In response to the policy, each Department will update necessary documents and plans as resources allow with support from Watershed Protection staff.

13.1.1 OFFICE OF TRANSPORTATION'S Bicycle & Pedestrian Transportation Plan (BPTP)

The public right-of-way and associated infrastructure plays a crucial role in stormwater management in the City, as impervious surfaces (e.g., streets and sidewalks) directly convey runoff into the storm drain system without treatment. Integrating GSI and LID into this type of infratructure can help filter roadway pollutants and litter, slow down the flow, and in some cases, infiltrate or capture and use rainwater. At minimum, even in areas with a high water table, runoff can still be slowed, reducing street ponding and flooding, and allowing the receiving storm drain system to better manage large storm events.

The Office of Transportation's (OOT) BPTP supports various goals and requirements, including those of the Sustainability and Climate Action Plan and the state's Complete Streets Act and regional Sustainable Communities Initiative. The National Association of City Transportation Officials' (NACTO) 2017 Urban Street Stormwater Guide builds upon prior complete street design publications and "provides practitioners, leaders, and other advocates with the tools to design streets for successful stormwater management, showing how GSI can bolster strategies to provide a safe and pleasant walking and biking experience, and safer streets for all users." Consequently, adjusting the next BPTP update to focus on sustainable streets (the combination of the complete street approach with GSI), rather than just complete streets, is the appropriate next step.

While an update of the BPTP will take longer than two years (the Permit deadline), the City Manager's policy will guide future Transportation projects¹ to include GSI when feasible. A subsequent phase would involve a comprehensive BPTP update would establish street design standards that would not only consider pedestrian, bike and school safety, but also provide GSI and multiple benefits to highly-used transporation routes.

¹The specifics of this policy are yet to be determined. Watershed Protection will work with OOT to determine next steps and the language and approach that supports both GSI Plan and OOT goals as well as MRP requirements.

13.1.2 DEPARTMENT OF PUBLIC WORKS, DIVISION OF ENGINEERING SERVICES (PWE) Storm Drain Master Plan (SDMP)

The next update to the SDMP, which identifies and prioritizes CIP projects to meet a 10-year storm level of service by way of the City's storm drain system, will not be conducted before the end of the MRP term. Meanwhile, the City Manager's policy will direct PWE to consider the feasibility of integrating GSI in planned and proposed CIP projects with the support of Watershed Protection. The future SDMP update should include an analysis of how the integration of both traditional and GSI can be designed to provide adequate capacity for all size storms, while considering the varying groundwater table depths throughout the City. The analysis can also consider using GSI in areas that experience ponding to treat smaller storms (2-year storms) as well as in combination with larger pipe infrastructure (designed to convey 10-year storms). Finally, the update should compare upfront construction costs and short- and longterm maintenance costs of both types of infrastructure.

Street and Sidewalk Improvements Program (Program)

Since streets and associated impervious surfaces are direct stormwater runoff conduits to the storm drain system, and because the City aims to continuously provide City streets at excellent condition, it is a clear fit to integrate GSI into this Program. This will not only meet MRP requirements, but also support meeting multiple Departmental goals. Although streets may sometimes be improved at the surface, it is important to nevertheless establish a standard for each project to be assessed using GSI feasibility tools. Although a plan is not in place for this Program, the CM policy will guide how future improvements are constructed and designed. This policy will be adjusted over time as-needed and as funding becomes available. Recommendations will also be included in the Sidewalk Assessment Study.

PWE Capital Improvement Programs Projects

The City Manager's policy will direct staff to evaluate CIP projects for GSI opportunities during the project scoping process. In addition, this policy will direct staff to include in relevant CIP project pages of the capital budget a summary of the evaluation process and results, and estimates for the cost of GSI measure maintenance.

Because funding can be a deterrent to full-scale GSI implementation, identification of leveraging opportunities

is essential. For example, if a CIP project is required to construct on-site GSI or stormwater treatment measures (per MRP Provision C.3) at a particular location, the GSI measures can be moved off-site or expanded to treat additional paved surfaces on the right-of-way (i.e., the sidewalk or street), while still meeting onsite requirements. Watershed Protection will help conduct project coordination meetings to ensure these opportunities are identified early in the design process.

13.1.3 COMMUNITY SERVICES DEPARTMENT Parks

As with PWE projects, CSD Parks staff will also be directed to consider the integration of GSI in its construction and maintenance of CIP projects. This would involve not only constructing GSI when funding resources allow, but also participating in assessing maintenance and monitoring best practices of GSI measures on properties for which CSD Parks staff is responsible. In addition, staff would participate in assessing and identifying the best equipment and materials that should be used during maintenance practices, such as an appropriate plant palette or an easy-to-maintain pervious material.

Education and Art in City Projects

Creating a theme around stormwater quality protection will increase public understanding and support for GSI projects and stormwater management around the City as well as increase water stewardship behaviors. Consequently, the City will evaluate using outreach products that will be placed at GSI locations on public property, where feasible. Products could include a new logo that identifies GSI or temporary or permanent educational signage.

In addition, the City will encourage and promote the creative use of stormwater for fountains, public displays, education and public art. A required one percent (1%) set aside for public art from the City's annual CIP budget and in coordination with the City's Public Art Program could help support a project that was art-centered. **Figure 13.1** provides examples of two art projects that integrated stormwater for educational purposes.

In addition, **Figure 13.2** provides an example of a roundabout in Riverside Drive Bridge, Los Angeles, that utilizes public art to achieve stormwater management, native landscaping, and solar energy benefits. The traffic circle includes permeable pavers, bioretention,

²SCVURPPP guidance memo titled "Mechanisms for Green Infrastructure Plan mplementation" (March 20, 2017) was used as a resource.

a 25,000-gallon rainwater cistern, and solar energy that powers the roundabout's reclaimed wastewater irrigation, lighting, and artwork in order to capture the stormwater from the adjacent bridge and roads; these stormwater measures ultimately allow the roundabout to capture and treat approximately 500,000 gallons of stormwater runoff. The central point of the roundabout includes nine egg-shaped stone sculptures, with each featuring a different face of a randomly-chosen community member.³

FIGURE 13.1:

Examples of Downspout Designs (left: "Downspout 101⁴" Designed by Buster Simpson; right is borrowed from the book "Artful Rainwater Design: Creative Ways to Manage Stormwater")







FIGURE 13.2: Faces of Elysian Valley by Freyja Bardell and Brian Howe of Greenmeme (2010 – 2017)



 $\label{eq:source:https://inhabitat.com/striking-solar-powered-la-roundabout-manages-stormwater-runoff-with-art/?variation=based and the source of the sour$

⁴The branching downspout is part of a public art project called "Growing Vine Street" that uses visual and provocative conveyance techniques to raise awareness of the stormwater flowing through the neighborhood.



