Low Impact Development (LID) Monitoring Plan for San Mateo County during MRP 3.0

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LIST OF ABBREVIATIONS

ACCWP	Alameda Countywide Clean Water Program
BAMSC	Bay Area Municipal Stormwater Collaborative
BMPs	Best Management Practices
COC	Chain of Custody
CWA	Clean Water Act
DMA	Drainage Management Area
EDD	Electronic Data Delivery
EMC	Event Mean Concentration
FD	Field Duplicate
FY	Fiscal Year
GSI	Green Stormwater Infrastructure
HDPE	High density polyethylene
LID	Low Impact Development
MC	Monitoring Coordinator
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
MS/MSD	Matrix Spike/Matrix Spike Duplicate
ND	Non Detect
NPDES	National Pollution Discharge Elimination System
O&M	Operations and maintenance
PCBs	Polychlorinated Biphenyls
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
RMP	Regional Monitoring Program for Water Quality in San Francisco Bay
ROS	Regression on Order Statistics
ROW	Right-of-Way
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SEBS	Styrene-ethylene-butylene-styrene
SSA	Solano Stormwater Alliance
TAG	Technical Advisory Group
TMDL	Total Maximum Daily Load
WY	Water Year
WMA	Watershed Management Area
CCCWP	Contra Costa Clean Water Program

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1.0 INTRODUCTION

This Low Impact Development (LID) Monitoring Plan describes the planned monitoring approach for bioretention facilities located in San Mateo County. These facilities are structural stormwater best management practices (BMPs) that were constructed for the treatment of stormwater runoff. This monitoring plan was developed by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP or Program) on behalf of all SMCWPPP member agencies (i.e., Permittees). SMCWPPP is a program of the City/County Association of Governments (C/CAG) of San Mateo County. Each incorporated city and town in the county and the County of San Mateo share a common National Pollutant Discharge Elimination System (NPDES) stormwater permit for Bay Area municipalities referred to as the Municipal Regional Permit (MRP; Order No. R2-2022-0018; Permit No. CAS612008). This monitoring plan will be implemented as required to result in compliance with Provision C.8.d of the MRP.

1.1. Problem Definition

Fish tissue monitoring in San Francisco Bay (Bay) has revealed the bioaccumulation of polychlorinated biphenyls (PCBs), mercury, and other pollutants in Bay sportfish. The levels found are thought to pose a health risk to people consuming these fish and as a result, an interim advisory has been issued on the consumption of sportfish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act (CWA) "Section 303(d) list" due to elevated levels of PCBs and mercury. In response, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has developed Total Maximum Daily Load (TMDL) water quality restoration programs targeting PCBs and mercury in the Bay. The general goals of the TMDLs are to identify sources of PCBs and mercury to the Bay and implement actions to control the sources of these pollutants to achieve water quality standards and restore beneficial uses (SFBRWQCB 2006, 2008). Further, pursuant to CWA §402, the MRP includes requirements to reduce pollutants in stormwater to the maximum extent practicable (MEP), which includes the use of management practices, control techniques and system, design and engineering methods for control of pollutants.

In response, SMCWPPP Permittees have implemented a variety of control measures over the past 20+ years. LID treatment measures, typically called green stormwater infrastructure (GSI), are one such control measure. LID/GSI uses vegetation, soils, and natural processes to remove pollutants from stormwater. These measures employ a variety of treatment, source control, and/or site design measures to reduce runoff and more closely mimic a site’s predevelopment hydrology by minimizing disturbed areas and impervious cover and then infiltrating, storing, detaining, evapotranspiring, and/or biotreating stormwater runoff close to its source. The most common types of LID/GSI facilities that are constructed in urban areas include bioretention, stormwater tree well filters, pervious pavement, infiltration facilities, green roofs, and rainwater harvesting and use facilities.

Over the past 10+ years, LID/GSI facilities have been implemented extensively across San Mateo County to reduce stormwater volumes and pollutant loads. These facilities treat thousands of acres of land in San Mateo County on public and private properties as a result of new development and redevelopment stormwater requirements in MRP Provision C.3 (C.3 requirements) and due to voluntary efforts by Permittees to implement GSI in streets and public rights of way (ROWs). Given the high costs of these projects and the widespread implementation across the county, additional information on the effectiveness of these measures to reduce stormwater pollutant loads is needed to better evaluate the benefits.

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1.2. Municipal Regional Permit LID Monitoring Requirements

The Regional Water Board added specific LID Monitoring requirements to the current MRP that became effective on July 1, 2022. Provision C.8.d directs Permittees to conduct LID monitoring during the permit term, and identifies specific parameters and monitoring frequencies that must be achieved to address the following management questions:

1. What are the pollutant removal and hydrologic benefits, such as addressing impacts associated with hydromodification, of different types of LID facilities, systems, components, and design variations, at different spatial scales (e.g., single control vs watershed or catchment scale), and how do they change over time?
2. What are the minimum levels of operations and maintenance (O&M) necessary to avoid deteriorated LID facilities, systems, and components that reduce pollutant removal and hydrologic performance?

In San Mateo County, a minimum of 25 water quality sampling events must be conducted during the MRP 3.0 permit term, with an annual minimum of three events beginning in Water Year (WY) 2024 (October 1, 2023 through September 30, 2024). Each sampling event must consist of paired flow weighted composite samples of the LID facility influent and effluent collected with automated samplers. Provision C.8.d.iv of the MRP specifies that all composite samples must be analyzed for total mercury, total polychlorinated biphenyls (PCBs), total suspended solids (TSS), per- and polyfluoroalkyl substances (PFAS), total petroleum hydrocarbons (TPH), total and dissolved copper, total hardness, and pH. In addition, flow must be measured at both influent and effluent sampling locations.

Permittees are required to submit LID Monitoring Plans at the regional or countywide level that demonstrate how the requirements in Provision C.8.d will be met. At a minimum, the Monitoring Plans must include the following:

a) Explain how the study(s) will address both management questions and propose monitoring questions necessary that will address both management questions.
b) Describe the LID facility(s) or system(s) and study area(s), including the characteristics, land use and management actions within the tributary drainage area to the LID facility(s) or system(s) that will be monitored.
c) List the monitoring stations, monitoring parameters, and associated measurement, sample and analytical methods that will be utilized.
d) Establish a monitoring schedule, including number and type (wet weather and dry weather) of monitoring events for each site, that may result in a greater number of total and/or annual monitoring events than the minimum required in Table 8.d.2, and including a discussion of the allocation of samples between and within sites.
e) Describe the data evaluation methods, such as statistical analyses to test whether differences in concentrations are statistically significant.
f) Include study-specific Quality Assurance Project Plans (QAPPs), which, at a minimum, are comparable to the SWAMP Quality Assurance Program Plan (QAPrP).[1]
g) Provide annual cost estimates for the implementation of the LID Monitoring Plan.
h) Explain how sampling and analytical methodologies will be regionally consistent.

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[1] The current version of the SWAMP QAPrP (January 2022) is available at: chrome-extension: //efaidnbmnnnibpcajpcglclefindmkaj/https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/swamp-qaprp-2022.pdf

Permittees must submit their Monitoring Plans to the Regional Water Board Executive Officer (EO) for approval by May 1, 2023 and must begin implementation of their approved or conditionally approved Monitoring Plans by October 1, 2023.

In addition to all of the above requirements, to assist development and implementation of scientifically-sound LID Monitoring Plans, to facilitate regional consistency with respect to sampling and analytical methodology, and to make recommendations about allocation of samples between and within different sites, Provision C.8.d.ii requires Permittees to form and convene a Technical Advisory Group (TAG). The TAG must include impartial science advisors and Water Board staff, to review and make recommendations regarding the LID Monitoring Plans (including their study design, analysis methods, results, and conclusions) prior to submission of the LID Monitoring Plans to the EO. In order to effectuate this review, the Permittees must submit their draft LID Monitoring Plans to the TAG by March 1, 2023. Prior to the EO's approval or conditional approval of the LID Monitoring Plans, the TAG must be convened at least biannually. Thereafter, it must be convened at least annually to provide continued feedback regarding the implementation of Provision C.8.d, including but not limited to study design, sample locations, and analysis methods.

[Note: Based on TAG comments following review of the draft LID Monitoring Plan, the final LID Monitoring Plan submitted to the Water Board on May 1, 2023 included analytes and monitoring elements in addition to the minimum requirements described in the MRP.]

1.3. LID Monitoring Goal and Objectives

The overall purpose of the LID Monitoring project described in this Plan is to measure compliance and effectiveness of LID controls. The specific goal of this monitoring is to provide new, regionally consistent data on the treatment effectiveness of recently constructed bioretention facilities in San Mateo County in compliance with the requirements of MRP Provision C.8.d. In order to achieve the project goal and address the management questions identified in MRP Provision C.8.d., this LID Monitoring Plan was designed to address the following three objectives.

1. To quantify the pollutant removal and hydrologic benefits of bioretention facilities, and document how they change over time.
2. To document the minimum levels of O&M necessary to avoid deterioration of the bioretention facilities and components that reduce pollutant removal and hydrologic performance.
3. To achieve regional consistency in sampling and analytical techniques among all five Bay Area counties subject to the MRP.

The LID Monitoring Plan presented here describes the monitoring that will take place in San Mateo County during the permit term (beginning WY 2024) to achieve the project goal and objectives and comply with the requirements of MRP Provision C.8.d. This monitoring will produce data that can be used to better understand the benefits of continued widespread LID/GSI implementation on pollutant loading and hydrology of receiving waters within Permittees' jurisdictions, and inform the design, construction, O&M and future implementation of LID/GSI. In the future, data from this LID Monitoring may also be used to calibrate and validate models that estimate pollutant removal effectiveness and inform sizing of LID facilities (e.g., countywide C.3 technical guidance documents, reasonable assurance analysis models, and other sizing and assessment models).

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1.4. Overall Regional Approach to LID Monitoring

This LID Monitoring Plan, and the associated QAPP, were developed by SMCWPPP in collaboration and cooperation with the other Bay Area countywide stormwater programs that represent municipalities subject to the MRP, including:

- Alameda Countywide Clean Water Program (ACCWP);
- Contra Costa Clean Water Program (CCCWP);
- Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP); and
- Solano Stormwater Alliance (SSA).

SMCWPPP and the other Bay Area stormwater programs have developed county-specific study designs for LID monitoring that will, at the regional level, evaluate a broader range of LID facility types, systems, components, design variations, and spatial scales. Furthermore, because different sites provide different opportunities, the county-specific study designs are tailored to the locations and facility characteristics of the sites within each county, while also addressing the specific monitoring requirements identified in MRP Provision C.8.d. The county-specific study designs include the following components (as applicable):

- The minimum monitoring requirements identified in MRP C.8.d (all counties);
- Continuous flow monitoring throughout the rainy season (all counties);
- Maintenance assessment at each facility prior to storm event monitoring (all counties);
- Monitoring to assess water storage within a facility and evaluate exfiltration to native soils at all sites with open or partially open bottoms to support assessment of the water balance at each facility – Contra Costa, San Mateo, Santa Clara, and Solano County sites; and
- Monitoring to assess maintenance frequency and/or level-of-effort at sites across the region that have varying levels of maintenance, and/or at paired sites that have similar locations and facility designs but different maintenance frequencies (i.e – Alameda County sites).

The sites selected for LID monitoring across the region, and any site-specific study design variations are summarized in Section 2.1 and presented in detail within each county's LID Monitoring Plan.

The LID Monitoring Plan presented here provides the study design for LID Monitoring in San Mateo County during MRP 3.0. The planned LID monitoring in San Mateo County will provide regionally consistent information relevant to the two management questions at two bioretention facilities that were recently constructed (2020) in the City of Brisbane, CA.

1.5. Project Organization

The SMCWPPP Program Manager (PM) will be responsible for overall Project implementation. The Project Team (currently Program Staff, EOA, Inc. and Kinnetic Environmental, Inc. (KEI)) will be responsible for all aspects of design and implementation of the monitoring, data management, quality assurance, and reporting functions. Municipal staff in Brisbane, or any other cities where monitoring sites are located, will support the Project Team by providing assistance with permitting, servicing and maintenance of facilities, and other support as required.

In addition, a regional LID monitoring workgroup has been formed through the Bay Area Municipal Stormwater Coalition (BAMSC) with representatives from each of the five Bay Area counties subject to the MRP along with their monitoring contractors. The purpose of the BAMSC LID Monitoring Workgroup

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is to ensure consistency in sampling and analytical techniques across all five Bay Area counties (Objective #3). SMCWPPP Permittees are active participants. In addition to SMCWPPP, the countywide programs participating in the BAMSC LID Monitoring Workgroup include: ACCWP, CCCWP, SCVURPPP, and SSA.

The BAMSC LID Monitoring workgroup meets approximately every other month to coordinate development and implementation of LID Monitoring Plans and convening and facilitation of the LID TAG. Further, the five BAMSC stormwater programs above agreed to develop and abide by a single, common QAPP for all LID Monitoring conducted during the permit term (AMS 2024). The QAPP is provided as a companion document to this Plan. All Programs will use common sampling methods and will employ common laboratories using the same methods for all analyses. The Programs will also use a regionally-developed maintenance assessment form to gather consistent data on maintenance status at each of the monitored LID treatment facilities across the region. The use of a common QAPP, sampling methods, data collection forms, laboratories and analysis methods will help ensure regional consistency in sampling and analytical techniques and comparable results.

The BAMSC LID Monitoring Workgroup will continue to meet throughout the permit term, as needed, to continue to facilitate and incorporate TAG input on monitoring plans, discuss monitoring issues that may arise in the future, and generally support continued regional consistency.

1.6. LID Monitoring Plan Revisions

In August 2023, the Regional Water Board submitted a *Conditional Approval Letter* to the five Bay Area countywide stormwater programs (ACCWP, CCCWP, SCVURPPP, SMCWPPP, and SSA). The conditional approval identified a number of revisions and new requirements that Water Board staff identified as necessary to approve the LID Monitoring Plans. Over the next several months, representatives from the five Bay Area stormwater programs met with Water Board staff to discuss the new requirements. The TAG provided input on these new requirements at a third TAG meeting held in April 2024. The stormwater programs developed proposals for revising their LID Monitoring Plans to meet the new requirements. These proposals were submitted via email to Keith Lichten, Division Manager of the Watershed Management Division for the SF Bay Regional Water Quality Control Board on May 17, 2024 and August 20, 2024. On August 30, 2024, Keith Lichten sent a confirmation email to the stormwater programs that the proposals for LID Monitoring Plans were acceptable. The stormwater programs agreed to re-submit their revised LID Monitoring Plans to the Regional Water Board on October 31, 2024.

This Revised LID Monitoring Plan incorporates all of the agreed-upon revisions to the SMCWPPP LID Monitoring Plan, as documented in the email exchanges described above. This revised LID Monitoring Plan incorporates all requirements in MRP Provision C.8.d, and all of the new requirements that were suggested by the TAG and/or subsequently requested by the Regional Water Board staff. These new requirements include additional of the following analytes and measurements parameters:

- Dissolved Mercury
- Total and Dissolved Zinc
- Continuous flow monitoring throughout the wet season
- Continuous water-level monitoring within the LID facilities throughout the wet season
- Targeting the first storm event of the season for water quality monitoring after Year 1
- Installation of a rain gauge at each site

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- Procedural blanks of used tubing at the end of each season for influent/effluent tubing at every faciality beginning Year 1; evaluation of results will determine the level of effort needed in future years.
- Additional data evaluation
- Addition of a regional analysis of the data in the Water Year 2025 Integrated Monitoring Report (Year 4 of MRP).

1.7. Adaptive Management

This monitoring plan lays out a detailed approach for addressing respective management and monitoring questions and achieving compliance with MRP permit conditions and the additional requirements added during the EO approval process through monitoring conducted by the collaborating stormwater Programs. Various aspects of sample collection, analysis, and interpretation have been identified and will be followed in a regionally-consistent fashion.