IMPLEMENTATION COMPONENTS



14.1 IMPLEMENTATION MANAGEMENT AND COORDINATION

As with the development of the Plan, Watershed Protection will serve as the main lead and coordinator of Plan implementation. Watershed Protection staff will carry out the following tasks, as well as additional ones as they arise, while ensuring City staff are provided sufficient opportunities to provide feedback.

- 1. Conduct regular, collaborative GSI Workgroup meetings;
- 2. Create and manage subcommittees to meet various needs, such as the development of the Maintenance and Monitoring Manual;
- 3. Develop applicable tools, policies, guidelines and resources and their updates as needed;
- 4. Update City plans and policies;
- 5. Establish necessary evaluation metrics, tracking, and reporting tools;
- 6. Track and implement best practices; and
- 7. Perform outreach and education as feasible.

The GSI Workgroup will serve as a platform to assess GSI opportunities; provide feedback on tools, policies, and other products; evaluate and track best practices and lessons learned; and collaborate among departments to create multi-benefit projects and leverage financial resources. Workgroup membership should include a minimum of one representative from each pertinent department and can break down into subcommittees for specialized responsibilities, such as maintenance.

14.2 EXTERNAL PROJECT OVERSIGHT

The SWMOC can provide a vehicle for residents and other members of the public to provide feedback and ideas throughout Plan implementation, as it did during its development. Their Responsibilities may include making recommendations for considering by staff; providing feedback on potential projects; and reviewing proposed policies. This oversight is not intended to replace the City's already existing CIP public review and approval process but will help augment the process with respect to GSI, potentially allowing discussion and consideration of projects in advance of the existing review process.

14.3 FEASIBILITY ASSESSMENT

The following list addresses a proposed process to determine feasibility of integration of a GSI project into a CIP project City project on a parcel or in the right-of-way. The list provides an outline of what will ultimately serve as a standard operating procedure. It will be amended over time in response to feedback and amended City procedures and policies. Funding is not addressed in this Section.

- Project Manager holds meetings at the beginning of the CIP project scoping process to determine feasibility, placement and extent of GSI measures through the structure of the GSI Workgroup or one of its subcommittees. Revisit at particular design phases, such as 30, 50, 75 and 90 percent.
- GSI feasibility is evaluated using pre-determined criteria, mapping software, other tools, professional judgement, and staff collaboration. This standardized process will be vetted by the GSI Workgroup and others as needed.
- The current list of prioritized project locations in Appendix O is used to assess opportunities as well, with this list being updated as new CIP projects are planned. Once the list is assessed per the process in this Section, the City's prioritized project locations will be included in the annual Adopted Capital Budget document when it is updated. The CIP plan is updated every year and is planned at 5-year intervals. Projects with a GSI component may be included in the CIP project as funded or unfunded projects. An unfunded project's inclusion in the annual Adopted Capital Budget document demonstrates that it is a City priority pending adequate funding.
- Watershed Protection staff identifies potential opportunities through regular plan review processes if not identified through a separate process.
- Based on funding opportunities, a preliminary budget may be created to determine financial feasibility.

14.4 TRACKING TOOLS

Practical tools, such as a project checklist, will be available to evaluate the potential integration of GSI and to track results and costs. This checklist will be available via the City computer network, and within two calendar years, will be available through cloud-based software. For those projects that will include GSI, a project checklist will be used to track the project from planning and Request for Proposal (RFP) development, through design, construction, and maintenance. Ultimately, tool and resources packages will be available for each project phase, all of which will be vetted by staff. Not only will projects be evaluated by these tools, but the results will also be distributed to stakeholders via an annual progress report to showcase GSI features within public projects. Information about GSI installations will be recorded into the City's GSI so that data can be viewed internally across departments and shared with other organizations as needed.

It should be noted that some tools will be developed at the County level in collaboration with other municipalities, and thus, timelines will not always be under City control. Furthermore, these tools will take time to develop due to limited City resources.

14.5 DETAILS AND SPECIFICATIONS

As mentioned previously in Section 7, the MRP requires the GSI Plan to include general design standards and specifications. As described, the City reviewed and provided feedback regarding example specifications presented in the SCVURPPP GSI Handbook (Parts 1 and 2). City staff will reference these examples and adapt them as needed for specific projects. In calendar year 2019, a consultant will be retained to assist in the development of Cityspecific standards and guidelines that will be used for City projects and made available for use on private projects, as appropriate. City staff may choose to pilot particular standards before finalizing them, especially to determine requirements or guidelines for private property. This will also allow staff to standardize typical City work practices; agree on consistent designs that meet requirements of various City Departments; and assure consistency between various contractors.

14.6 MAINTENANCE AND MONITORING MANUAL

An item not included in MRP requirements is a Maintenance and Monitoring Manual (Manual) for the GSI measures on City property and the rightof-way. This Manual will document and evaluate current maintenance practices; identify and schedule maintenance and monitoring responsibilities;

FIGURE 14.1: Maintenance on a Bioretention Measure



Source: SFPUC

conduct effectiveness assessments using an adaptive management approach; and set performance goals. With a kickoff also planned for calendar year 2019, the Manual's development will be carried out in collaboration with the City-specific standards and guidelines. During this process, staff will also identify funding needs and potential partnering opportunities with local organizations regarding GSI maintenance.

As part of an overall effort to improve the maintenance of GSI on City property, the landscape maintenance staff should be trained in GSI practices and Bay-Friendly practices and potentially be certified through the National Green Infrastructure Certification Program¹, which is likely to develop in the state of California in the coming year. Contractors who provide GSI maintenance services should also be trained and certified. Once the Manual is completed, staff and contractors will be trained to carry out responsibilities outlined in it. **Figure 14.1** is an example of maintenance on a bioretention feature. SECTION 14

14.7 PILOT PROJECTS

14.7.1 CIP PILOTS

In support of the City's vision, staff will explore and implement pilot projects on City-owned parcels and rights-of-way to assess where and how GSI can be implemented in the future. Currently, the City's Urban Forestry soil volume requirements are usually met by installing suspended pavement systems beneath trees (see Section 1.3.3) to hold the required amount of soil (in place of using structural soil, which does not support Urban Forestry goals). A stormwater treatment soil mix can be used in combination with the planting soil within the suspended pavement systems to create a larger area that can soak up additional runoff from the street, which would allow sites to surpass minimum stormwater requirements with systems that are already required by the City. Watershed Protection is coordinating with Urban Forestry to incorporate this pilot project within the design for the upcoming Public Safety Building to treat neighboring streets and sidewalks. Once implemented, the project would be evaluated via the tracking tools described in Section 14.4 to determine feasibility for other project applications.

The City will also consider pilot projects on a properties identified as high priority per the process explained in Section 4.3, such as a City-owned parking lot. A project that can also meet other Department needs, such as Urban Forestry's shade requirements, will be explored.

14.7.2 LOCAL PARTNERSHIPS AND VOLUNTEER PROGRAMS

Partnering with local organizations will allow the City to leverage its resources and obtain additional support to offset high maintenance costs. The City is piloting a program with a local group, Grassroots Ecology, to pilot a small project in which the group will use its significant plant restoration experience to conduct nontechnical maintenance tasks. This program will involve collaboration with Parks Maintenance Division staff to identify these tasks, with the approach to inform the Maintenance and Monitoring Manual. Finally, because this group's primary experience is with native plant propagation and plantings, this project will investigate the use of native plants and pollinators to diversify plant palettes used in bioretention areas.

In addition, Grassroots Ecology has significant experience establishing volunteer programs and conducting volunteer-supported restoration projects and school and family educational activities (see **Figure 14.2** for an example rain garden implemented by Grassroots Ecology). This pilot project will also involve training volunteers to monitor and provide minor maintenance support in their neighborhoods. Volunteers will, at the same time, learn about the benefits of GSI and see a successful partnership in action.

The City will determine whether to broaden this pilot and potentially partner with additional local organizations in the future.



FIGURE 14.2: Hoover Park Rain Garden in Palo Alto Planted by Grassroots Ecology.

Source: www.grassrootsecology.org/demo-gardens



NEXT STEPS-FURTHER EXPLORATION



This Section addresses items deemed necessary to ensure successful long-term implementation of this Plan that were identified by staff as needing further exploration beyond the Plan development period or through feedback from the public. The timeline for each item will vary based on available resources, but will be integrated into an overall workplan in the coming months.

15.1 RIGHT-OF-WAY OPPORTUNITIES

This GSI Plan prioritizes City-owned locations but does not identify GSI project opportunities in the City's right-of-way. As described in Section 1.3.2, the right-ofway, which includes streets, sidewalks, planting strips and alleys, offers various stormwater treatment options that provide numerous benefits, including social and environmental. A process will be determined to identify high priority areas as well as procedures to determine project opportunities when staff is evaluating street improvements and enhancements to bicycle and pedestrian features.

15.2 PROJECT COST TRACKING

The need to track, document and evaluate project costs is important to determine the economic impacts and benefits of GSI Plan implementation. This involves costs related to project planning, design, installation, operation and maintenance as well as replacement over time. In addition, going a step further to assess avoided costs, such as lowered irrigation costs due to a stormwater capture and reuse project, will help future funding decisions in regards to the use of a new stormwater management approach that uses GSI in complement with gray, or traditional, storm drain projects. Next steps will involve (1) evaluating cost tracking tools and the use of asset management systems; (2) establishing cost tracking procedures and data analysis methods; (3) determining which cost/benefit approach to use; (4) analyzing data over time that can be used to fortify project opportunity evaluations and budgeting; and (5) adapting systems over time.

15.3 PERFORMANCE

15.3.1 PERFORMANCE METRICS

There is a clear need to determine what type of performance metric(s) should be used to establish

appropriate goals and assess the effectiveness of GSI Plan implementation over time. Various metrics are being used across the country, including acreage or percentage of impervious surface reduction; stormwater runoff volume reduction; amount of "greened" acres (those acres treated by GSI); or particular water quality objectives. Additional research needs to be conducted to determine the best fit for the City considering the availability of data, the cost of obtaining additional data and conducting a baseline analysis, and the work necessary to regularly conduct future analyses to evaluate progress over time.

15.3.2 RATING TOOLS

Evaluating the performance of the design, construction and maintenance of projects can help provide transparency of the use of public funds and encourages staff to continuously improve their effectiveness. Using rating tools, such as the Envision Sustainable Infrastructure Card or the Greenroads Rating System Program, will help evaluate, verify, and document performance according to Department goals and strategies. Figure 15.1 provides a Greenroads evaluation example for the West Hacienda Avenue project in the City of Campbell¹. In order to holistically manage complex projects that can meet multiple objectives of various Departments, support the City's Comprehensive and Sustainability and Climate Action Plans (among others), and provide accurate, data-supported results to the public, performance rating tools should be evaluated to choose which best assesses performance of varying scales of GSI projects. Such a tool can be integrated into the GSI evaluation process and follow projects through the design, construction and maintenance phases.

15.4 FUNDING ANALYSIS

A common concern for a municipal plan that establishes new requirements and management approaches, particularly leading to new projects, is funding for both construction and maintenance. Funding solutions for both need to be explored and may need to be addressed separately, with some taking more time to establish. Additional work needs to be carried out to alleviate this concern; consequently, a high priority item post-acceptance of this Plan is to conduct a comprehensive funding

¹Source: https://www.greenroads.org/141/92/hacienda-green-street-improvements.html

needs and opportunity analysis for short- and long-term needs. This analysis will increase our understanding of both construction and maintenance costs for City facilities as well as identify and prioritize funding opportunities. The following lists potential future solutions that need to be further vetted to provide stakeholders with a sense of the direction the City may choose to go:

- A program that would allow private developers to provide a financial contribution equal to a pre-determined formula toward building and maintaining public GSI in-lieu of on-site GSI. This program could be triggered, for example, if a private site cannot construct on-site GSI due to physical constraints or if a CIP project is being planned nearby where GSI could treat a larger area.
- Benefit or Improvement Districts for commercial or residential areas that would allow assessment fees to be directed toward installation and maintenance of GSI within the boundary of said district. For downtown Palo Alto, which is already designated as a Business Improvement District, amendments could be made to include GSI. For residential areas, a Green (Stormwater Infrastructure) Benefit District could be created to fund and maintain GSI and other landscaping located in the right-of-way within that area. Local examples include the Dogpatch and Northwest Potrero Hill Districts in the City of San Francisco.

• Pilot public-private partnerships in which the cost of construction and/or maintenance is shared between the two parties. This could involve various combinations of responsibilities, with maintenance taken on solely by a private contractor or local organization at a lower rate than staff.

15.5 PRIVATE PROPERTY OPPORTUNITIES

The GSI Plan focuses on public property under the jurisdiction of the City. However, to increase the impact of GSI implementation City-wide, it is imperative to consider the establishment of additional requirements for private property, investigate opportunities to encourage installation of GSI measures in the City's right-of-way as well as create incentives that will reward private property owners for installing and maintaining GSI beyond what is required. This Plan does not propose new requirements, but rather it sets the stage for increasing the scale of GSI implementation throughout the City. Staff will fully research private property opportunities post-acceptance of this Plan.