It is understood, however, that changing circumstances or understanding gained through Project implementation may require modifications to the overall monitoring approach or site-specific protocols to best meet monitoring objectives. The monitoring program therefore acknowledges and incorporates some degree of adaptive management into its operating procedures.

Recognizing that the scale and relative urgency of issues faced may vary significantly over the course of Project implementation, the Plan allows field staff to use best professional judgment (BPJ) to modify protocols identified in this Plan to respond to changing conditions in the field that require immediate action or risk jeopardizing data collection efforts. Examples of issues that could be documented and reported later include slight changes to mobilization or storm definition criteria, minor equipment concerns or data gaps (e.g., in flow monitoring), and occasional on-site maintenance of facilities to remove impediments to monitoring.

More substantive issues and those affecting regional implementation may require a higher level of coordination with, for example, one or more collaborating Programs, external technical advisors, or Water Board staff. In each instance, Project participants will document conditions that require modifications to this Plan and response actions. For those issues that require a higher level of review, Program representatives will coordinate directly with Water Board staff, who will make the determination whether additional input of TAG or other parties is warranted. Examples of issues that would require more immediate coordination would include major changes to sample collection protocols, consideration of alternative monitoring sites or major structural changes to existing sites, and significant quality assurance concerns. In any event, significant changes to monitoring protocols, implementation, etc., will not be made without notification being made to the Water Board.

Changes adopted over the course of Project implementation will be formalized in addenda to this monitoring plan on an annual basis or other frequency as appropriate.

1.8. Monitoring Plan Organization

This LID Monitoring Plan provides the study design and the sampling and analysis plan for San Mateo County during MRP 3.0. This plan is organized as follows:

- Section 1 – Introduction
  - LID Monitoring Goal and Objectives
  - Overall Regional Approach to LID Monitoring

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  - Project Organization
  - LID Monitoring Plan Revisions
  - Adaptive Management
  - Monitoring Plan Organization
- Section 2 –Site Locations and Local LID Facility Characteristics
  - Sites Selected Across the Region
  - Site Selection in San Mateo County
- Section 3 – Sampling Design and Rationale
  - Overall Monitoring Approach
  - Stormwater Sampling
  - Assessing O&M
  - Monitoring Frequency and Schedule
- Section 4 – Laboratory Analysis
- Section 5 – Field Methods and Procedures
  - Monitoring and Sampling Equipment
  - Sampling Procedures
- Section 6 - Sampling Containers and Handling
- Section 7 - Disposal of Residual Material
- Section 8 - Sample Documentation
- Section 9 – Quality Control
- Section 10 - Field Variances
- Section 11 – Field Health and Safety
- Section 12 – Data Evaluation
- Section 13 -Cost Tracking
- Section 14 – References
- Attachments:
  - A: Regional Maintenance Assessment Form
  - B: Field Monitoring Standard Operating Procedures (SOP)
  - C: Field Datasheets
  - D: LID Field Blank Standard Operating Procedure

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2.0 Site Locations and GSI/LID Facility Characteristics

2.1. Sites Selected Across the Region

Across the five Bay Area counties, a total of eight sites have been selected for LID monitoring during the permit term. Table 2.1 presents a summary of these site locations, GSI/LID facility characteristics, and any site-specific study design variation applicable at a given site. Additional information on consideration of countywide and regional representativeness of these sites is presented below.

All of the facilities selected for LID monitoring across the region are public projects. In contrast, the vast majority of LID facilities across the region are private MRP Provision C.3-regulated projects. However, although not all of the sites selected for LID monitoring are C.3 regulated projects, they all followed many of the same C.3 design and sizing requirements, and include many of the features that are generally representative of the types of LID facilities that have been constructed across the region. In addition, all the facilities selected for monitoring are bioretention facilities, which is by far the most common type of LID facility that has been constructed to date in the Bay Area. Bioretention areas are depressed landscaped areas that consist of a ponding area, mulch layer, plants, and a special biotreatment soil media composed of sand and compost, underlain by drain rock and an underdrain, if required. Bioretention is designed to retain stormwater runoff, filter stormwater runoff through biotreatment soil media and plant roots, and either infiltrate stormwater runoff to underlying soils as allowed by site conditions, or release treated stormwater runoff to the storm drain system, or both. They can be of any shape and are adaptable for use on a building or parking lot sites or in the street ROW. These systems primarily remove contaminants using physical filtration, although sedimentation and sorption also occur. Typically, effluent is consistent in quality, but often lower quality than sedimentation-based systems (i.e., extended detention ponds).

Two of the bioretention facilities selected for monitoring across the region are lined, while the rest are unlined. Unlined facilities are much more common across the region because MRP Provision C.3.d encourages projects that maximize infiltration to native soil. The facility construction dates range from new construction to facilities that were constructed in 2014. Most facilities were built in the last four years. These facilities drain catchments with various land uses, including old industrial, old commercial and transportation, old residential, new urban, and open space.

The design of all the facilities selected for monitoring generally followed each Countywide program's C.3 stormwater handbook, which provides guidance on designing facilities to meet MRP requirements. These guidelines are intended to ensure design and construction consistency across projects of the same type (i.e., bioretention facilities). Across the region, the range of drainage management area (DMA) sizes is relatively small, spanning 0.13 acres up to 1.7 acres. Facility sizing ratios (facility surface area to DMA size) range from 2% to 8%. Although most of the facilities selected for monitoring are not C.3 regulated projects, all of these facilities were sized to meet the minimum C.3.d sizing criteria. Ponding depths range from 6 to 12 inches, while all facilities include 18 inches of bioretention soil media overlain on 12 inches of permeable gravel. All of the facilities have bioretention soil media that meets the BASMAA specifications as required of C.3 regulated projects. All of the facilities have underdrains, which are located within the gravel drainage layer. These features are generally typical of LID facilities across both the county and the region.

In combination, the sites selected for LID monitoring across the region represent a typical range of bioretention facilities, systems, components, design variations, and spatial scales for evaluation that will address the broad MRP management questions.

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Table 2.1. Bay Area Municipal Stormwater Collaborative Low Impact Development (LID) monitoring sites across five Bay Area counties: Alameda, Contra Costa, San Mateo, Santa Clara and Solano, CA.

County	Site Location	Facility Type	Lined / Unlined	Under-drain	Soil Type (Unlined Facilities)	Year Built	# inlets	Facility Drainage Management Area (acres)	Facility Size (sf)	Meets C.3.d Sizing Criteria	Sizing Method	Ponding Depth (inches)	Mulch Depth (inches)	Soil Mix Depth (inches)	Gravel Layer Depth (inches)	Location of Underdrain	DMA Land Use	DMA % Impervious	Primary Land Use Types in Vicinity of Facility
Alameda	Admiral Toney Way Oakland (Site #18W)	Bioretention Planter Box	L	Yes	na	2019	4	0.22	325	Yes	Flow-Volume Combo	6	0	18	12	~middle of gravel layer (4" perforated PVC)	Street	100%	Old Industrial
Alameda	Admiral Toney Way Oakland (Site #18E)	Bioretention Planter Box	L	Yes	na	2019	3	0.35	286	Yes	Flow-Volume Combo	6	0	18	12	~middle of gravel layer (4" perforated PVC)	Street	100%	Old Industrial
Contra Costa	Fairmount Ave/ Ohlone Greenway El Cerrito	Bioretention	U	Yes	D	2014	2	1.70	2,460	Yes	Flow-volume combo	6	3 (wood) or 5 (rock)	18	12	~middle of gravel layer (6" perforated PVC)	Street and pedestrian/ bicycle path	70%	Old Residential and Old Commercial
Santa Clara	First Street San Jose-TCM #6	Bioretention	U	Yes	D	2022	2	0.304	285	Yes	Flow-Volume Combo	12	3	18	12	~bottom of gravel layer	Street	70%	Residential and Open Space
Santa Clara	First Street San Jose-TCM #4	Bioretention	U	Yes	D	2022	2	0.194	180	Yes	Flow-Volume Combo	12	3	18	12	~bottom of gravel layer	Street	70%	Residential and Open Space
San Mateo	Mariposa Street at Visitacion Brisbane	Bioretention	U	Yes	D	2020	4	0.132	438	Yes	Flow-Volume Combo	6	3	18	12	6" from bottom of permeable rock layer	Street	30%	Commercial
San Mateo	Santa Clara Avenue at San Bruno Avenue Brisbane	Bioretention	U	Yes	D	2020	2	0.34	350	Yes	Flow-Volume Combo	6	3	18	12	6" from bottom of permeable rock layer	Street	30%	Residential
Solano	Lotz Way & Civic Center Drive Suisun City	Bioretention	U	Yes	D	2024	1 inlet to water quality monitoring cell (9 total to feature)	~1.4 ac (total drainage to feature is ~4.3 ac)	~1,000 sf (entire feature 4,856 sf)	Yes	Flow-Volume Combo	6	0	18	12	6" minimum from bottom of permeable rock layer	Amtrak Park & Ride Parking Lot, and Highway 12 off ramp	70%	Transportation

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2.2. Site Selection in San Mateo County

Appropriate site selection is a critical factor in achieving the desired project outcomes. The Project Team implemented an exhaustive selection process to identify sites to conduct the LID monitoring in San Mateo County, as described in this Plan. Site selection criteria were identified to ensure the locations selected could accommodate all of the monitoring requirements in the MRP, be safe for field staff and equipment, and provide meaningful data on LID effectiveness in San Mateo County. Site selection criteria included:

- Public projects – to facilitate site access and permission to install equipment.
- Projects built in 2013 or later – to ensure the facility meets MRP sizing and design criteria.
- Drainage area should include old industrial and/or other old urban land uses (preferred) – to increase the likelihood that the influent contains measurable quantities of the required monitoring analytes.
- Projects must be able to accommodate all MRP monitoring requirements:
  - Must have an accessible underdrain for effluent sampling;
  - Effluent sampling location must be a point location that drains all flows discharging through the bioretention media in the facility and isolated from other flows (i.e., no co-mingling with overflow);
  - Must have a single Influent location for sampling (i.e., no sheet flow into the facility);
  - Influent/effluent locations must be able to accommodate the sampling equipment and have adequate drop to allow flow measurement and collection of water quality samples; and
  - Must have adequate space to install a utility box to house sampling equipment for the duration of the project that does not impede the flow of traffic or pedestrians.
- Safe location – a location that is safe to access prior to, during, and after storm events, and is safe to store equipment and reduce the risk for vandalism.

For practical purposes, the Project Team determined that monitoring should be conducted at a minimum of two LID facilities in order to meet the required number of sampling events (n=25) that must be collected during the permit term in San Mateo County. To identify potential project sites, the Project Team conducted a desktop review of all existing public GSI facilities in San Mateo County to identify potential project sites that appeared to meet the above requirements. The next step involved field reconnaissance during dry weather to verify site conditions and design features. The final step involved field reconnaissance during wet weather to observe flow patterns into and out of the facilities during storm events and to verify the systems were functioning as designed. Initially, the Project Team identified ten sites that appeared to meet the minimum site selection criteria based on desktop review. However, after site visits, the Project Team determined that the vast majority of public GSI projects that have been constructed to date in San Mateo County have one or more design or logistical features that preclude selection for this LID monitoring project. Two projects were identified that meet the above site selection criteria, include all the design features necessary to conduct the MRP-required monitoring, and were observed to function properly during wet weather flow conditions. Both projects are public green street projects that include bioretention facilities, located in the City of Brisbane, CA.

Additional information about the project facilities selected for monitoring during MRP 3.0 in San Mateo County and details of locations and the specific GSI/LID facility characteristics are provided below. Neither of these sites have any previous LID monitoring data available.

2.3. Brisbane Green Street Projects

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There are two green street facilities that have been selected for LID monitoring in the City of Brisbane: (1) Mariposa Street Bioretention Facility, and (2) Santa Clara Street Bioretention Facility. Both facilities were constructed in 2020 as part of the Brisbane Safe Routes to School and Green Infrastructure Project (this is not a regulated project built for credit towards C.3.j), which included construction of multiple bioretention facilities along school routes in Brisbane. None of the other LID facilities in the Brisbane Safe Routes to School Project are suitable for monitoring using the methods prescribed in the MRP.

2.3.1. Catchment Description

The Brisbane Safe Routes to School and Green Infrastructure Project is within a 1,639-acre catchment identified as Watershed Management Area (WMA) # 17 located mostly within the City of Brisbane (Figure 2.1). Stormwater in the catchment drains to Guadalupe Valley Creek which flows to Brisbane Lagoon, a remnant of San Francisco Bay formed with the construction of Highway 101. The catchment consists of 9 acres of new urban, 191 acres of old industrial, 90 acres of old commercial/old transportation, 324 acres of old residential, and the rest is open space. In addition to the Mariposa Street and Santa Clara Street bioretention facilities, there are eight other GSI/LID projects in the catchment.

2.3.2. Mariposa Street Bioretention Facility Description

The Mariposa Street bioretention facility is located on Mariposa Street at the corner of Visitacion Avenue in “downtown” Brisbane (Figure 2.2). The project consists of a 438 square foot (SF) stormwater planter box with concrete retaining curbs located along the street and has multiple curb openings that allow flow directly from the street and sidewalk into the facility. Drainage flows into the facility from two different directions. Flows move north along Visitacion Avenue and around the corner on Mariposa Street to enter the facility at one end. At the other end, flows move west down Mariposa Street to the facility. The 0.13-acre drainage area is comprised of impervious street surfaces in an old commercial land use area. The facility was oversized to capture a 0.2 in/hour storm event for the drainage area with less ponding depth.

2.3.3. Santa Clara Street Bioretention Facility Description

The Santa Clara Street bioretention facility is located on Santa Clara Street at the corner of San Bruno Avenue across from Brisbane Elementary School (Figure 2.2). This project consists of a 350 SF stormwater planter box with concrete retaining curbs adjacent to the street. A sidewalk separates the planter box from the street. Because this facility was constructed along a sloping street, a concrete check dam was constructed at the mid-point of the planter box to slow flow coming into the facility from the uphill drainage area (Figure 2.3). The planter box has two openings to allow flow from the street into the facility through trench drains. Most of the flow enters the system through the primary opening located at the upstream end of the facility. The retaining wall also has 4 inch drainage notches to allow flow from the sidewalk into the facility. The facility was initially sized to treat flows from a 0.2 inch/hour rainfall event for the drainage area. However, as construction began, utility conflicts were discovered that necessitated a move to the opposite side of the street. The drainage area for the new location was about 40% larger (0.34 acres). Unfortunately, due to space constraints at the new location, the facility size could not be increased and the constructed facility is undersized for the new drainage area. The 0.34-acre drainage area is comprised of impervious surfaces in an old residential land use area.

2.3.4. Design Features

The design features of both Brisbane green street facilities are shown in Figure 2.4. These bioretention facilities consist of 6 inches of ponding depth, 18 inches of bioretention soil mix and 12 inches of class II permeable gravel. Each facility has one outflow via a 4-inch perforated underdrain pipe that runs the

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length of the facility (passing through the check dam at the Santa Clara Street facility) and connects to the municipal separate storm sewer system (MS4). Each facility also contains an overflow riser that allows direct flow to the storm drain in the event of excess flows. The overflow riser provides access to the underdrain pipe for effluent sampling. Neither facility has an impermeable liner, allowing some infiltration of treated water.