Through the update of Chapter 16.11 of the Municipal Code (as mentioned in Section 12), additional redeveloped sites may be required to install on-site LID, which can lead to a greater



FIGURE 15.1: Greenroads Evaluation Example –West Hacienda Avenue Green Street (City of Campbell)

number of small-scale stormwater management systems throughout the City. LID will keep stormwater runoff on-site, while providing more affordable options to engineered treatment measures. New construction or redevelopment provides an ideal opportunity to manage on-site stormwater runoff differently by site design approaches, including, but not limited to, minimizing impervious surfaces, grading walkways or driveways to drain to nearby landscaping instead of the sidewalk or street, or by taking care to not compact soils that will be planted post-construction.

Even if a private property owner may not be able to redesign a site, stormwater runoff may be captured and sometimes used using LID approaches (Figures 15.2 – 15.4). For example, structures could be designed or retrofitted so that downspouts are "disconnected" from the street and storm drain system. This could be done by diverting roof runoff to one or a combination of the items below:

- An existing, non-modified landscaped area, particularly if several downspouts can divert smaller amounts of roof runoff across the property;
- A retrofitted landscaped area that may be amended

with soil and/or a subsurface layer with base rock for increased infiltration or dug down to have a depression for more water-holding capacity (sometimes called a "rain garden"); and/or

• An above- or below-ground rain barrel or cistern that can store runoff to be used.

Another way that a site may be retrofitted is to construct a depressed but relatively shallow landscaped area with permeable soils and droughttolerant and/or native plants. Planting trees in the outer boundaries can also help with water uptake. In addition to capturing roof runoff, or simply rain, these rain gardens (when appropriately sized) can capture runoff from walkways, sidewalks, driveways and small parking lots if these impervious areas are graded to drain to them, or in some cases, piped underground to them. These rain gardens are different from bioretention or biotreatment areas/planters, as they do not need to be engineered or designed to treat a particular amount of runoff. Finally, property owners may also choose to use pervious materials to construct walkways, driveways or other impervious surfaces, which allow rain to infiltrate through the material to the underlying soil.



Source: craftspost.com

FIGURE 15.2: Examples of Rain Barrels Collecting Roof Runoff



Source: backyardville.com

⁵NOTE: The following information should not be used as detailed guidance, but rather as a starting point to rethink how stormwater can be generally managed on private properties, whether residential or non-residential. Constraints such as depth to groundwater, soil type and/or location of utilities should be considered and must be evaluated on a case-by-case basis.

FIGURE 15.3: Examples of Roof Runoff Diverted to Site-Scale Landscaped Areas/Planters



Source: architerradesigns.com/landscape-planters-rooftop-installation-blog



Source: sfbetterstreets.org



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Source: architerradesigns.com/landscape-planters-rooftopinstallation-blog



Source: horsleywitten.com/



Source: blazingstargardens.com/

FIGURE 15.4: Examples of Diversion of Surface Runoff from Impervious Areas to Rain Gardens in a Neighborhood and Small Parking Lot

Some private property owners may choose to install GSI measures (even when not required) in addition to some of the approaches mentioned in this Section. General descriptions are provided in Section 1.3. Overall, it is important for property owners to not only consider design and construction costs, but also maintenance requirements during the decision-making process.

GSI may be necessary for pollutant removal on large commercial and industrial sites, and to obtain multiple benefits throughout the City. Therefore, post-acceptance of the Plan, staff will investigate other options to increase private property GSI. This Plan does not propose new requirements, but rather it sets the stage for increasing the scale of GSI implementation throughout the City. The following lists potential options for consideration that could increase the amount of GSI on private properties; however, additional options will be evaluated.

• Decreasing the size threshold trigger for required stormwater treatment (Provision C.3 as described in Section 1.4.2).

- Leveraging current requirements: The City's Urban Forestry soil volume requirement for private and street trees is usually met by using suspended pavement systems placed beneath the trees (see Section 1.3.3) to hold the required amount of soil. A stormwater treatment soil mix can be used in combination with the planting soil to create a larger area that can soak up additional runoff from the street. Thus, a project can treat additional paved surfaces beyond the required parcel area for minimal additional construction costs. Maintenance responsibilities for all parties involved will need to be outlined per the new Maintenance and Monitoring Manual, in a legal agreement.
- Providing incentives, such as expedited permitting and/or reduced permit fees, for projects that install GSI beyond the requirement: for example, the project could include treating a particular amount

of public right-of-way and taking on maintenance of the features based on an agreement (as described above). A reduced permit fee could offset a percentage of the City's estimated longterm maintenance costs. Moreover, the property owner may be able to forego installing on-site treatment, if the site was plumbed to the right-ofway treatment measure.

- Requiring new development projects that meet a certain size threshold, and that are already required to construct new right-of-way features per other City requirements, to also install GSI measures. A legal agreement would outline maintenance and replacement of features over time.
- Exploring collaboration opportunities with large private property owners, such as Stanford and PAUSD, to integrate GSI throughout their jurisdictions (as described in Section 4.1).

REFERENCES

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Stormwater Funding Barriers and Opportunities. Prepared by the California Stormwater Quality Association. 2017.

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APPENDIX A: Proposed Bikeways¹ (per Bicycle and Pedestrian Transportation Plan, 2012)



¹Caltrans defines bikeways as the following: Class I bikeways are facilities with exclusive right-of-way for bicyclists and pedestrians; Class II bikeways are bike lanes established along streets and are defined by pavement striping and signage to delineate a portion of a roadway for bicycle travel; Class III bikeways designate a preferred route for bicyclists on streets shared with motor traffic not served by dedicated bikeways to provide continuity to the bikeway network; Class IV bikeways are for exclusive use of bicycles, physically separated from motor traffic with a vertical feature. The City defines these bikeways as the following: Class 2e1 bikeways are bikeways where a Class 2 bikeway exists, but does not currently meet Caltrans specifications. Class 2e2 bikeways are existing Class 3 bikeways that are proposed as Class 2 bikeways that meet Caltrans specifications.



²This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review, consult, and/or field verify the primary data and information sources to determine the usability of the information.

APPENDIX C: Key Development Areas³



³Key Development Areas are defined in Section 4.3.1.
APPENDIX D⁴: Localized Ponding⁵ and FEMA Flood Zone Designations⁶



4 This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review,

consult, and/or field verify the primary data and information sources to determine the usability of the information.

⁵Localized ponding is defined in Section 1.3.1. Additional areas may be identified in the future.

 $^{\rm 6}{\rm FEMA}$ flood zone designations are defined in Section 4.3.1.

APPENDIX E: Trash Generation Designations⁷



⁷Trash generation designations are defined in Section 4.3.1. Note that the "very high" areas are under the jurisdiction of the California Department of Transportation.

APPENDIX F⁸: Contaminated Groundwater Plume⁹ Approximate Limits



⁸This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review, consult, and/or field verify the primary data and information sources to determine the usability of the information. ⁹See Section 2.3 for more information.

APPENDIX G: Existing City-Owned GSI Locations¹⁰



¹⁰See Section 1.3.4 for more information.

APPENDIX H¹¹: Parcel Slope¹²



¹¹This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review, consult, and/or field verify the primary data and information sources to determine the usability of the information. ¹²See Section 4.2 for more information. APPENDIX I: Quadrant Reference Map for City-Owned Properties and Proposed/ Planned Projects Prioritized by Location¹³



¹³Refer to Section 4



APPENDIX K: City-Owned Properties and Proposed/Planned Projects Prioritized by Location—Quadrant 1B





APPENDIX

¹⁴ "SD" stands for storm drain

APPENDIX M: City-Owned Properties and Proposed/Planned Projects Prioritized by Location—Quadrant 3



APPENDIX N: City-Owned Properties and Proposed/Planned Projects Prioritized by Location—Quadrant 4¹⁵



15Pearson Arastradero Parking Lot and Foothills Park were both prioritized as project locations even though some sections of both parcels have a slope greater than 15 percent.

APPENDIX O: Prioritized City-Owned Project Location List

Project	Project Location	Total	Prioritzation
Lot Q (High/Alma North Garage)	430 High Street	32	High
Public Safety Building (Parking Lot 6)	Parking Lot C-6 (250 Sherman Avenue)	32	High
Quarry Road Improvements and Transit Center Access	Quarry Road between El Camino Real and Welch Road	32	High
Embarcadero Rd at El Camino Real Improvements	Embarcadero Road and El Camino Real	31	High
Churchill Avenue Enhanced Bikeway	El Camino Real and Churchill Avenue	30	High
Fire Station 1 (University Park Fire Station)	301 Alma Street	30	High
Fire Station 4 and Transfer Station	3600 Middlefield Road	30	High
Lot D (Downtown Parking Garage)	375 Hamilton Avenue	30	High
Lot N (Emerson/Hamilton Lot)	501 Emerson Street	30	High
Mitchell Park	600 East Meadow Drive	30	High
Peers Park	1899 Park Boulevard	30	High
Cogswell Plaza and La Comida (includes Parking Lot C)	256 Lytton Avenue	29	High
El Camino Median Landscape Improvements	City limits - University Avenue & Page Mill - Arastradero	29	High
Lot O (Emerson/High Lot)	430 Emerson Street	29	High
Lot S/L (Bryant/Lytton Garage)	445 Bryant Street	29	High
Lot T (Lytton/Kipling Lot)	434 Lytton Avenue	29	High
250 University Avenue Garage	250 University Avenue	28	High
City Hall/King Plaza and Police Department	250 Hamilton Avenue	28	High
Colorado Pump Station Integration with Matadero Pump Station	Colorado Avenue and W Bayshore Road	28	High
Downtown Library	270 Forest Avenue	28	High
Gamble Garden Center	1431 Waverley Street	28	High
Heritage Park and Palo Alto History Museum.	300 Homer Avenue (bounded by Waverley, Homer, and Bryant)	28	High
Hoover Park	2901 Cowper Street	28	High
Lawn Bowling Green Club Park	474 Embarcadero Road	28	High
Lot A (Emerson/Lytton Lot)	437 Emerson Street	28	High
Lot H (Cowper/Hamilton Lot)	457 Hamilton Avenue	28	High
Lot K (Lytton/Waverley Lot)	351 Lytton Avenue	28	High
Lot P (High/Hamilton Lot)	561 Hamilton Street	28	High
Lot R (High/Alma South Garage)	Between 528 High Street and Alma Street	28	High
Rinconada Park	777 Embarcadero Road (between Hopkins Avenue, Middlefield Road, and Embarcadero Road)	28	High
Robles Park	4116 Park Boulevard	28	High
Tennis Courts near Rinconada Library	777 Embarcadero Road	28	High
West Bayshore Pump Station	West Bayshore Road near Highway 101 to Adobe Creek outfall	28	High
West Bayshore Road to Adobe Creek Storm Drain Capacity Upgrade	3480 W Bayshore Road to Adobe Creek outfall	28	High

APPENDIX O: Prioritized City-Owned Project Location List (continued)

Project	Project Location	Total	Prioritzation
Bol Park	3590 Laguna Avenue Between Roble Ridge Road, Matadero Avenue and Laguna Avenue	27	Medium
Colorado Receiving Station	1080 Colorado (by Matadero Canal)	27	Medium
El Camino Real Pedestrian Safety and Streetscape Project	2962 Page Mill Road	27	Medium
Lot F (Florence/Lytton Lot)	425 Florence Street	27	Medium
Briones Park and Fire Station 5 (same parcel number)	600 Arastradero Road	26	Medium
Corporation Way/East Bayshore Road Pump Station	Corporation Way and East Bayshore Road	26	Medium
Greer Park	1098 Amarillo Avenue	26	Medium
Lot 7 (California Ave Area Parking Garage)	350 Sherman Avenue	26	Medium
Lot 8 (Sherman/Ash)	448 Sherman Avenue	26	Medium
Lot E (Gilman/Bryant Lot)	642 Gilman Street	26	Medium
Lot G (Gilman/Waverley Lot)	671 Gilman Street	26	Medium
Museum of American Heritage	351 Homer Avenue	26	Medium
Terman Park	655 Arastradero Road	26	Medium
Weisshaar Park	2298 Dartmouth Street	26	Medium
Werry Park	2100 Dartmouth Street between College and Stanford Avenues	26	Medium
Clover Leaf ROW	200 San Antonio Road and Alma Street	25	Medium
East Meadow Circle Storm Drain Connection Improvement Project to Adobe Creek Pump Station	1034 through 1098 E Meadow Circle	25	Medium
Fire Station 2 (Mayfield)	2675 Hanover Street	25	Medium
Johnson Park	251 Waverley Street	25	Medium
Winter Lodge/Swim Center	3009 Middlefield Road	25	Medium
Cameron Park	2101 Wellesley Street	24	Medium
Center Drive Storm Drain Capacity Upgrade Project	Center Drive from Channing Avenue to Hamilton Avenue	24	Medium
Eleanor Pardee Park	851 Center Drive	24	Medium
Esther Clark Park	Old Adobe Road	24	Medium
Fabian Way Storm Drain Capacity Upgrade Project	3798 - 3890 Fabian Way	24	Medium
Lot 3 (Ted Thompson Parking Garage)	275 Cambridge Avenue	24	Medium
Lot 4 (Cambridge/Birch)	407 Cambridge Avenue	24	Medium
Lot 5 (Cambridge E/Garage)	451 Cambridge Avenue	24	Medium
Lot K (Lytton/Waverley Lot)	364 Bryant Street	24	Medium
Lot N (Emerson/Ramona Lot)	Between 539 Emerson and Lane 12 West (behind Lytton Plaza)	24	Medium
Lytton Plaza	Emerson Street and University Avenue	24	Medium
Maybell Substation	527 Maybell Avenue	24	Medium
Municipal Service Center	3201 E Bayshore Road	24	Medium
Palo Alto Tower Well	201 Alma Street	24	Medium
Park Substation	3291 Park Boulevard	24	Medium
Ventura Park	3990 Ventura Court	24	Medium