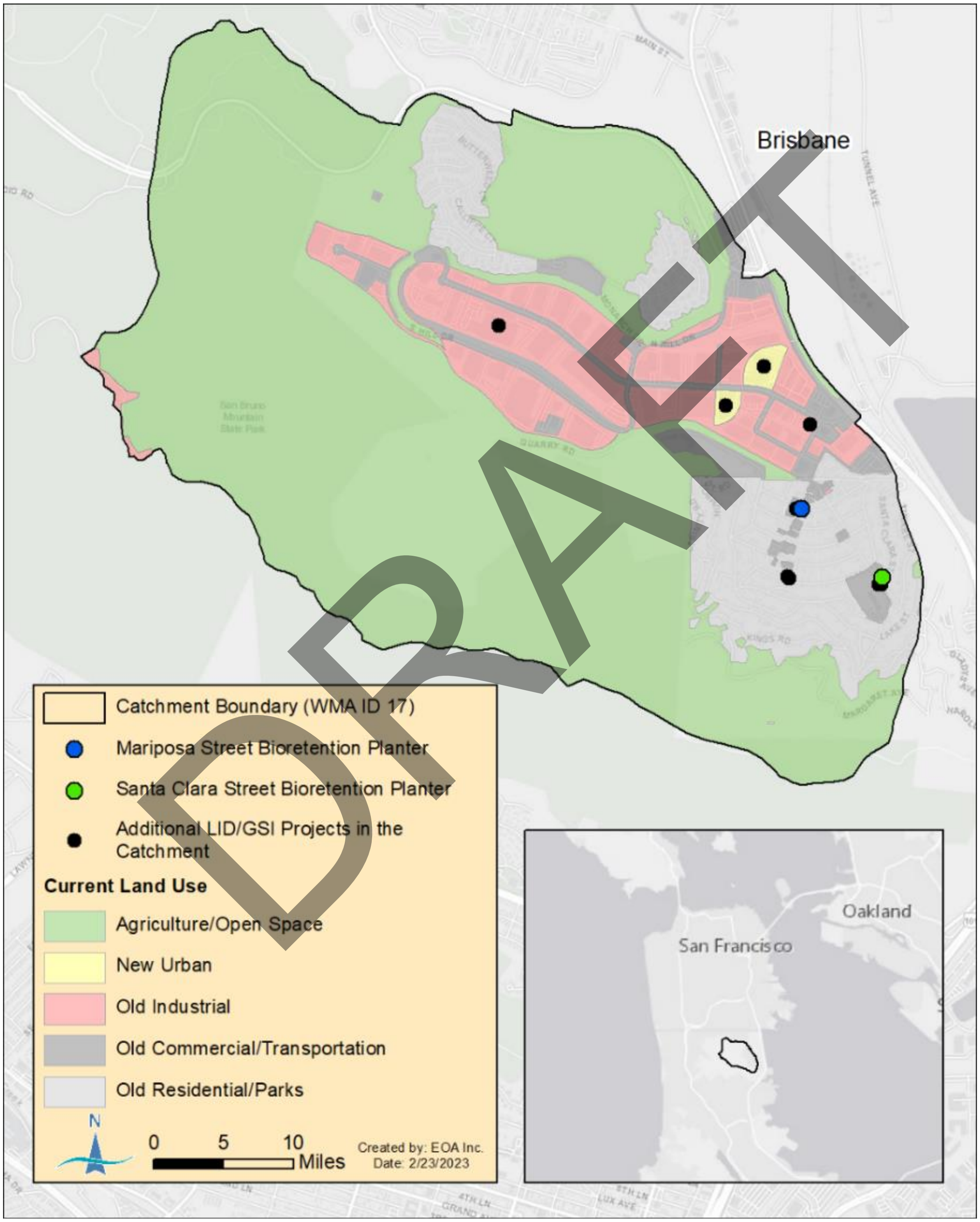

Figure 2.1. Location of two potential LID monitoring sites located in Watershed Management Area (WMA) #17 in the City of Brisbane.

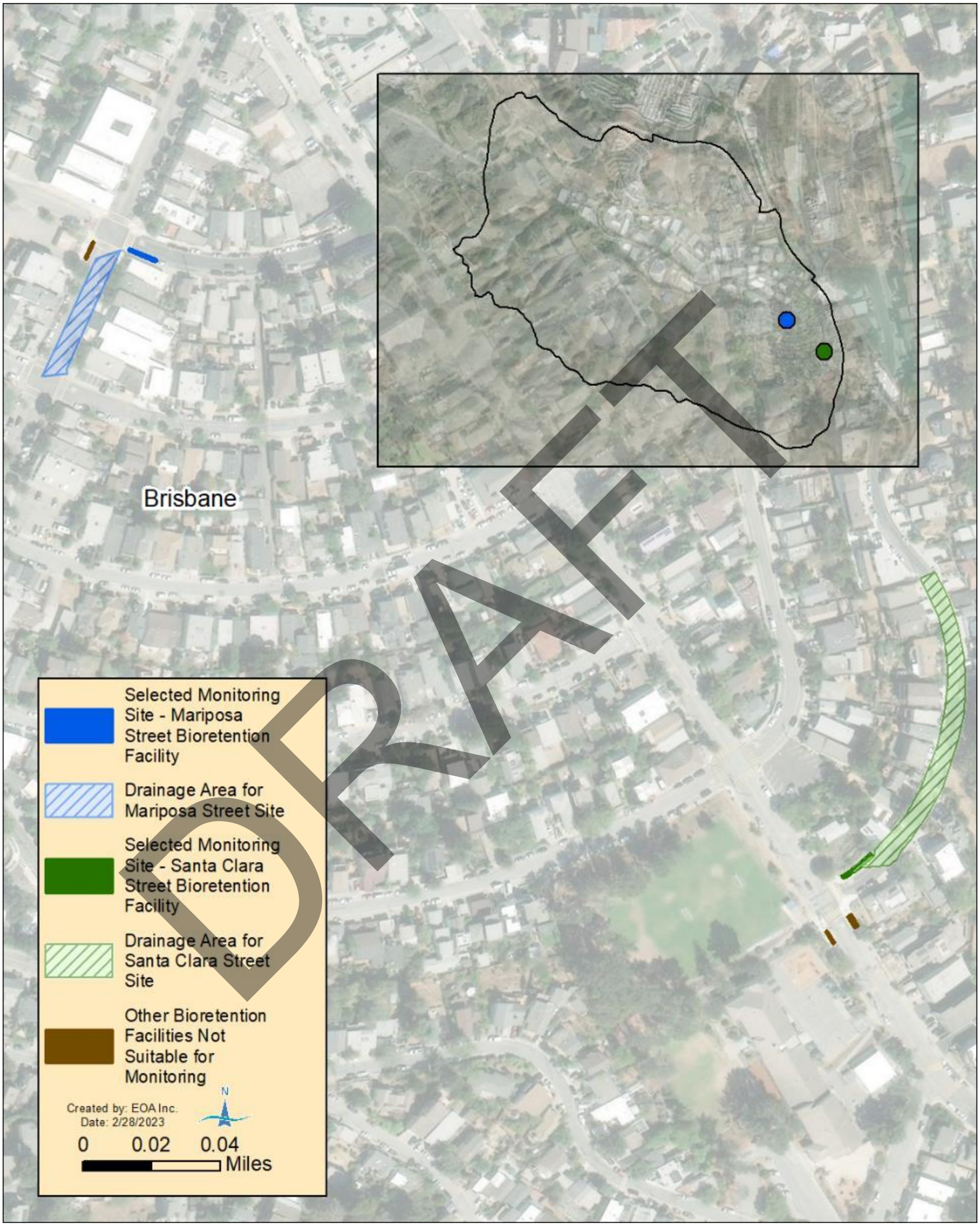

Figure 2.2. Location of bioretention facilities on Mariposa Street and Santa Clara Street in Brisbane, CA.

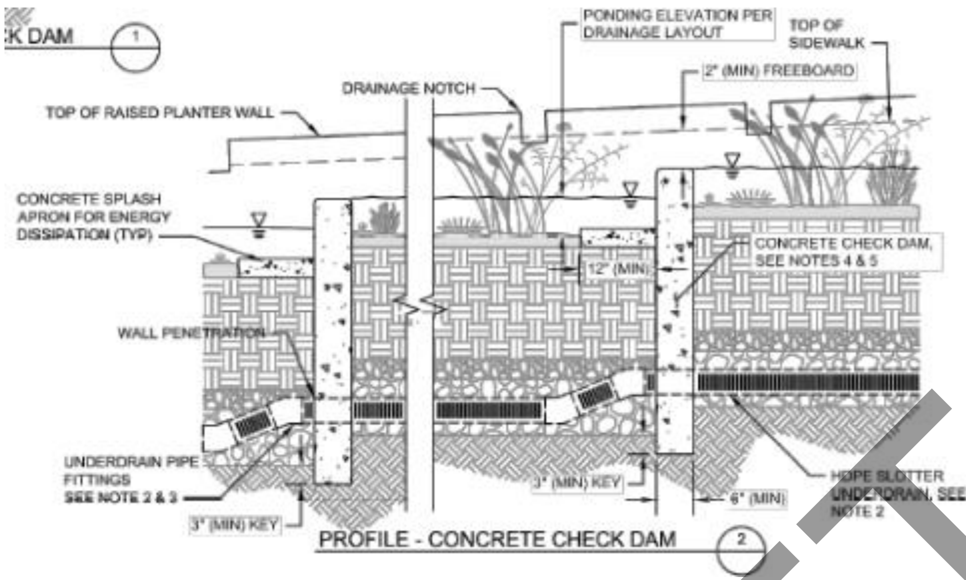

Figure 2.3. Design details showing the profile and concrete check dam at the Santa Clara Street bioretention facility, Brisbane, CA.

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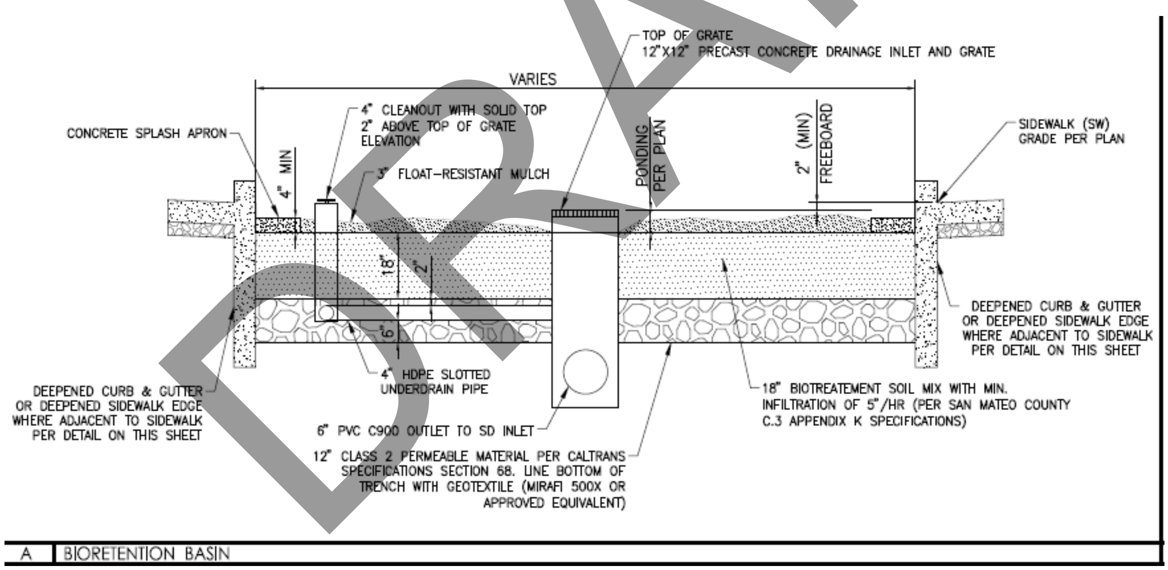

Figure 2.4. Typical design detail of the Mariposa Street and Santa Clara Street bioretention facilities, Brisbane, CA.

3.0 SAMPLING DESIGN AND RATIONALE

3.1. Overall Monitoring Approach

The Project Team identified two main monitoring tasks to address the management questions identified in Section 1.1 and to accomplish the monitoring goal and objectives.

Task 1 – Stormwater Sampling. This task will conduct stormwater sampling of paired influent and effluent water quality and flow volume at two LID/GSI facilities in San Mateo County during multiple storm events throughout the permit term. When possible, the first storm event of each wet season will be specifically targeted for monitoring. Stormwater sampling will provide data on individual bioretention facilities treating defined drainage areas to evaluate the pollutant removal and hydrologic benefits of these facilities and changes over time (Management Question 1). Flow-weighted composite samples will be used to estimate pollutant treatment effectiveness (including percent removal of sampled pollutants) by comparing influent vs. effluent water quality at each monitoring location, and documenting the overall quality of the effluent. Stormwater concentration measurements are focused on PCBs and mercury as well as other parameters required by the MRP and added through the TAG review and RWB EO conditional approval process. Hydrology will be evaluated by identifying sources and sinks of water flow into and out of each facility and directly measuring each where possible. Specific monitoring questions that can be addressed by the water quality and hydrologic monitoring described here include:

1. Are there significant differences between influent water quality and effluent water quality for individual analytes?
2. How does pollutant treatment effectiveness for sediment-associated pollutants[2] (e.g., TSS, PCBs, total mercury, total copper, total zinc,) compare with those that are not sediment-associated?[3] (e.g., dissolved mercury, dissolved copper, dissolved zinc)?
3. Does the facility effluent achieve water quality goals?
4. How much does the treatment facility reduce runoff volumes?
5. How does the combined effect of treatment (i.e., pollutant concentration reduction/enhancement and runoff volume reduction) affect loads to receiving waters?
6. How much runoff that enters the facility is fully treated vs. overflows the facility?
7. How much does the treatment facility decrease peak runoff rates?

- Task 2 – Assessing O&M Impacts. This task will document ongoing O&M actions at monitored LID/GSI facilities in San Mateo County throughout the monitoring project, including periodic site assessments to evaluate the necessary level of O&M required to maintain proper functioning of the facilities. Documenting O&M actions will provide qualitative and quantitative data to assess the effects of maintenance efforts upon facility performance and identify the necessary level of

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[2] Sediment associated contaminants are pollutants whose physicochemical properties promote adherence, or sorption, to sediment rather than dissolving in water. While the total fractions are listed for metals as sediment associated contaminants, more accurately it is the particulate fraction of metals which is the difference between the total metal concentration and the dissolved metal concentration.

[3] Non-sediment associated pollutants include pollutants whose physicochemical properties promote dissolving in water rather than adherence, or sorption, to sediment.

O&M at each site to ensure proper functioning of the facility. Monitoring questions for this aspect of Project implementation include:

1. Is the manufacturer / designer recommended level of maintenance sufficient to achieve optimal system performance?
2. Do the results suggest needed changes to the recommended inspection and maintenance protocols and/or facility design?
3. How does flow into the facilities vary over time elapsed from previous maintenance?
4. How do pollutant concentrations vary as a function of time elapsed from previous maintenance?
5. What were the catchment conditions that may have affected observed variations in flow?
6. What is the relationship between the characteristics of the tributary drainage area (in particular, with respect to pollutant/sediment loading) and how does this relate to maintenance need and performance of the facility?

Additional details on each of these tasks and how they will be addressed through Project implementation are provided below. Note, there is an underlying dynamic of conflict between monitoring requirements specified in MRP 3.0 and requirements associated with implementation of standard sampling and analytical methods and protocols. Therefore, compromises between these two dynamics have been made. When faced with these conflicts for a given collection / analysis, this monitoring plan favors permit compliance over strict adherence to standard methods. Details of the field sampling methods and specific considerations for each analyte are discussed in full in Section 5, Field Methods and Procedures.

3.2. Stormwater Sampling

Stormwater sampling will involve the collection and analysis of flow-weighted composite water quality samples at paired influent and effluent sampling stations. Paired influent-effluent studies compare simultaneous samples taken of inflow and outflow from an LID feature. Paired samples allow for fewer samples to be used to establish levels of pollutant reduction compared to unpaired samples saving collection and analysis costs. However, one limitation of the paired sampling approach is that since paired influent-effluent studies require fewer sites to establish a reduction it can be difficult to compare the performance of different types of LID features at different sites given the potential for drastically different loading scenarios for each site.