APPENDIX O: Prioritized City-Owned Project Location List (continued)

Project	Project Location	Total	Prioritzation
6" Water Main	4028 Park Boulevard	23	Medium
Adobe Creek Substation	1157 East Meadow Road	23	Medium
Baylands	2375 Embarcadero Road	23	Medium
Byxbee Park Completion	2500 Embarcadero Road	23	Medium
Foothills Park	1530 Arastradero Road	23	Medium
Hopkins Creekside Park	Palo Alto Avenue from Emerson Street to Marlowe Street	23	Medium
Kellogg Parkette	Waverley and Embarcadero (next to Gamble Garden)	23	Medium
Monroe Park	375 Monroe Drive	23	Medium
Parkette Area at Alma Street	103 Embarcadero Road	23	Medium
Boulware Park	401 Fernando Avenue	22	Low
East Charleston Road to Adobe Creek Storm Drain Capacity Upgrade Project	E Charleston Road to Adobe Creek (between Fabian Way and Louis Road)	22	Low
Henry W. Seale Park	3100 Stockton Place	22	Low
Jerry Bowden Park	2380 High Street	22	Low
Lot 1 (Cambridge/Park)	270 Cambridge Avenue	22	Low
Lot 2 (Cambridge/Birch)	366 Cambridge Avenue	22	Low
Lot 9	2320 Birch Street	22	Low
Midtown Court Parking Lot	2700 Midtown Court	22	Low
Portion of Golf Course/Baylands Athletic Center	1900 Geng Road	22	Low
Adobe Creek Pump Station	1198 E Meadow Drive	21	Low
East Meadow Drive to Adobe Creek Pump Station Storm Drain Capacity Upgrade Project	East Meadow Drive between E Meadow Circle and Adobe Creek	21	Low
Hamilton Ave Storm Drain Capacity Upgrade Project	Hamilton Ave from Rhodes Drive through Center Drive	21	Low
Louis Road Overflow Storm Drain	Louis Road (Seale-Wooster Canal to Matadero Creek)	21	Low
Louis Road SD Capacity Upgrade Project	Louis Road (Embarcadero Road to Seale-Wooster Canal)	21	Low
Pearson Arastradero Preserve Parking Lot Improvement	1530 Arastradero Road	21	Low
Ramos Park	800 East Meadow Drive	21	Low
Scott Street Mini Park	End of Scott Street at the intersection of Scott Street and Addison Avenue	21	Low
Sensing Unit/Hillview Relieve Valve	3402 Hillview Avenue	21	Low
Sterling Canal	3101 Maddux Drive thru 3298 Maddux Drive	21	Low
Airport	1925 Embarcadero Road	20	Low
Alma Substation (Current land use is an apartment building)	801 Alma Street	20	Low
Los Altos Treatment Plant	1237 N San Antonio Road	20	Low
Palo Alto Community Child Care	3990 Ventura Court	20	Low
Sarah Wallis Park	202 Ash Street	20	Low
College Terrace Children Center and Library, and Mayfield Park	2300 Wellesley Street	19	Low

APPENDIX O: Prioritized City-Owned Project Location List (continued)

Project	Project Location	Total	Prioritzation
Loma Verde Ave Storm Drain Capacity Upgrade Project	Loma Verde Ave (Louis Road to Sterling Canal) 901 Loma Verde Avenue - 1100 Loma Verde Avenue	19	Low
Strip of Land Near Matadero Creek	Barron Park neighborhood	19	Low
20' Wide Footpath/Bike Improvement Project Path at Baylands	2525 E Bayshore Road	18	Low
Dealership Parking Lot	3279 E Bayshore Road	17	Low
Landscape Area at Oregon Expressway and Alma Street	103 Colorado (Between Oregon and Colorado)	17	Low
Regional Water Quality Control Plant	2504 Embarcadero Way	17	Low
Strip of Land by San Francisquito Creek dividing Palo Alto and Menlo Park	Riparian buffer along San Francisquito Creek that runs between Emerson Street and Marlowe Street	16	Low
Residential drive-thru	2297 Williams Street	15	Low

APPENDIX P: Integration with City Plans and Documents

As described in Section 8.0, the City's planning documents were reviewed to determine to what extent these included language to support GSI and if any changes were needed for the City to effectively implement the GSI Plan. The City determined that none of the reviewed documents prevent the implementation of GSI projects within the City. Moreover, several planning documents already contain some language to support the GSI Plan. However, various plans need to be better aligned with the GSI Plan to require the integration of GSI and use of the various tools, specifications and guidelines addressed in this Plan and through subsequent implementation. The following sections provide a brief discussion for each planning document that was reviewed for GSI integration, including examples of language supporting GSI in these documents where applicable. Additional examples of GSIrelated language can be found in references such as SCVURPPP's Model Green Infrastructure Language for Incorporation into Municipal Plans (2016).

A workplan for future integration of GSI language is provided in Section 8.3 of the main document. Certain documents and plans will be updated in calendar years 2019-2020. This section will be updated once those documents are finalized.

BICYCLE AND PEDESTRIAN TRANSPORTATION PLAN (2012)

The Bicycle and Pedestrian Transportation Plan contains the policy vision, design guidance, and specific recommendations to increase walking and biking rates to help achieve local and regional targets for accommodating new growth, maintaining mobility, and reducing overall environmental impacts. It was updated in July 2012 and includes limited language regarding the incorporation of GSI into transportation projects, namely:

• Section 2.2 Strategic Guiding Principles: At the project scale, seek integrated design solutions that achieve multiple benefits (e.g., a sidewalk extension that also provides landscaping or stormwater management opportunities) and avoid or improve abrupt transitions in the public realm.