Stormwater sampling will also include monitoring runoff volume and flow rates at influent, effluent and overflow sampling stations. Overflow refers to the water that has entered the facility and is partially treated, but discharges through the riser to the MS4 instead of through the underdrain. Street bypass is flow that does not enter the facility through the inlet(s), but continues to flow untreated down the curb. Street bypass will not be measured. Measurement data on flow rates at the influent, effluent and overflow sampling stations will be used to evaluate hydrologic performance, measure the total storm volume, and to facilitate collection of automated, flow-weighted, whole-storm composite water samples. Volume measurement is essential to estimate the effectiveness of LID sites. The sources and sinks of water flow into and out of each facility will be identified and directly measured where possible to support water balance evaluation. Additional site-specific indicators of hydrologic function and flow balance will be measured as appropriate for each facility to better evaluate water balance, as described in Section 3.2.5.

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3.2.1. Definition of a Storm

Since the estimation of event mean concentrations (EMCs) is an MRP requirement, whole-storm composite samples must be collected and analyzed. Previous discussions with TAG members have indicated a preference for conducting water quality monitoring under a variety of storm types in order to better understand performance of monitored facilities under representative environmental conditions. BAMSC Programs have developed the following guidelines to incorporate structure consistent with other monitoring projects while allowing flexibility for Programs to tailor monitoring efforts to site-specific conditions. In this way, collaborating Programs will have a consistent basis for selecting and monitoring target storms while allowing for flexibility in implementation to address site-specific differences (e.g., in water quality entering the facility, storm size required to generate effluent, and lag time between influent and effluent flow).

The Project definition of a whole storm was compiled from definitions and guidelines used by Caltrans and EPA for prior monitoring efforts and is taken from the Caltrans Stormwater Monitoring Guidance Manual ((Caltrans 2020, Caltrans 2023, USEPA 2018), as follows:

- "A storm with precipitation of 0.10 inches or greater that produces measurable discharge and that occurs at least 72 hours from the previous measurable (greater than 0.10 inch precipitation) storm event. However, the 72-hour antecedent dry period requirement may be waived at times to ensure that Project data sets are not biased with antecedent dry periods consistently greater than 72 hours (Caltrans 2020).
- The storm event begins with a period of six consecutive hours with cumulative precipitation of at least 0.10 inches.
- The storm event ends with a period of between 6 and 24 consecutive hours, each hour with precipitation less than or equal to 0.010 inches."

3.2.2. Weather Tracking and Monitoring Preparation

SMCWPPP's Monitoring Coordinator (MC) will review the relevant weather forecasting tools, including National Weather Service forecasts (http://www.weather.gov/), and will track potential rainfall events. Targeted monitoring events should have an associated quantitative precipitation forecast (QPF) of at least 0.20" over twelve hours, and a probability of precipitation (POP) of at least 70% reported by the National Weather Service, San Francisco Office. Once an event is selected for possible mobilization, field staff will be notified (ideally 72 hours before predicted arrival) and staff will be placed on altert. At this point, field staff will conduct the following activities:

1. Alert lab(s) of possible monitoring activities;
2. Assemble field equipment, including sample containers;
3. Prepare field log forms, chain of custody forms and sample labels;
4. Schedule personnel and vehicles as required for field activities; and
5. Test / calibrate field equipment, as required.

At approximately 24 hours before the predicted event start time, the MC will notify field staff about the likelihood of monitoring the storm based upon the most recent forecast. When and if a new weather forecast occurs after this point or at approximately 12 hours before the predicted event (whichever occurs first), the MC will coordinate with field staff to determine whether to stand down, delay the proposed start time, or initiate monitoring activities. If monitoring is initiated, field staff will initiate the following activities:

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1. Perform a pre-storm site inspection (during daylight hours, if possible);
2. Inspect monitoring equipment (tubing, connections, electronics, etc.);
3. Calibrate water level sensors;
4. Replace peristaltic pump-roller tubing;
5. Ensure 12-volt batteries are fully charged; replace as necessary;
6. Program autosamplers and datalogger/controllers;
7. Install clean bottles in autosamplers; and
8. Ensure a sufficient quantity of wet ice is installed in autosamplers.

At any time prior to initiation of monitoring activities, the MC may tell field staff to stand down. This may be done based upon safety considerations, equipment issues, updated weather forecasts, or other reasons. Upon being informed to stand down, field crews will then:

1. Return sampling site to its pre-sampling condition; and
2. Inventory, clean, organize, and prepare sampling equipment for next event.

As the storm season progresses, storm event mobilization criteria may be modified based upon the number of successfully monitored storms, the magnitude and presentation of storms monitored, the performance of a given facility during specific storm events, and the expected number of storms for the remaining wet season.

3.2.3. Sampling Stations

Each LID facility selected for monitoring during this project will include a minimum of four sampling stations: (1) an influent sampling station, (2) an effluent sampling station, and (3) an overflow sampling station, and (4) a monitoring well (i.e., piezometer) installed within the facility to evaluate water storage within the facility and exfiltration to native soils. Additional site-specific details about each sampling station are provided below and in Section 3.2.5. Sampling stations for each of the two facilities that will be monitored (Mariposa Street Bioretention Facility and Santa Clara Street Bioretention Facility) are shown on Figures 3.1 and 3.2. Each of these facilities has multiple curb openings to allow inflow to the units. At the Mariposa Street facility, the influent sampling station will be configured with a tray between the roadside inlets to allow flows to comingle prior to sampling. At the Santa Clara Street facility, the primary inlet will be sampled; only minimal runoff enters through other inlets. The effluent sampling station at each facility will be located within the underdrain pipe as it discharges into the overflow riser vault. Each of these facilities will also have an overflow sampling station to measure the flow that enters the facility, but exceeds the facility's filtration capacity and flows directly to the overflow drain. Overflow is partially treated by detention within the facility but not fully treated by filtration through soil media. Water storage within the facility and exfiltration to native soil (i.e., discharge to groundwater) will be measured during each wet weather season beginning in WY 2025. A single, shallow monitoring well (i.e., piezometer) will be installed in the approximate geographical center of the facility and outfitted with a pressure transducer to measure hydrostatic water pressure within the well and record water depth once per minute throughout the wet weather season.

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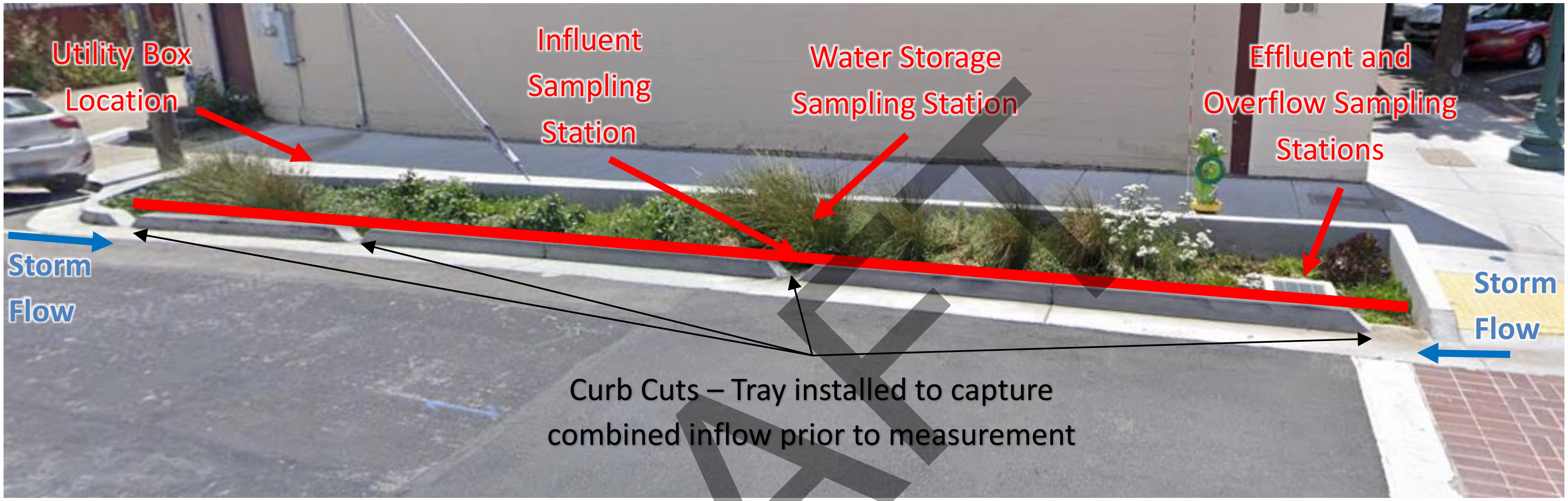

Figure 3.1. Sampling stations and other features at the Mariposa Street bioretention facility, Brisbane CA.

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Figure 3.2. Sampling stations and other features at the Santa Clara Street bioretention facility, Brisbane CA.

3.2.4. Flow Monitoring and Automated Water Quality Sample Collection

At each LID facility, flow and water quality monitoring equipment will be installed at the influent and effluent sampling stations. Flow monitoring equipment will also be installed at the in-basin overflow sampling locations and water level monitoring equipment will be installed at the water storage sampling stations. Water quality samples will be collected during targeted storm events, while flow and water level monitoring equipment will be active throughout the wet-weather season so that flow rates and storm volume may be documented for sampled events as well as for non-sampled events. Flow monitoring equipment installed at influent and effluent monitoring stations will allow automated, flow-weighted, whole-storm composite sampling and measurement of total storm volume at both influent and effluent locations.

Influent and effluent flows for all San Mateo County sites will be directly measured with a compound vee-notch weir and a bubbler water level sensor installed at the influent and effluent sampling stations. Automated time-series water depth data will be recorded once per minute during storm events. Compound weirs with a vee notch for low flow will help to ensure accurate flow data over a wide range of rates. The bubbler water level sensor will be connected to a programmable, remotely operated datalogger/controller. The datalogger/controller will record water depth data once per minute during storm events. The controller will track the volume of stormwater passing through the influent and effluent locations and independently trigger automated sample collection at equal volume intervals for the influent station and separate equal volume intervals for the effluent station. The equal volume intervals, or pacing values, for the influent station and the effluent station will be selected for each monitoring event based on the following factors: DMA, runoff coefficient (average percent imperviousness), QPF, probability of precipitation (POP), antecedent dry period, volume of each aliquot (1 liter (L)), and the total sample volume required for laboratory analysis (approximately 6 L). A pacing value spreadsheet will be developed for each station, and over time, a rating curve will be developed based on empirical data of runoff volume to rainfall.

The automated sampling equipment, batteries, and other supplies will be installed within a secure metal storage vault installed at each monitoring site. Tamper-resistant polyvinyl chloride (PVC) conduit will extend from the storage vault to fixed locations at both the influent and effluent sampling stations to facilitate collection of water samples. High density polyethylene (HDPE) sample collection intake tubing connected to the autosamplers will be routed through the protective PVC conduit and positioned in an appropriate location to collect the water samples at each sampling station. The influent sampling intake tubing will include a stainless steel strainer at the end. The effluent sampling intake tubing will be positioned near the terminus of the underdrain pipe, upstream of the weir. All PVC conduit will be hidden underground whenever possible, with only limited exposure above ground. This may require the Project Team to core through concrete walls or slabs at the site.

Flow measurement data will be used in real-time to trigger flow-weighted composite sampling. Sufficient flow-weighted sample aliquots will be collected along with sufficient percent storm capture to ensure that each whole-storm composite sample meets representativeness criteria. Criteria for acceptable representativeness is provided in Table 3.1 (Caltrans, 2020).

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Table 3.1. Required number of sampling aliquots and percent storm capture for storm representation.

Total Event Precipitation	Minimum Number of Aliquots	Percent Storm Capture Requirement[1]
0–0.25″	6	85
0.25–0.5″	8	80
0.5–1″	10	80
>1″	12	75

[1]Percent storm capture is the percent of flow volume represented by a composite sample. It is calculated by dividing the flow volume that passed the sampling station during sample collection by the total flow that passed the sampling station during the entire monitoring event.

3.2.5. Water Balance

A water balance analysis of a LID facility identifies the inputs, facility storage, and outputs of water flow through the system, as shown in Figure 3.3. The water balance approach provides a quantitative evaluation of the hydrologic functioning of the LID system. The water balance can indicate the relative values of the inputs, outputs, and storage within the system, and changes over varying storm conditions over time. This is helpful to understand if the system is functioning as designed, identify potential data gaps (i.e., missing inflow or outflow variables), and provide estimation of variables that are more difficult / challenging to measure directly.

$$V_{in} + \Delta Storage = V_{out}$$

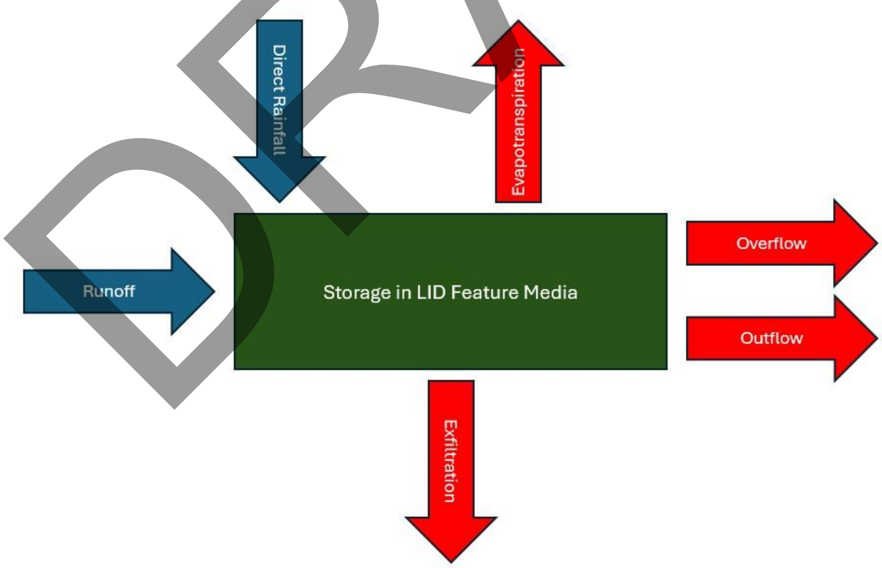

Figure 3.3. Water balance equation and diagram of water balance inputs and outputs at a Low Impact Development (LID) facility.

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The water balance at the monitored facilities will be evaluated through analysis of measured flow data and measured inputs and outputs to the facility using monitored/estimated variables. The water balance variables to be analyzed in a Microsoft Excel Spreadsheet for each facility will include the following data:

- Water Input Sources (V_{in}):
  - Runoff
    - Influent volume from the DMA that passes through the curb inlets
  - Rain falling directly on the LID footprint
- Water Storage within the Facility (Δ Storage = Initial storage – Final storage):
  - Initial abstraction volume at the start of a rain event (i.e., the volume available for water storage within the facility). This is the volume of water that is required to prime the facility before runoff can occur, calculated as the difference between initial and final storage.
- Water Losses from the Facility (V_{out}):
  - Outflow - effluent volume that is discharged from the facility to the MS4;
  - In-basin overflow once maximum ponding depth is exceeded.;
  - Exfiltration to native soil;
  - Evapotranspiration; and
  - Leaks within the LID infrastructure (i.e., ungrouted/damaged overflow structure that allows overflow before the design overflow depth is reached).

The methods that will be used to measure influent and effluent volumes were described in Section 3.2.4. The methods that will be used to measure or estimate the remaining variables in the water balance (i.e., other inputs/outputs/storage) are described below.

Precipitation Monitoring

A calibrated tipping-bucket rain gauge will be installed at the monitoring site to estimate rainfall within the DMA. Publicly available rain gauges that are nearby (e.g., Weather Underground Stations) will be used to corroborate data from the Project rain gauge. The rain gauge will be re-calibrated at least annually.

Initial Abstraction Volume

The amount of water storage available in the facility media at the start of a storm event (i.e., initial abstraction volume) can be crucial for an accurate representation of the water balance, especially at larger or oversized LID facilities. Understanding water storage in the LID facility media can also illustrate the total water available for evapotranspiration (in lined facilities) or combined evapotranspiration and exfiltration (in unlined facilities). The initial abstraction volume for a given storm event is the difference in the initial water content of the media prior to the onset of rainfall and the maximum water content of the media during the storm. Typically, the initial abstraction volume will be highest in the early season before the facility is saturated. The maximum initial abstraction volume for a fully unsaturated facility is assumed to be the volume of soil media plus the volume of the gravel layer times a porosity factor of 0.40.