The next update will include language that will integrate the GSI Plan appropriately. Until the next

update occurs, a policy will be established to ensure staff adequately considers GSI in the future. Example language that can be considered for this policy is provided below:

- Encourage and support the inclusion of green stormwater infrastructure in the design of pedestrian and bicycle facilities. GSI can provide multiple benefits such as stormwater treatment, beautification and can be efficiently incorporated into bicycle and pedestrian projects.
- Regularly coordinate scopes and timelines of roadway maintenance, GSI implementation, utility, and private development activities to identify potential collaboration opportunities on the bikeway network and within priority pedestrian areas.

CITY PARKS SUSTAINABILITY REVIEW (2014-2015)

The Parks Sustainability Review identifies opportunities to increase sustainable and resource-saving practices associated with the operation and management of parks and open space, as well as recreational facilities within the City. Like the Parks, Trails, Natural Open Space and Recreation Master Plan (Parks Master Plan), the City Parks Sustainability Review document already includes adequate references to support GSI implementation, namely:

- Introduction and Background
 - o Water Conservation and Quality
 - Policies and actions that promote activities that support stormwater capture...are considered to further sustainability goals.
- Water Conservation and Quality
 - Item 6: Adopt a planting approach that focuses on transitioning to native and/or drought-tolerant plants and also provides ecological services such as improving water quality.
 - Item 9: Design stormwater improvements throughout the park system to incorporate LID systems to treat pollutants in stormwater runoff (e.g., through rain gardens, bioretention areas and living roof systems).
 - 9.a: Site and implement treatment wetlands where they will provide the highest return on investment (e.g., adjacent to creeks or other wetlands).

- 9.b: Naturalize creek edges adjacent to parks and open space where feasible.
- Item 10: Increase the use of permeable pavements in parking lots with filtration systems for pollutants.
- Climate Change and Air Quality
 - o Item 3.b: Use pervious surfaces in place of pavement where feasible.
 - Item 4.b: Design adaptive green infrastructure along creeks where increasingly unpredictable levels of precipitation and sea level rise will impact adjacent properties and ecosystems.

The language in the City Parks Sustainability Review will be revised as part of future updates to directly relate to the GSI Plan.

COMPREHENSIVE PLAN 2030 (2017)

The City's Comprehensive Plan 2030 strives to build a coherent vision of the City's future with input from its stakeholders. It is the primary tool for guiding the future development of the City. The Comprehensive Plan provides a guide for making planning and development choices by describing long-term goals for the City's future as well as policies to guide dayto-day decisions (p. I-1). The Comprehensive Plan was updated in November 2017 and includes language to promote GSI and support the GSI Plan. For example, page I-3 of the introduction describes the City's commitment to sustainable design:

- Protecting and Sustaining the Natural Environment
 - o With most of the Baylands and foothills already protected as permanent open space, the Comprehensive Plan's focus turns inward to the fragile ecosystems within developed portions of the City. The natural infrastructure, which includes a network of trees, open spaces, parks and other green spaces, and the connections between them, will provide access to nature. The City's urban forest, which benefits humans, plants, animals, and microorganisms, will be promoted throughout the City. The Comprehensive Plan fosters energy and water conservation, healthy soils, and a sustainable water supply. During the life of this Comprehensive Plan, climate change is expected to affect the City's physical infrastructure and natural ecology. To minimize these impacts, and to protect the natural environment, the City

will maintain a holistic approach to managing its creek corridors, habitat areas and green infrastructure, which have been a source of civic pride. Implementation of the climate change adaptation strategies identified in the Comprehensive Plan will ensure that Palo Alto meets today's needs without compromising the needs of future generations.

GSI references in other sections of the Comprehensive Plan include the following:

- Transportation Element
 - Policy T-4.7: Require new residential development projects to implement best practices for street design, stormwater management and green infrastructure.
 - Policy T-5.8: Promote vehicle parking areas designed to reduce stormwater runoff, increase compatibility with street trees and add visual interest to streets and other public locations...
 - Program T5.8.1: Study the feasibility of retrofitting City-owned surface parking lots to implement best management practices for stormwater management and urban heat island mitigation, including green infrastructure, permeable pavement and reflective surfaces.
 - Program T5.8.2: Identify incentives to encourage the retrofit of privately-owned surface parking areas to incorporate best management practices for stormwater management and urban heat island mitigation...
 - Program T5.8.3: Update City requirements regarding trees and other landscaping that capture and filter stormwater within surface parking lots to take advantage of new technology.
- Natural Environment Element
 - Policy N-2.1: Recognize the importance of the urban forest as a vital part of the City's natural and green infrastructure network that contributes to public health, resiliency, habitat values, appreciation of natural systems and an attractive visual character which must be protected and enhanced.

There are opportunities to expand GSI language and to clearly connect this Comprehensive Plan to the GSI Plan in the next update.

DEPARTMENT OF PUBLIC WORKS STRATEGIC PLAN (2016-2018)

The Department of Public Works Strategic Plan (2016-2018) describes the Department's vision, mission and value statements. It guides the Department to make informed decisions about where to direct resources most efficiently, as well as outlines Division goals and how to measure progress towards accomplishing them.

Language to support the GSI Plan is adequately incorporated in the current Strategic Plan, as described below:

- Public Works Engineering Services Division 3-Year Strategic Goals, Key Performance Measures & Success Indicators
 - o Reduce stormwater runoff and protect the quality of waters discharged to creeks and the Bay while improving the storm drain system.
 - Complete a Green Infrastructure work plan that includes Low Impact Design (LID) for drainage features in public and private streets, parking lots, roofs, etc., to reduce adverse water quality impacts of development and urban runoff.

The next update (planned for 2019) will reference GSI implementation progress.

PARKS, TRAILS, NATURAL OPEN SPACE AND RECREATION MASTER PLAN (2017)

The Parks, Trails, Natural Open Space and Recreation Master Plan (Parks Master Plan), updated in September 2017, presents the vision for the future of the City's parks, trails, natural open space and recreation system, based on guiding principles, goals and concepts developed through a rigorous analysis of the existing system and a robust community engagement process. This Parks Master Plan incorporates sustainable best practices in the maintenance, management and development of facilities where consistent with ecological best practices and also promotes stormwater-friendly design.

The following Policy 6.E Programs support GSI:

- Program 6.E.16: Explore stormwater runoff capture opportunities in parks for recycling in irrigation.
- Program 6.E.19: Promote urban greening by integrating stormwater design into planting beds, reducing irrigation and providing interpretive

information about park contributions to City water quality.

- Program 6.E.21: Ensure project designs for new facilities and retrofits will be consistent with sustainable design principles and practices. This includes evaluating all projects for opportunities to implement green stormwater infrastructure such as bioswales, stormwater planters, rain gardens, permeable pavers and porous concrete and asphalt.
- Program 6.E.22: Identify locations and develop swales, detention basins and rain gardens to retain and treat stormwater.