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In-basin Overflow Monitoring

Overflow monitoring will be performed by measuring the ponding depth within the basin with a pressure transducer depth sensor. This automated monitoring will provide time-series water depth data recorded once per minute. If the maximum ponding depth is exceeded, overflow to the in-basin bypass structure will occur. The overflow volume will be measured by treating the overflow grate as a broad-crested weir. The depth data recorded every minute will indicate the time, duration, and depth of bypass flow, should it occur.

Exfiltration to native soil

Exfiltration to native soil (i.e., discharge to groundwater) will be measured with a piezometer during each wet weather season beginning in WY 2025. A single, shallow monitoring well (i.e., piezometer) will be installed in the approximate geographical center of the facility and outfitted with a pressure transducer which will record water depth once per minute throughout the wet weather season. Refer to Figure 3.4 for a schematic of the monitoring well design.

The purpose of the piezometer is to measure the recession rate of water within the gravel layer following each storm event. After a storm has ended, the water detained within the gravel layer between the invert of the underdrain effluent pipe and the surface of the native soil should recede only through exfiltration to the native soil. The measured recession rate will be multiplied by an assumed gravel media porosity factor of 0.40 to yield the infiltration rate to native soil for each qualifying storm event. Qualifying storms must produce sufficient runoff to fill the gravel layer and must not produce additional runoff from rainfall or other sources while post-storm recession is taking place.

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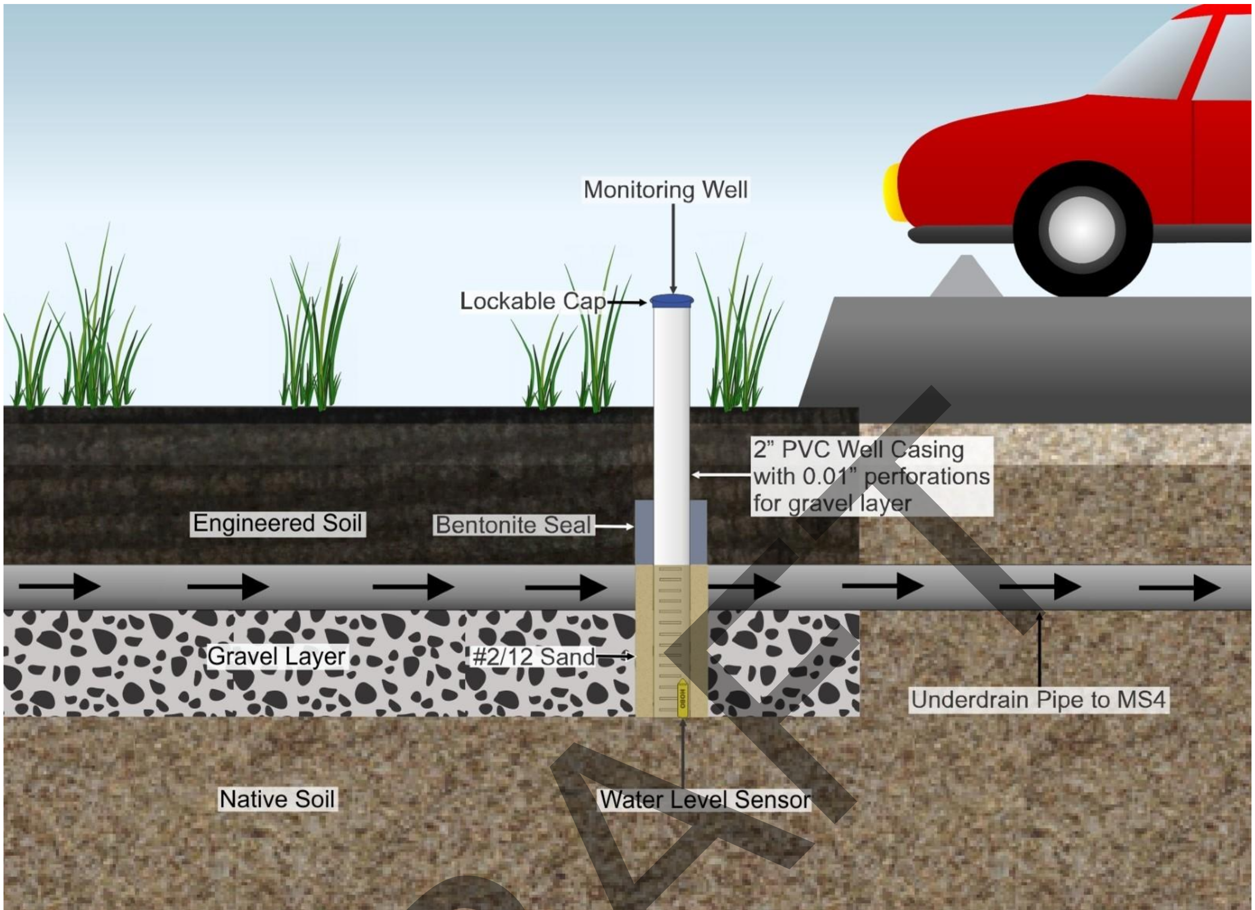

Figure 3.4. General bioretention facility monitoring well design.

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3.3. Assessing O&M

In order to evaluate the minimum level of O&M necessary to avoid deterioration of the system (Management Question 2), the Project Team will conduct periodic maintenance assessments at each facility throughout the project. These efforts will document all ongoing maintenance activities at each facility, record observations on facility conditions at multiple points in time throughout the study, compare the observed conditions to the expected standards for a well maintained facility, and determine if any remedial actions are needed to ensure proper functioning of the facility. Any changes in functioning of the LID facility(ies) that may be associated with maintenance issues will be documented. For each facility, the timing and associated level of effort of maintenance activities may be reevaluated as the Project evolves. In addition, the frequency and/or level of maintenance conducted at LID monitoring sites across the region will vary, and this variability will provide information that can be used to better understand the minimum level of maintenance required to maintain proper functioning of these systems.

3.3.1. Current Level of Maintenance

The two LID facilities currently planned for monitoring in San Mateo County are public bioretention facilities located in the City of Brisbane. Typically, bioretention facilities are intended to be inspected and maintained prior to the onset of the wet season, and then periodically during the wet season. These facilities are currently maintained by City of Brisbane staff, following the recommendations and guidance provided by SMCWPPP (SMCWPPP 2020). Based on this guidance, the City has identified the existing (and planned) maintenance tasks and schedule that will be followed throughout the monitoring project (Table 3.2). This is the recommended level of maintenance for these facilities.

Table 3.2. City of Brisbane current and planned maintenance activities and schedule for the Brisbane Green Streets Projects, Brisbane, CA.

Maintenance Task	Schedule
Inspect bioretention surface area, inlets and outlets for obstructions and trash; clear any obstructions and remove weeds and trash;	Monthly or Quarterly
Inspect bioretention areas for standing water. The presence of algae growth in ponded water is a good indicator of problems. In general, if standing water does not drain within 1 day, there may be a problem with the system. First check the cleanout riser and clean out underdrains for clogging material. Other causes of standing water can include clogged outlets, faulty irrigation systems, and/or improperly specified or installed biotreatment soil media, mulch, or plant material. If needed, remove problematic materials and replace with approved biotreatment soil media, mulch, new plants and/or other components as needed. Compaction of native soil can also be a cause of standing water; in which case the whole system may need to be reconstructed. If mosquito larvae are observed, contact the San Mateo County Mosquito Abatement District at (650) 344-8592 or www.smcmvcd.org/online-service-request. Larvae breed more quickly in warmer seasons.	Monthly or Quarterly
Before and after the rainy season, an evaluation of the whole control system should be conducted, including the following activities: • Prune and weed the bioretention area; remove trash; remove and replace any dead plants. • Inspect the vegetation to ensure that it is healthy and dense enough to provide filtering and protection from erosion. Do not use pesticides or other chemical applications to treat diseased plants, control weeds or remove unwanted growth. • Inspect inlets for channels, exposure of soils, or other evidence of erosion. Clear obstructions and remove accumulation of sediment. Properly grade or armor curb cuts to control erosion. • Check the irrigation system to ensure that plants are receiving the correct amount of water. Repair or replace any improperly functioning equipment. • Use compost and other natural soil amendments and fertilizers. Do not use synthetic fertilizers, especially if the system uses an underdrain. • Inspect the energy dissipater at the inlet to ensure it is functioning adequately, and that there is no scour of the surface mulch. Remove any accumulation of sediment. • Inspect and, if needed, replace wood or rock mulch depending on the site conditions. It is recommended that composted arbor mulch be applied once a year to maintain a 3" depth. Mulch should be added when erosion is evident or when the bioretention area begins to look unattractive. The entire area may need mulch replacement every two to three years, although spot mulching may be sufficient when there are random void areas. Rock mulch can be raked up or manually collected and redistributed after maintenance is performed	Before and After each Rainy Season
Inspect the system for erosion of biotreatment soil media, loss of mulch, standing water, structural failure, clogged overflows, weeds, trash and dead plants. If using rock mulch, check for 3" of coverage.	After large storm events

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3.3.2. Assessment of Maintenance Effect upon Facility Performance

In order to evaluate the minimum level of O&M necessary to maintain the functioning of the system (Management Question 2), maintenance levels at the LID Monitoring facilities will be compared with pollutant removal performance to assess whether there is an association between the level of maintenance and facility performance. These evaluations may also be done at the regional level, where the frequency and level of effort of maintenance activities at the LID Monitoring sites across the region will vary based on differences across cities, maintenance crews, catchment characteristics, etc. In addition, for the duration of the permit, the two facilities at the ACCWP site will deliberately vary the level of maintenance between the two very similar facilities. This variation in maintenance levels across sites and across the region will allow the project team to assess potential performance differences between the facilities that may be due to differences in maintenance. Evaluation of maintenance impacts across sites will be conducted as part of the regional analysis described in Section 12.3.

3.3.3. Maintenance Assessments

The maintenance assessments conducted at the Brisbane Mariposa Street and Santa Clara Street Bioretention Facilities will follow the detailed guidance and recommendations provided in the City of San José's *GSI Maintenance Field Guide*. The Field Guide presents an inspection-based approach to adaptively manage maintenance activities at GSI facilities, identifies maintenance standards, and provides guidelines to ensure maintenance standards at each facility are achieved. The Project Team developed a *Regional Maintenance Assessment Form*, provided as Attachment A, that will be used by all the BAMSC stormwater programs for the maintenance assessments. The form was modeled after the Bioretention Planter Maintenance Inspection Checklist that is included in the City of San José's *GSI Maintenance Field Guide.* The form will be filled out during each facility assessment to document the maintenance activities that have occurred at the facility since the previous assessment and to record observations on maintenance status during the assessment. The Project Team will need to coordinate with the City staff that conduct maintenance to track and record all maintenance activities at the facilities throughout the study period.

A summary of the maintenance assessment process that the Project Team will follow is provided here. During each maintenance assessment, field staff will use the *Regional Maintenance Assessment Form* (Attachment A) to document removal of trash, clogging issues, flooding issues, vegetation growth, structural damage, contamination within the treatment area and overall health of the facilities. These observations will be compared to maintenance standards established by the City (or Countywide Program) for a particular type of facility, and to the performance during monitored storm events. If field staff observe that conditions at a facility have deteriorated to a level that will likely impact proper function (e.g., excess sediment build-up at the inlets such that flow would be impeded or blocked from entering the facility), then the Project Team and/or City staff will ensure the required maintenance occurs to return the facility to a well-maintained condition prior to the next storm event. Timing and levels of effort associated with all maintenance activities (both scheduled and unscheduled) will be documented. Field staff will also record qualitative information that may affect interpretation of Project results relative to the management questions posed. For example, staff will document characteristics that may affect treatment facility performance (e.g., dead / removed vegetation, sustained ponding after cessation of rainfall, extensive trash coverage), as well as activities or features within the catchment that may have implications on required maintenance.

Each water year of the Project, the first maintenance assessment will be conducted after the initial maintenance service has been completed per the specifications identified in Table 3.2 for maintenance tasks required "before each rainy season". The initial assessment will evaluate the status of the facility

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at the start of each rainy season, and determine whether additional actions are needed to ensure proper functioning of the facility during storm events. Follow-up maintenance assessments will be conducted prior to the start of each monitored storm event. A minimum of three follow-up assessments will be conducted each year. At least one additional assessment will be conducted each year during the dry season.

3.4. Monitoring Frequency and Schedule

The proposed monitoring frequency and schedule for this Project are presented in Table 3.3 and Table 3.4 and described below.

3.4.1. Task 1 Stormwater Sampling Schedule

Task 1 Stormwater sampling will start at both Brisbane bioretention facilities in WY 2024 (which begins on Oct 1, 2023) and continue each rainy season through the end of the permit. At each facility, paired influent/effluent water quality and flow samples will be collected during multiple storm events each year. In order to achieve MRP minimum requirements, SMCWPPP will plan on sampling two to four storm events (one influent / effluent pair at one facility equals one event) at two facilities each year. Flow monitoring will be conducted continuously throughout each rainy season. Table 3.3 presents a potential sampling schedule that will achieve the MRP-required minimum number of storm event water quality samples each year and over the permit term. This sampling frequency will provide an opportunity to evaluate the functioning and performance of the targeted LID facilities over time. Should a lack of viable rainfall events preclude collection of the required annual minimum, target events may be rolled over to a successive year.

Table 3.3. Water quality storm event monitoring schedule at San Mateo County Low Impact Development (LID) monitoring sites during MRP 3.0.

	Water Year			
Task 1 Stormwater Monitoring	2024	2025	2026	2027
Count of monitored storm events at Santa Clara Street Bioretention Facility, Brisbane CA	3	3	3	3
Count of monitored storm events at Mariposa Avenue Bioretention Facility, Brisbane CA	3	4	3	3
Total Storm Events Monitored	**25**			

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3.4.3. Task 2 Assessing O&M Schedule

Task 2 assessing O&M actions will also start at the beginning of WY 2024 (Oct 2023) and continue through the end of the permit (June 2027). Each year of the permit, site assessments will be conducted at each monitored facility at the beginning of each rainy season, prior to each monitored storm event, and in the summer after the end of the rainy season. Table 3.4 identifies the number of maintenance assessments that will be conducted at each LID monitoring facility, assuming three storms are monitored at a site each year.

Table 3.4. Maintenance assessment schedule at San Mateo County Low Impact Development (LID) monitoring sites during MRP 3.0.

Task 2 Maintenance Assessments		Water Year			
		2024	2025	2026	2027
Facility Assessments Conducted at Each LID Facility (assumes 3 storms will be monitored at a given facility each year)	Pre-Rainy Season Assessment (Fall)	1	1	1	1
	Storm #1 Assessment	1	1	1	1
	Storm #2 Assessment	1	1	1	1
	Storm #3 Assessment	1	1	1	1
	Post-Rainy Season Assessment (Summer)	1	1	1	1
	Total Number of Assessments Each Year	**5**	**5**	**5**	**5**

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4.0 LABORATORY ANALYSIS

4.1. Aqueous Samples

Water quality samples collected as described in Section 3.0 will be analyzed for the parameters listed in Table 4.1, per the requirements in the MRP (Table 8.d.2 in the MRP). Samples will be analyzed for parameters selected from the following suite: PCBs, dissolved and total Hg, PFAS, dissolved and total copper, dissolved and total zinc, hardness, TSS, TPH as Diesel / Motor Oil, and pH. Methods for analysis of Project analytes are described in Table 4.1. All chemical analyses will be conducted at a laboratory certified for such analyses by the California Department of Health Services or a laboratory approved by the Executive Officer.

Table 4.1. SMCWPPP LID monitoring analytes, methods, and reporting units

Analyte	**Sampling Method**	**Recommended Analytical Method**	**Reporting Units**
PCBs (congeners)	Automated composite	EPA 1668	pg/L
Mercury (Hg), dissolved and total	Automated composite	EPA 1631	ug/L
Copper (Cu), dissolved and total	Automated composite	EPA 200.8	ug/L
Zinc (Zn), dissolved and total	Automated composite	EPA 200.8	ug/L
Hardness	Automated composite	EPA 1638M / SM 2340	mg/L
Total Suspended Solids (TSS)	Automated composite	SM 2540D	mg/L
TPH as diesel & motor oil	Automated composite	EPA 8015 / 8260	ug/L
PFAS	Automated composite	EPA 1633	ng/L
pH	Automated composite	Field meter	0.01 units

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4.2. Turn Around Time

SMCWPPP does not anticipate requesting that laboratories achieve expedited turnaround times. Project laboratories will be required to meet the QA/QC requirements within Section 14 of the QAPP (AMS 2024).

4.3. Analytical Laboratories

Stormwater Programs collaborating on LID Project implementation have agreed to use the following common laboratories: Enthalpy Analytical of El Dorado Hills (formerly Vista Analytical Laboratories) for PFAS and PCBs; and Caltest Analytical Laboratory of Napa for all remaining analytes. These laboratories will operate under the direction of the QAPP (AMS 2024). MQOs for laboratory analyses are defined in the QAPP (AMS 2024).

Enthalpy Analytical will report the list of forty PCBs congeners previously identified by the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP 40)[4] consistent with what has been reported for many previous stormwater sampling efforts in the Bay Area. Enthalpy Analytical will report a sum of these forty congeners associated with each sample. Laboratory reports and associated data files from Enthalpy Analytical will report total PCBs (sum of forty congeners) for each sample using the substitution technique of replacing each non-detected (ND) congener with a concentration of zero.

[4] The RMP 40 PCB congeners include: PCB-8, PCB-18, PCB-28, PCB-31, PCB-33, PCB-44, PCB-49, PCB-52, PCB-56, PCB-60, PCB-66, PCB-70, PCB-74, PCB-87, PCB-95, PCB-97, PCB-99, PCB-101, PCB-105, PCB-110, PCB-118, PCB-128, PCB-132, PCB-138, PCB-141, PCB-149, PCB-151, PCB-153, PCB-156, PCB-158, PCB-170, PCB-174, PCB-177, PCB-180, PCB-183, PCB-187, PCB-194, PCB-195, PCB-201, PCB-203.

5.0 FIELD METHODS AND PROCEDURES

All collaborating Stormwater Programs will use a common set of sampling protocols tailored to site-specific conditions. A summary of monitoring techniques is presented in the sections below. Additional detail is included in Attachment B.

An underlying dynamic of the conflict between monitoring requirements specified in MRP and requirements associated with implementation of standard sampling and analytical methods means that compromises will need to be made between the two. When faced with these conflicts for a given collection / analysis, this monitoring plan favors permit compliance over strict adherence to standard methods. Specific considerations for each analyte are discussed in detail in Section 10, Field Variances.

Additional safety measures may be necessary in some cases; for example, if traffic control is required or there is extensive homeless presence in the immediate area (Attachment B).

5.1. Monitoring and Sampling Equipment

Sampling equipment has been selected to best ensure compliance with MRP permit conditions, and to the maximum extent practicable, to be consistent with standard sample collection and analysis methods. Key equipment specifications include use of the following:

- Programmable datalogger/controller (Campbell Scientific CR1000®);
- Vee-notch compound weirs (Thel-mar®);
- Bubbler water level sensors (Campbell Scientific LevelVUE B10®);
- Pressure transducer piezometers (Campbell Scientific CS451®);
- Programmable autosamplers (Teledyne ISCO®);
- Styrene-ethylene-butylene-styrene (SEBS) pump roller tubing, replaced each event;
- HDPE intake tubing, replaced per monitoring season (3/8" ID x 1/2" OD);
- Stainless steel intake strainer;
- Borosilicate glass carboys (Corning®, 20-liters);
- Dual carboy stainless steel solenoid valve;
- Telemetry hardware (Campbell Scientific®);
- Rain gauge; and
- 12 volt deep-cycle batteries.

The equipment listed above will be installed at each LID facility, either contained within a steel security enclosure or mounted within the facility's infrastructure. Table 5.1 lists monitoring equipment and supplies that will be transported to the site by field crews for event monitoring. The equipment list should be reviewed and tailored by field contractors to meet the specific needs of each sampling site.

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Table 5.1. Field sampling equipment and supplies for SMCWPPP LID monitoring (per site).

Description of Equipment/Supplies
Safety personal protective equipment (foul weather gear, ANSI Class III safety vests, high visibility hard hat, eye protection, safety gloves)
Traffic safety equipment (traffic control cones with reflective stripping, flashing amber vehicle lights, etc.)
20-liter borosilicate glass carboys, pre-cleaned (4)
Wet ice in coolers (40 lbs.) and ice scoop
SEBS pump roller tubing, pre-cleaned (2 lengths)
Type I deionized water (for backflushing the HDPE intake tubing)
Chemical resistant nitrile gloves, powder-free
Field notebook (Monitoring Plan, QAPP, HSP, SOPs, COCs, Field logs, permits, etc. as required)
Pencils, pens, indelible markers
Tool and supply kit (ruler, tape measure, zip ties, screw drivers, wrenches, etc.)
First aid kit
Flashlights and headlamps
Paper and cloth towels
Camera and selfie stick, weather resistant with date/time metadata
Cell phone, fully charged
Umbrella (to keep camera, cell phone, and other sensitive equipment dry)

5.2. Equipment Decontamination

Decontamination of sampling equipment must be conducted consistently to ensure the quality of samples collected. All equipment that comes into contact with sample water will be decontaminated and blanked prior to installation/use. This equipment includes: 20-liter borosilicate glass carboys, HDPE intake tubing, SEBS pump-roller tubing, and stainless steel strainers. Decontamination will occur prior to use of a piece of equipment, and may be conducted by the field contractors, analytical labs, or a combination of the two. The following cleaning procedure will be followed to decontaminate equipment after initial purchase and again after use. Note that the SEBS pump roller tubing will be replaced with new, cleaned tubing prior to each monitoring event.

- Wash with non-phosphate laboratory detergent;
- Rinse thoroughly with Type I deionized (DI) water;
- Wash glass carboys with 10N ACS reagent grade nitric acid;
- Wash tubing and strainers with 2N ACS reagent grade nitric acid;
- Rinse thoroughly with Type I DI water;
- Wash with ACS reagent grade methanol;
- Rinse thoroughly with Type I DI water;
- Seal carboys and tubing with aluminum foil that has been cleaned with non-phosphate laboratory detergent and rinsed with Type I DI water;
- Place cleaned tubing and strainers in clean polyethylene bags.

Immediately following cleaning, rinsate blanks will be collected and analyzed for all parameters at a 5% frequency (e.g., one out of every 20 carboys cleaned) per SWAMP protocols.

Borosilicate glass carboys are recleaned and reused indefinitely, Stainless steel strainers are cleaned at the beginning of each storm season and are reused until they show signs of degradation. HDPE intake tubing is cleaned following purchase and is discarded at the end of each monitoring season. SEBS pump-roller tubing is cleaned following purchase and is discarded at the end of each sampling event.

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Since the HDPE intake tubing will not be replaced between monitoring events, the tubing will be back purged with 2 to 4 liters of Type I deionized water prior to each sampling event and immediately after each sampling event. This procedure will take place at the influent and effluent stations and is intended to reduce the amount of contaminants that are carried over from one storm to another and to purge foreign material from the tubing prior to initiation of sample collection.

5.3. Sampling Procedures

As SMCWPPP sampling sites are fixed stations, GPS coordinates will be assigned at the beginning of the Project and do not need to be recorded at each sampling event. As appropriate, sampling personnel may sketch the sample location into the logbook/datasheet and record any notable comments related to monitoring. Field staff should also take periodic photographs to document monitoring efforts.

Samples will be collected via autosampler as flow-weighted composites. The sampling method is discussed briefly below and in more detail in Section 3.2 above. Standard protocols for autosampling are not amenable to collection of all target analytes, so some compromises have been made in this monitoring plan and will be described in more detail below.

Autosampler - Using clean hands/ dirty hands technique, clean SEBS tubing will be inserted into the ISCO autosampler as part of initial mobilization efforts. The SEBS tubing will be secured to pre-cleaned, rigid HDPE tubing that will be targeted toward the influent / effluent sampling point, respectively, and will lead from the equipment security enclosure to the appropriate point in the sampling stream.

Field samples will be collected as flow-weighted composites at a rate determined by precipitation predictions and prior flow-to-rain response, if known. If this response is unknown (e.g., it is the first storm sampled at a site), catchment area and estimated runoff coefficients will be used. As described previously, all samples will be generated from a composite borosilicate glass carboy associated with each autosampler. Subsamples taken from each carboy for individual analyses will be prepared in the laboratory by Caltest personnel. Details are identified in the QAPP (AMS 2024).

Sampling personnel must arrive on-site and complete the equipment setup prior to onset of precipitation. Off-site storm monitoring personnel will monitor rainfall and flow data and will direct sampling personnel in the case that storm presentation differs from prediction and alteration of sampling pace or discontinuation of sampling is warranted.

5.4. Sample Preservation

For certain analyses, standard methods specify that sample preservation or processing (e.g., filtration) needs to occur within a short timeframe. Ideally, preservation and/or filtration should occur directly in the field or within the holding time specified for each analysis. Given the trade-offs required to achieve Permit compliance, field preservation and filtration will not be performed as part of Project implementation. However, we will ensure the 24-hour hold time for mercury filtration is met. This is consistent with Caltrans (2020), which recommends filtering in the field is only conducted when filtering can be performed in a manner that minimizes contamination and the analytical lab is a substantial distance away. Additional detail is provided in Section 10, Field Variances.

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6.0 SAMPLE CONTAINERS AND HANDLING

Recommended SWAMP sample container type and handling techniques are summarized for Project analytes in Table 6.1. Consistent with MRP monitoring specifications, these standard methods will be adjusted to support overall goals of the Project. A full discussion of the compromises made relative to specific analytes is presented in Section 10, Field Variances. Sample handling and chain of custody procedures are also described in detail in Section 12 of the QAPP (AMS 2023).

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Table 6.1. SWAMP protocols for sample handling for Project analytes in surface water. These protocols will be adjusted consistent with Project needs.

Analyte	Analyte Group	Sample Container Material & Property	Preservative	Holding Time (at 4 ± 2 ºC)
Mercury (Total)	Inorganics	Glass, sterilizable plastic (e.g., polypropylene)	Preserve with 0.5% v:v pretested 5% BrCl or 12N HCl within 48 hours	90 days at room temperature following acidification
Mercury (Dissolved)	Inorganics	Glass, sterilizable plastic (e.g., polypropylene)	Filter and preserve with 0.5% v: v pre-tested 5% BrCl or 12N HCl within 48 hours	90 days at room temperature following acidification
PCBs (as RMP 40 congeners)	Synthetic Organic Compounds in Water	Amber glass	Cool to 4 ± 2 ºC	1 year until extraction, 1 year after extraction
Total Suspended Solids (TSS)	Conventional	Glass, Polyethylene	Cool to 4 ± 2 ºC	7 days
PFAS	Synthetic Organic Compounds in Water	HDPE	Freeze as soon as possible after collection	90 days (ship frozen on blue ice)
TPH as Diesel / Motor Oil	Semi-volatile Organic Compounds in Water	Glass	Cool to 4 ± 2 ºC	7 days until extraction, 40 days after extraction
Dissolved Copper, Zinc	Inorganics	Polyethylene	Filter within 15 minutes of collection; HNO3 to pH<2 within 48 hours and at least 24 hours prior to analysis	6 months at room temperature following acidification
Total Copper, Zinc	Inorganics	Polyethylene	HNO3 to pH<2 within 48 hours and at least 24 hours prior to analysis	6 months at room temperature following acidification
Hardness (as CaCO3)	Conventional	Polyethylene	Cool to 4 ± 2 ºC; HNO3 or H2SO4 to pH<2	6 months
pH	Conventional	NA	NA	Analyze immediately

[1]From SWAMP Measurement Quality Objectives, https://www.waterboards.ca.gov/water_issues/programs/swamp/mqo.html, accessed December 12, 2022

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6.1. Packaging and Shipping

At the conclusion of a given event, individual carboys will be transferred to the prime analytical laboratory by field personnel or laboratory courier. Carboys will be maintained on wet ice to retain temperature and transferred in a manner that minimizes chance of breakage, loss, and contamination per the following general guidelines.

6.2. Aqueous Samples Without Preservative

The following summarizes the packaging procedures that will be followed for samples that are to be transferred cold (i.e., not frozen). This encompasses all Project samples.

- Cap the carboy with pre-cleaned aluminum foil;
- Lift full carboys with a mesh lifting harness that is installed with the empty carboy;
- When wet ice is used, seal the drain plug of the cooler with duct tape to prevent melting ice from leaking out of the cooler;
- The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment;
- Ensure sample labels are securely fastened and legible;
- Wrap glass carboys in bubble wrap to prevent breakage;
- Place carboys in a sturdy cooler / transport container. Enclose the appropriate chain of custody (COC) in a zip-lock plastic bag.

7.0 DISPOSAL OF RESIDUAL MATERIAL

In the process of collecting environmental samples, the field staff will generate different types of potentially contaminated Investigation Derived Waste (IDW) that include the following:

- Used personal protective equipment (PPE).

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements to the extent practicable. The sampling plan will follow the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Sampling wastes generated through implementation of the Project will be contained and managed as described below:

- Used personal protective equipment (PPE) and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill.

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8.0 SAMPLE DOCUMENTATION

Individual field crews are responsible for generating sample documentation in the field, archiving, and delivering to the MC. Various methods of field documentation are described below.

8.1. Field Datasheets

All field data gathered by this project will be recorded on standardized field data entry forms. These forms are shown in Attachment C. An electronic data form using the Fulcrum application (or equivalent) will be considered as well. Field data sheets shall include at a minimum: date, names of crew members, narrative description of the sampling site (general location), other relevant information such as aliquot pacing, weather conditions, sample matrix, and sample IDs for the various composite samples collected. If an entry form is filled out during stormwater sampling, additional relevant information such as the current number of aliquots sampled, flow data from the local flow meter, field observations such as turbidity and conditions within the catchment and within the LID facility that may affect variations in flow, and details about any issues that may have affected the quality of the recorded data and/or sampled water will be recorded.

8.2. Field Logbooks

In addition to completing field data sheets, sampling personnel should record relevant information in bound, waterproof logbooks or electronic devices. Given that sampling will be conducted during storm events, all information should be recorded in pencil or waterproof pen. Any changes made to recorded information will be made using single strike-through and will be initialed and dated by the person making the change. Information will be photocopied/scanned and delivered to MC along with field datasheets. All entries should be legible and initialed / signed by the individual making the entries.

In addition to the sampling information, the following specific information may also be recorded in the field logbook for each day of sampling, if not captured by field datasheets:

- Team members and their responsibilities;
- Time of arrival / entry on site and time of site departure;
- Summary of any meetings or discussions with property owner or agency personnel;
- Deviations from sampling plans, site safety plans, and QAPP procedures;
- Changes in personnel and responsibilities with reasons for the changes.

8.3. Photographs

Photographic documentation is an important part of sampling procedures. An associated photo log will be maintained documenting sites and subjects associated with photographs. A copy of all photographs should be provided to the MC at the conclusion of sampling efforts and maintained for Project duration.

For each photograph taken, the following information shall be recorded in field datasheets:

- Photo ID – Will be assigned in the office after completion of sampling. ID will be assigned per the following convention SITE-P-YYYYMMDD-## (where SITE indicates the station ID, P indicates “Photo”, YYYMMDD indicates date, and ## indicates photo number at that site, starting at zero and numbered sequentially from start of event;
- Time, date, location;
- Description of the subject photographed;
- Name of person taking the photograph.

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8.4. Sample Labeling

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. The composite samples will have identifiable and unique numbers. At a minimum, the sample labels will contain the following information: station ID, location within site (i.e., influent / effluent), and date of collection.