The next update of the Parks Master Plan will include language more specific to GSI and the GSI Plan. It is not considered a high priority, as this plan already supports the use of GSI, and staff is aware of moving towards integrating this approach in future work.

SEA LEVEL RISE ADAPTATION POLICY (2019)

The City's Sea Level Rise Adaptation Policy was approved by City Council in March 2019. It will be followed by a Sea Level Rise (SLR) Implementation Plan to be completed in summer 2020. The Policy defines GSI and also lists various actions to be conducted by Departments deemed necessary to support the Policy. One of those actions is Watershed Protection serving as lead for implementation of the GSI Plan. Watershed Protection staff will remain involved to ensure further integration with the upcoming development of the SLR Implementation Plan.

SEWER SYSTEM MANAGEMENT PLAN (2017)

The City of Palo Alto Sewer System Management Plan describes the City's procedures involved in the planning, management, and operation and maintenance of the City's sanitary sewer system. It was last updated in November 2017. Sections of the document offer opportunity to incorporate language in support of the GSI Plan, which will be incorporated with the next update (planned for fall 2019).

STORM DRAIN MASTER PLAN (2015)

The Storm Drain Master Plan (SDMP), updated in 2015, discusses the background, analysis, and proposed solutions for managing the City's storm drain system.

The SDMP also includes design standards for larger infrastructure projects needed to provide a 10-year storm level of drainage service throughout the City. The document briefly describes MRP LID requirements and provides references (web links) for more information on LID and GSI. Chapter 6, Section 6.6, recommends the following:

• The City should consider incorporating LID elements into street and utility improvement projects. Elements, such as sidewalk storage, bioswales in park strips, and tree preservation, can slow rainwater discharge to the storm drain system, and may reduce nuisance ponding through additional storage, although are not intended to reduce discharge to the system during larger events such as the 10-year storm.

However, the SDMP should be updated to ensure projects are properly vetted to include GSI (to treat smaller storms), that no opportunity is lost, and that the connection between the SDMP and the GSI Plan is strengthened and fully integrated. Implementation will involve establishing a policy for staff to consider this amended approach during the project scoping phase.

SUSTAINABILITY AND CLIMATE ACTION PLAN (2016)

The Sustainability and Climate Action Plan Framework (S/CAP), adopted by City Council in November 2016, is intended as a road map for development of subsequent Sustainability Implementation Plans. The S/CAP proposes high-level implementation pathways for how the City will continue its environmental stewardship, and exceed state requirements for greenhouse gas emission reductions. The S/CAP sets strategic direction and overall goals, and suggests initial priority actions. In particular, it calls out a need for a GSI policy, meeting MRP requirements, and considering GSI in future projects. Specific language incorporated in the S/CAP to support the GSI Plan includes:

- Climate Adaptation: Preparing for Change
 - o Strategy: Build resilience considerations into City planning and capital projects, especially near the Bay shoreline.
 - Pursue "green infrastructure" as required by the Regional Water Quality Control Board and as warranted by staff analysis; include supporting policies in the Comprehensive

Plan Update aimed at increasing stormwater capture and infiltration.

- Regeneration and the Natural Environment
 - o Strategy: Deploy Green Infrastructure.
 - Develop a green infrastructure policy
 - Require consideration of green infrastructure strategies whenever street or open space improvements may be made, including construction, landscaping and traffic calming projects.
 - Coordinate strategies across departments to leverage benefits. For example, reduced roadway and parking demand resulting from single occupancy vehicle-reducing transportation strategies would enable more permeable surfaces and water capture; include such economic benefits in analysis of those transportation projects.
 - Map City water flows and soil types to evaluate which types of green infrastructure investments and locations could provide greatest benefits.
 - Incentivize Green Roof Installation. Address through building policy or utility incentive the promotion of green roofs.
 - Establish City Policy on Green Streets and Green Parking Design.
 - Include Green Streets, alleys and curb cuts in street work, parking strips, planter areas of sidewalks, curb extensions, and street medians.
 - Establish City design policies to include green parking infrastructure in all new parking facilities.
 - Incorporate additional green infrastructure elements into parking lot designs, including permeable pavements installed in sections of a parking lot and rain gardens and bioswales included in medians and along a parking lot perimeter.

There is adequate language supporting the GSI Plan. The S/CAP will reference GSI progress in the 2020 Sustainability and Climate Action Plan Update.

SUSTAINABILITY IMPLEMENTATION PLAN (2017)

The 2018 -2020 Sustainability Implementation Plan (SIP), accepted in December 2017, is related to the

S/CAP and focuses on two key concerns – carbon dioxide (CO2) emissions and Water – and four key areas of activity: Energy, Mobility, Electric Vehicles, and Water. The key actions for Water include:

- Develop programs and ordinances to facilitate the use of non-traditional, non-potable water sources (e.g. graywater, stormwater, black water, etc.); and
- Develop a Green Stormwater (previously Storm Water) Infrastructure Plan to better capture and infiltrate stormwater back into the hydrologic cycle.

While the language supporting the GSI Plan is considered adequate, the SIP will reference GSI progress in its next update, which will be included in the 2020 Sustainability and Climate Action Plan Update.

URBAN FOREST MASTER PLAN (2019)

The Urban Forest Master Plan (UFMP), updated in February 2019, is a guide to how the City manages its urban forest. Elements of the UFMP include an analysis of current urban forest conditions and recommendations for future management and implementation actions. The following language to support the GSI Plan is incorporated in the UFMP:

- Vision Statement
 - Both tangible and intangible benefits of green infrastructure will be valued, and stewardship will reflect collaboration by City leaders, City staff, residents, property owners, business owners, and partners.

Although it currently supports the GSI Plan, language should be expanded in future updates to directly relate to the GSI Plan, especially regarding use of tree well filters and suspended pavement systems for capturing and treating stormwater. This will be addressed in the next update (tentatively calendar year 2020).

URBAN WATER MANAGEMENT PLAN (2016)

The City of Palo Alto Urban Water Management Plan describes the City's water demands, water supply distribution system and reliability, and guides management of the water system. It was last updated in June 2016. Various sections of the document offer opportunity to incorporate language in support of the GSI Plan, which will be incorporated with the next update (to be determined). **APPENDIX Q:** Utilities Department—Electric Fund CIP Projects for 2019-2023 (FY18 Adopted Capital Budget)



APPENDIX R: Utilities Department—Gas Fund CIP Projects for 2019-2023 (FY18 Adopted Capital Budget)



APPENDIX S: Utilities Department—Wastewater Fund CIP Projects for 2019-2023 (FY18 Adopted Capital Budget)



APPENDIX T: Utilities Department—Water Fund CIP Projects for 2019-2023 (FY18 Adopted Capital Budget)