Each sample collected for the Project will be labeled according to the following naming convention:

SITE-L-YYYYMMDDHHMM

where:

SITE	- Site ID (e.g., TW6)
L	- Location (I = influent; E = effluent)
YYYYMMDD	- Date (Year, Month Number (01-12), Date (01-31)
HHMM	- Time (HH = 00-23 hours, MM = 00-59 minutes)

The collection time of the whole-storm composite sample is the time that the last sample aliquot was automatically collected (Caltrans 2020).

8.5. Sample Chain of Custody Forms

All sample deliveries for analyses will be accompanied by a chain of custody record (COC). COCs will be completed and sent with the samples for each laboratory and each shipment (e.g., each event). If multiple carboys deliveries are made on a single day, COC forms will cover only samples within a given delivery.

The COC will identify the contents of each delivery and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are delivered, the custody of the samples will be the responsibility of the field contractor. The sampling team leader or designee will sign the COC in the "relinquished by" box and note date and time.

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9.0 QUALITY CONTROL

Field personnel will strictly adhere to Section 11 of the QAPP (AMS 2024) to ensure the collection of representative, uncontaminated samples. To the extent possible, sampling methods are designed to maintain compliance with the MRP. The most important aspects of quality control associated with sample collection are as follows:

- Field personnel will be thoroughly trained in the proper use of sample collection equipment and will be able to distinguish acceptable versus unacceptable samples in accordance with pre-established criteria presented in this Monitoring Plan and relevant SOPs.
- Field personnel will be thoroughly trained to recognize and avoid potential sources of sample contamination (e.g., dirty hands, ice used for cooling, potentially contaminating materials).
- To the extent possible, sampling equipment that comes in direct contact with the sample will be made of non-contaminating materials and will be thoroughly cleaned between sampling events.
- Sample containers will be pre-cleaned and of the recommended type.

Other quality control aspects of particular relevance to the sampling program are described below and in Section 14 of the QAPP (AMS 2024).

9.1. Equipment Blanks

All the project analytes are sampled in a flow-weighted composited manner using 20-liter borosilicate glass carboys. Field blanks from stormwater collected in these large sample bottles are not easily collected in the field in the same manner as field blanks for grab samples. This is because of the automated sampling approach that includes a stainless-steel intake strainer, HDPE intake tubing, SEBS pump-roller tubing and finally the borosilicate glass carboy. Due to this practical limitation, this project will adopt methods used by the California Department of Transportation (Caltrans) for its stormwater sampling projects that use automated, flow-weighted sampling.[5]

For non-PFAS analytes, equipment blanks will be performed instead of field blanks on the 20-liter borosilicate glass carboys, intake tubing, pump-roller tubing, and stainless-steel strainers. The equipment blanking requirement is met by performing the following procedures:

1. After a batch of borosilicate glass carboys is cleaned, a bottle blank (rinsate blank) on one randomly selected vessel from the batch at a rate of 5% (1 blank for every 20 carboys cleaned).
2. Prior to the beginning of monitoring for a season, after a batch of intake tubing, pump-roller tubing, and strainers have been cleaned, perform an equipment blank (rinsate blank) on the tubing and strainers.
3. If one or more of the equipment items show evidence of unacceptable contamination, the equipment must be recleaned and the analyses run again until no further unacceptable contamination is found.
4. In addition to the equipment blanks discussed above, additional equipment blanks will be collected and analyzed at the end of the monitoring season of Year 1. These blanks will be collected at every site on the used HDPE influent and effluent tubing that is removed at the end of the monitoring season during equipment demobilization. Field procedures for collecting these

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[5] For example, see California Department of Transportation (Caltrans) Highway 33 Open Graded Friction Course (OGFC) Water Quality Analysis Quality Assurance Project Plan (QAPP), Caltrans Document Number CTSW-PL-22-421.01.01, November 2022.

blanks are described in Attachment D. Based on analytical results after the first monitoring year, the Program along with its regional partners (ACCWP, CCCWP, SCVURPPP, and SSA) will re-evaluate the need to continue these blanks samples in future monitoring seasons. This evaluation will be presented to the Regional Water Board and TAG in the SMCWPPP WY 2024 Urban Creeks Monitoring Report (UCMR).

For PFAS samples, consistent with the analytical method, a field blank is defined for the Project as an aliquot of a clean matrix that is free of native analyte, which is transported to the field in sealed containers and returned with the samples. Field blank containers are opened in the field, transferred into another clean sample collection container (ideally of the same type as used for field sample collection), and handled identically to field samples (available space within the sampling enclosure may be an issue). Field Blanks will be collected a minimum of once per year per sampling location. Equipment blanks will be collected a minimum of once per year, following the same protocols as identified above for non-PFAS analytes.

The site code for equipment blanks should be FieldQA. The equipment blank collection time should be the actual time of the sample creation. As described above, these quality control samples will be created and analyzed at the project laboratory or at the monitoring contractor's cleaning facility and will not be created in the field.

9.2. Field Duplicates

For this project, a field duplicate (FD) is a sample that is split into two fractions in the field and sent to the laboratory for analysis as two different samples. FDs will be collected at the rate of 5% of all analyses conducted under this project or once per season, whichever is more frequent, per Section 14 of the QAPP (AMS 2024). Identification of tentative locations for collection of FDs will be made through the sampling design process. Field crews will have the discretion to alter locations based upon schedule or site conditions. Contributing factors to be considered within the sampling design process or by field crews for determination or relocation of FD locations include the sample volume collected over the course of the monitoring event and the analysis to be conducted.

For the 20-liter carboys being used for composite sample containers, FDs will be created using the following process:

1. Prior to sampling, cut the pacing value in half for what would normally be used for the storm so that twice as much sample water as would be normally targeted will be collected. This is done so enough water is collected to have both a field sample and a FD of equal volumes of sample water that are sufficient to analyze all Project analytes.
2. After sampling is complete, vigorously mix the sample water collected in the carboys until all sediment is in suspension.
3. Before sediment falls out of suspension, pour half of the thoroughly mixed sample water into a second carboy and half into a third carboy. Do not allow the original carboy to sit more than 60 seconds after vigorous mixing. The original carboy may have to be thoroughly mixed more than once to generate the FD. This process may have to be done in steps when the sampled stormwater is in more than one carboy. When this process is complete, one of the two new carboys is the field sample; the other is the FD. The choice of which one is which is irrelevant.

FD samples should be submitted to the laboratory as blind samples. This is done by creating a Sample ID for it that has the sample date of the related field sample and a collection time that is fifteen minutes after that reported for the field sample.

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The number of FD samples will be assigned based upon the number of field samples collected. Analyses of field duplicate samples will be handled the same as those for field samples.

9.3. Matrix Spike/Matrix Spike Duplicate Samples

Matrix spikes (MS) are environmental samples that are fortified by the laboratory with a known amount of target analyte and then analyzed as ordinary field samples. Fortifying a sample in this way is often referred to as "spiking" the sample, and fortified samples are usually referred to as "matrix spikes." MSs and their duplicates (MSDs) are used to demonstrate that the laboratory produces precise and accurate results when analyzing environmental samples.

MS/MSD samples shall be analyzed at a rate as described in the QAPP (AMS 2024). Samples intended for MS/MSD shall be clearly noted on the Chain of Custody form. Also, sample volumes provided to the laboratory for MS/MSDs must be clearly specified on the Chain of Custody "Comments" section or other space available such that the laboratory clearly understands the requested additional analyses. The laboratory will typically specify how much sample water it needs on top of the normal amount collected so that it can run the MS/MSDs as not all analytes require these extra samples to be analyzed as specified by their analytical methods.

Prior to sampling, the pacing value should be lowered enough so that the extra sample water required by the laboratory to analyze the requested MS/MSDs will be collected in addition to the amount from what would normally be used for the field samples.

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10.0 FIELD VARIANCES

As described in Section 5, Field Methods and Procedures, the full suite of MRP analytes is not conducive to collection via a single sampling technique. For example, the Teflon™ tubing typically used to support trace metal sampling is not appropriate for collection of PFAS samples. The sampling and analysis methods for Project implementation were selected to best ensure compliance with permit terms in a feasible manner while still generating meaningful information to address the management questions. Specific compromises that are incorporated into this monitoring plan are described by analyte in Table 10.1 below. It should be noted that any effects that comprises made in sampling and handling protocols would have on a specific analyte are expected to effect both influent and effluent streams in the same manner.

As conditions in the field may vary, it may become necessary to implement minor modifications to the sampling methodologies presented in this plan. When possible, the MC will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the appropriate sampling project report.

As discussed previously, if field personnel determine that the integrity of a specific sample has been compromised to such an extent to put into question the value of the data, personnel have the ability to discontinue attempted sampling. In addition, field personnel may not be able to make this call at time of sampling, and should then attempt to contact the MC to assist with this determination. If they are unable to reach the MC, field personnel may elect to collect a sample, but should verify its dispensation with the MC before delivering the sample to the laboratory.

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Table 10.1. Variations from standard methods associated with LID monitoring implementation using flow-weighted composites collected via autosampler.

Analyte	Project Protocol	Variance	Justification
Mercury (Total, low level)	Collection by peristaltic pump sampler with stainless-steel intake strainer, HDPE intake tubing, and SEBS pump-roller tubing into a borosilicate glass composite carboy	Typically, low-level mercury is collected via grab sampling by clean hands/dirty hand method	Selected based upon overall suite of Project analytes. Will incorporate blanking of equipment for various analytes to assess effect of protocol. Precedent of pump collections by Alameda County Public Works Agency (ACPWA) Turner Court LID monitoring project
Mercury (Dissolved, low level)		Typically, low-level mercury is collected via grab sampling by clean hands/dirty hand method and filtered upon collection and preserved within 48 hrs. Project samples will be filtered and then preserved at the lab immediately upon receipt	Selected based upon overall suite of Project analytes. Will incorporate blanking of equipment for various analytes to assess effect of protocol. Field filtration can introduce contaminants. Filtering will be performed in a clean laboratory setting and data qualified to reflect variance. This is consistent with Caltrans (2020), which recommends filtering in the field is only conducted when filtering can be performed in a manner that minimizes contamination and the analytical lab is a substantial distance away.
PCBs		Typically, PCBs are collected with Teflon® intake tubing.	Selected to optimize overall suite of Project analytes. Will incorporate blanking of equipment for various analytes to assess effect of protocol.
Total Suspended Solids (TSS)		None	N/A
PFAS		Typically, PFAS is collected via grab sampling	Selected based upon overall suite of Project analytes. Project will test / confirm SEBS tubing does not contain PFAS. Will incorporate blanking of equipment for various analytes to assess effect of protocol
TPH as Diesel / Motor Oil (C 12-24, C 24-36)		Typically TPH diesel and motor oil are collected via grab sampling	Selected based upon overall suite of Project analytes. Precedent of pump collections by Alameda County Public Works Agency (ACPWA) Turner Court LID monitoring project.
Dissolved Copper, Zinc		Method calls for samples to be filtered within 15 minutes of collection and preserved within 48 hrs. Project samples will be filtered at lab immediately upon receipt	Field filtration can introduce contaminants. Filtering will be performed in a clean laboratory setting and data qualified to reflect variance. This is consistent with Caltrans (2020), which recommends filtering in the field is only conducted when filtering can be

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			performed in a manner that minimizes contamination and the analytical lab is a substantial distance away.
Total Copper, Zinc		When collected with peristaltic pump, metals are typically collected using Teflon™ intake tubing. Project will employ HDPE intake tubing	Selected to optimize overall suite of Project analytes. Will incorporate blanking of equipment to assess effect of protocol.
Hardness (as CaCO3)		None	N/A
pH		Intended to be measured immediately after collection. Will instead be measured in the field from event composite at conclusion of sample collection.	Infeasible to measure with autosampler

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11.0 FIELD HEALTH AND SAFETY

All field crews should be expected to abide by their employer's health and safety programs. Health and safety programs (HSP) should reflect at least the minimum requirements listed in the Recommended Minimum Health and Safety Guidelines for SWAMP Field Activities. Prior to commencement of field activities, contractors are required to establish site-specific Health and Safety plans including the location of the nearest emergency medical services.

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12.0 DATA EVALUATION

12.1. Water Quality and Hydrology Evaluations

This Plan presents an overall approach to assessing LID facility effectiveness by comparing measured inflow and outflow water quality and hydrology parameters, and documenting effluent water quality. Water quality data (pollutant EMCs) and hydrologic parameters (influent/effluent volume, flow rate, and rainfall depth) will be measured at the LID facility. A simplified water balance calculation will be applied to evaluate the inputs/outputs/storage in the LID facility. Additional parameters such as exfiltration to native soils, media water content, groundwater intrusion, and evapotranspiration will be measured or estimated using inputs/outputs to the water balance as described in Section 3.2.5. These data may inform development of a more robust water balance. In addition, data evaluation will also consider the effects of sizing and design on system performance.

The parameters that will be evaluated statistically may include pollutant EMCs, pollutant loads, runoff volumes, and peak flow rates. These parameters will be analyzed according to methods specified in the Caltrans BMP Pilot Study Guidance Manual (Caltrans 2021). These methods include detecting possible outliers, examination of data quality, estimation of standard distributional statistics, and presentation of these results in tabular and/or graphical form as described below.

Box and whisker plots may be used to illustrate the central tendency of the influent and effluent parameters. The box plots will also summarize the 25th and 75th percentiles, median, and any outliers. Grouped bar charts may be used to evaluate the relative difference of the influent and effluent parameters on an event basis.

Confidence intervals in the box plots can be generated using the bias corrected and accelerated bootstrap method described by Efron and Tibishirani (1993). This method is a robust approach for computing confidence intervals that is resistant to outliers and does not require any distributional assumptions. Comparison of the confidence intervals about the influent and effluent medians can be used to roughly identify statistically significant differences between the central tendencies of the data.

If it is deemed desirable over the course of Project implementation, total PCBs reported by the laboratory which use the standard substitution technique of ND = zero may be recalculated by using the robust Regression on Order Statistics (ROS) method. This method is consistent with that employed in the Caltrans BMP Pilot Study Guidance Manual (Caltrans 2021) and the International Stormwater BMP Database 2020 Summary Statistics report (ISBMPD 2020). These PCBs totals can be added to the laboratory EDD and noted as produced by ROS method.

ROS may also be used when computing and reporting averages and any other associated statistics. ROS plots the known, detected, and possibly transformed values on a probability plot with a linear axis and calculates a linear regression line to approximate the parameters of the underlying (assumed) distribution. This fitted distribution is then utilized to generate imputed estimates for each of the censored measurements, which are then combined with the known (i.e., detected) values to estimate summary statistics of interest. These imputed values should not be used for any additional calculations other than estimating summary statistics for the data set as a whole. The method is labeled ‘robust’ because the detected measurements are used as is to make estimates, rather than simply using the fitted distributional parameters from the probability plot. For example, ROS can be used to compute a total PCBs EMC in instances when some congeners are ND. It can also be used when EMCs of an analyte

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from different samples are used to compute an average over the sample ensemble and some of them are ND.

When using this robust method, conclusions regarding BMP performance should carefully consider the influence of large percentages of NDs. For example, pollutant removals may be found to be statistically insignificant for a BMP, but that BMP may still provide removals at higher influent concentrations. The number of influent and effluent NDs should be reviewed before making conclusions. Pollutant-BMP combinations with high percentages of non-detects will be identified in a table.

Further data evaluation methods will employ statistical testing to evaluate differences in paired influent and effluent parameters across multiple events. To test for statistically significant differences between influent and effluent parameters with completely uncensored data (i.e., no NDs), these differences will first be tested for fitting normal distributions using the Shapiro-Wilk test (Shapiro and Wilk, 1965). If the Shapiro-Wilk test fails to indicate the data are normally distributed, then a log transform will be used, and the Shapiro-Wilk test will be repeated. At this point, if the data can be assumed to be normally distributed per Shapiro-Wilks, testing for statistical differences between influent and effluent parameters will be done using a one-way paired t-test with significance assessed at $\alpha = 10\%$. For this study, the initial level of significance will be set at 10 percent initially because of the relatively small sample size and volatile nature of environmental data. To account for α inflation and multiple comparisons, Holm's method (Holm 1979) will be used to adjust the level of significance accordingly.

Censored data (with one or more NDs) and uncensored data that fails the Shapiro-Wilk test will be tested using the Paired Prentice-Wilcoxon test (PPW; Kalbfleisch and Prentice 1980) for significant differences between influent and effluent EMCs with significance assessed at alpha = 10%. This alpha level will also be adjusted according to Holm's method. PPW is a variation of the Generalized Wilcoxon test, and it is especially designed for paired data sets. Being non-parametric, the PPW test makes no assumptions about the distribution of the data on which it is run. Additionally, the test is appropriate for comparing two groups with matched pairs of data and can be applied to censored data sets. (Rouhani and van Geel 2017; Helsel 2012).

To assess performance of each LID facility, the following metrics may be calculated from the influent and effluent parameters (X) including pollutant EMCs, pollutant loads, runoff volumes, and peak flow rates.

1. Removal efficiency (RE) = $X_{inf} – X_{eff} / X_{inf}$

   The RE metric evaluates the change in the effluent relative to the influent for a given parameter for each storm event at each site. Note that this is a per storm event statistic. Note that this is a per storm event statistic.

2. Efficiency Ratio (ER) = Mean X_{eff} / Mean X_{inf}

   The efficiency ratio metric evaluates the relative change in average influent and effluent among storm events for a given parameter for each site. Note that this is derived from an ensemble of storm event statistics.

3. Loads (or Volume) Efficiency Ratio (LER) = Sum $Load_{eff}$ /Sum $Load_{inf}$.

   The loads (or volume) efficiency ratio evaluates the relative change in the total influent and effluent storm loads (or runoff volumes) for each site.

The effluent EMCs will also be compared to selected water quality goals, where applicable.

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Finally, the removal efficiency of each site will be estimated for EMCs and storm loads using the slope of the linear regression of the paired influent and effluent data. The proportion (%) efficiency is estimated as 1 minus the slope of the regression (Beta).

The data evaluation will also apply the water balance calculation below in order to better understand flow through and storage in the system. The measured/estimated data collected as described in Section 3.2.5 will be used to construct the water balance during monitored storm events as shown in Equation 12.1.

Equation 12.1: $$V_{in} + \Delta\, Storage = V_{out}$$

Where:

V_{in} is the sum of these parameters:

- **Influent Volume**
- **Direct rainfall volume on the facility surface**

Change in Storage (*Δ Storage*) is the difference between these values:

- Initial media water volume
- Saturated media water volume

V_{out} is the sum of these parameters:

- **Effluent Volume**
- **In-basin Overflow Volume (i.e., overflow volume within the basin)**
- **Exfiltration**
- Evapotranspiration

Parameters in bold will be measured at all sites (as applicableNot all parameters apply to all LID facilities.

The water balance calculation will provide information on the relative inputs/outputs to the system, help identify data gaps (i.e., missing water inputs/outputs), and allow for estimation of parameters that are more difficult/challenging to directly measure.

12.1.1. Supplementary Analyses

If the analyses above demonstrate significant relationships exist between influent and effluent EMCs or loads, generalized linear models (GLM) or boosted regression trees (BRT) incorporating environmental predictor variables may be explored to evaluate the potential controlling factors associated with the observed removal efficiency patterns. A rank of relative importance of any environmental variables that explain a significant proportion of the variance among sites and/or storm events will be presented.

12.2. Maintenance Assessment Data Evaluation

Data evaluation associated with the maintenance assessments will primarily be qualitative. The Project Team will review the maintenance assessments completed at each facility over the permit term and identify the types and frequencies of maintenance deficiencies that were identified. Catchment-level activities and conditions recorded on the assessment forms will also be reviewed to identify potential explanatory or contributing factors for maintenance deficiencies identified. For each site, the frequency and type of maintenance issues that required immediate action to ensure proper functioning of a facility will be identified to determine if the routine maintenance frequency was adequate to address these, or

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if additional maintenance activities are needed to avoid maintenance problems. Any maintenance deficiencies identified will be compared with the current maintenance practices and schedules, and the Project Team will develop potential solutions.

In addition to qualitative assessments of maintenance efforts upon facility functioning, the Project will also include quantitative assessments of facility performance. By tracking maintenance timing and level of effort throughout the Project, pollutant data will be reviewed as a function of time since previous maintenance activities. The Project Team will develop time series data plots of flow, pollutant concentrations during storm events, and loads reduced and the occurrence of maintenance activities. These graphs will be evaluated for patterns that suggest relationships between these factors and the occurrence of maintenance. Potential indicators of maintenance issues will be identified, such as reduced flow rates into a facility or increased ponding time (all relative to storm size), and the frequency of these occurrences compared with the timing of maintenance activities (or lack of maintenance activities). Statistical tests (as described in Section 12.3) to identify differences between LID monitoring sites based on factors such as loads and volumes reduced will be performed. Any statistically significant differences between the sites suggests that differences in maintenance across the facilities may have been a factor that should be considered. This information can be used to review the timing of maintenance activities and whether varying level of effort affected the treatment effectiveness. Given the variability expected in pollutant concentrations across storm events, it is uncertain whether this type of analysis will provide meaningful insight. However, the Project Team will use all of the evaluations described above to inform the development of recommendations for improving or maintaining current maintenance practices and schedules at each of the LID facilities monitored during this project.

12.3. Regional Analysis

A regional analysis that compares monitoring results between counties will be completed and reported with the Water Year 2025 Integrated Monitoring Report. This regional analysis will include evaluation and analysis of the following required components:

- Difference in design variations;
- Differences in spatial scales;
- Differences in system ages.

The regional analysis will also include a comparison of treatment results for groups of sites based on a variety of characteristics, including how differences in influent quality are accounted for when drawing conclusions about performance.

Further, the regional analysis will also include a comparison of the results from each site with the results of sites in other counties that are implementing different maintenance practices and/or schedules. The frequency and/or level of maintenance conducted at LID monitoring sites across the region will vary, and this variability may provide information that can be used to better understand the minimum level of maintenance required to maintain proper functioning of these systems. Statistical tests (as described in Section 12.2) to identify differences between the LID monitoring sites across the region based on factors such as loads and volumes reduced may be performed. Any statistically significant differences between the sites suggests that differences in maintenance across the facilities may have been a factor that should be considered. This evaluation across all LID monitoring sites in the region will be included in the 2026 Integrated Monitoring Report.

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13.0 REPORTING

Data collected by the LID Monitoring project described in this plan will be reported annually by water year in the LID Monitoring Status Report that will be included in the annual Urban Creeks Monitoring Reports (and WY 2025 Integrated Monitoring Report) as required by Provision C.8.h.iii.(1) of the MRP. . At a minimum, each report will include the following information:

- A summary of the LID monitoring methods used in the preceding water year;
- A summary table that lists monitoring samples collected during the preceding water year;
- A summary of lessons learned;
- A statement of data quality;
- The raw data generated by the preceding water year/
- An outline of steps for the upcoming water year; and
- An analysis of the data.

In addition to the discussion points listed in Provision C.8.h.iii.(g)(1), at the request of the Regional Water Board, SMCWPPP will also provide a discussion of the following:

- Description of catchment conditions that may have affected observed variations in flow;
- Aspects of the facility design may have affected flow; and
- What changes, if any, to facility design or operation are suggested by overserved flow variations.

13.1. Cost Tracking

Provision C.8.d.i.(1)(g) of MRP 3.0 requires that annual cost estimates for the implementation of the LID Monitoring Plan are provided to the Regional Water Board. SMCWPPP has contracted with EOA to conduct LID monitoring consistent with MRP permit requirements. All EOA expenses associated with this effort will be tracked and invoiced separately to SMCWPPP and will be reported in annual Urban Creeks Monitoring Reports (UCMRs). Additional costs that are incurred in support of this monitoring effort by other consultants, efforts of SMCWPPP Program staff, and efforts of other Project participants (e.g., City maintenance staff) will also be reported.

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ATTACHMENTS

- Attachment A – Regional Maintenance Assessment Form
- Attachment B - Field Monitoring Standard Operating Procedures
- Attachment C – Field Datasheets
- Attachment D – LID Field Blank Standard Operating Procedures

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Bay Area Municipal Stormwater Collaborative

Attachment A – Regional Maintenance Assessment Form

Program: ________________ Record ID: ________________

Field Staff Name: ________________ Assessment Date: ________________

Low Impact Development (LID) Facility Maintenance Assessment Form

Type of Inspection: ☐ Pre-Storm Monitoring ☐ Dry Weather Assessment ☐ Other: _______________	☐ Follow-up Maintenance Needed

1. GENERAL INFORMATION		
Name of Facility:	Site Address:	Site ID#:

2. MAINTENANCE HISTORY		
Date of most recent maintenance activity:	Performed by:	Description of maintenance performed:

3. LID ASSESSMENT

MAINTENANCE FINDING SUMMARY		Y	N	N/A	Comments/Actions Taken
Trash or debris	Is trash or debris present in the treatment area?				
	Are one or more inlets, outlets or overflow structures obstructed?				
Weeds	Are weeds present in the treatment area?				
	Are invasive plants present?				
	Are weeds about to or currently going to seed?				
Plant Health	Are all plants healthy, thriving, and aesthetically pleasing?				
	Are there signs of diseased or distressed plants in the treatment area?				
Pruning	Is the system well-manicured & properly pruned, trimmed, dead headed and thinned?				
	Are plants overpruned or overgrown in the treatment area?				
Plant Density	Are plants overcrowded?				
	Are there bare spots in the treatment area?				
	Are plants obstructing one or more inlets/overflows/irrigation system?				
Mulch	Is there full coverage of at least 3" of composted arbor mulch?				
	Is the mulch free of sediment and not clumped together?				
Cobble & Flow Dissipation	Is appropriately sized cobble placed at all inlets/outlets/splash pads?				
	Is the cobble free of sediment, debris, and clogging?				
	Are there signs of erosion at any inlets, outlets, or splash pads?				
Erosion & Sedimentation	Are there signs of erosion or sedimentation in the treatment area?				
	Are the treatment area and adjacent areas protected from erosion?				
	Are there signs of erosion at any inlets, outlets, or splash pads?				
	Are there signs of channelization and scour or loss of soil?				
Standing Water & Vector Control	Is all water drained from the treatment system within 72 hours from last rain?				
	Is there evidence of mosquitoes in the treatment area?				
	Is there evidence of rodent activity in the treatment area?				
Structural Damage	Is there structural damage to the treatment system?				
Irrigation	Is the irrigation system functioning properly with no leaks, breaks, etc.?				
	Are all landscaped portions of the treatment area receiving proper irrigation?				
Contamination	Is there evidence of contamination in the treatment area?				
	Area any BMPs implemented to prevent contamination?				
Vandalism	Are there any signs of vandalism or graffiti?				
Field Measurements	Amount of material (trash, debris, sediment) collected: (number of bags, pounds, or gallons/bag):				

4. DRAINAGE MANAGEMENT AREA INFORMATION
General Observations:

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Attachment B - Field Monitoring Standard Operating Procedures

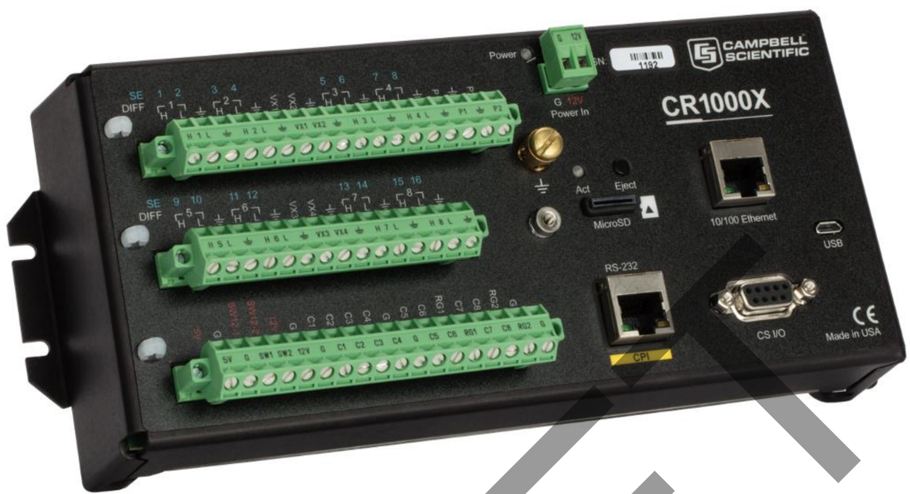

Figure 15.1. Campbell Scientific CR1000X Logger

Campbell Scientific CR-1000X Logger Wiring Tables

Logger Port	Wire Color	Description/Connection
Logger Power connection		
Power 12V	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
Earth ground	Green	Ground rod
LevelVUEB10 Bubbler Transducer (#1) *		
Power 12V+	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
G	Black	Logger G
SDI-12 Signal (data)	Green	C1
LevelVUEB10 Bubbler Transducer (#2) *		

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Power 12V+	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
G	Black	Logger G
SDI-12 Signal (data)	Green	C2

LevelVUEB10 Bubbler Transducer (#3, as needed) *

Power 12V+	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
G	Black	Logger G
SDI-12 Signal (data)	Green	C3

LevelVUEB10 Bubbler Transducer (#4, as needed) *

Power 12V+	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
G	Black	Logger G
SDI-12 Signal (data)	Green	C4

LevelVUEB10 Bubbler Transducer (#5, as needed) *

Power 12V+	Red	Battery positive (+)
Power ground	Black	Battery ground (-)
G	Black	Logger G
SDI-12 Signal (data)	Green	C5

ISCO Sampler 1 Control Cable

Power 12V	Red	AMP pin B
G	Black	AMP pin A
Flow pulse	Red	C6 (AMP pin C)

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GND	Black	G (AMP pin B)
ISCO Sampler 2 Control Cable		
Power 12V	Red	AMP pin B
G	Black	AMP pin A
Flow pulse	Red	C7 (AMP pin C)
GND	Black	G (AMP pin B)

Note: G = Power Ground, denoted by a "G" on the CR1000X wiring panel, GND = Signal Ground, denoted by the circuit schematic symbol for earth ground (≑).

* The current load of the internal compressor requires a LevelVUEB10 to be connected directly to a 12 VDC battery.

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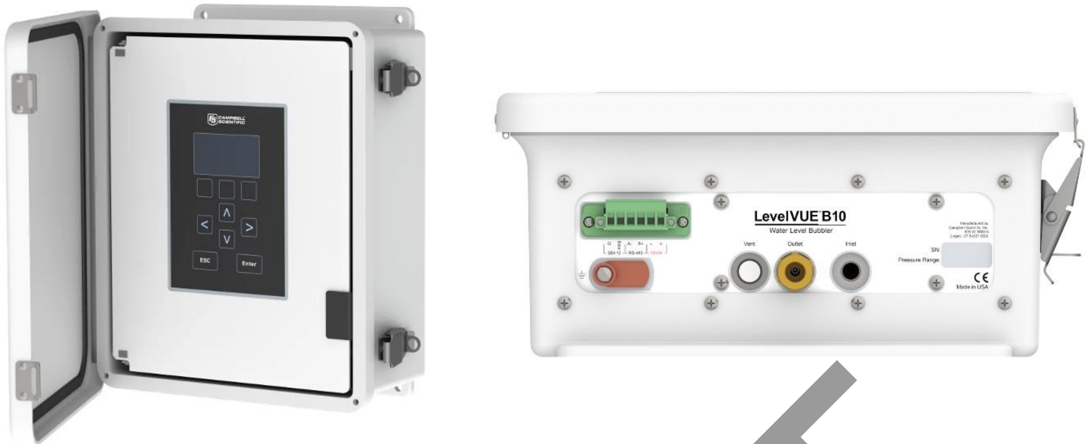

Figure 15.2. Campbell Scientific LevelVUE™B10

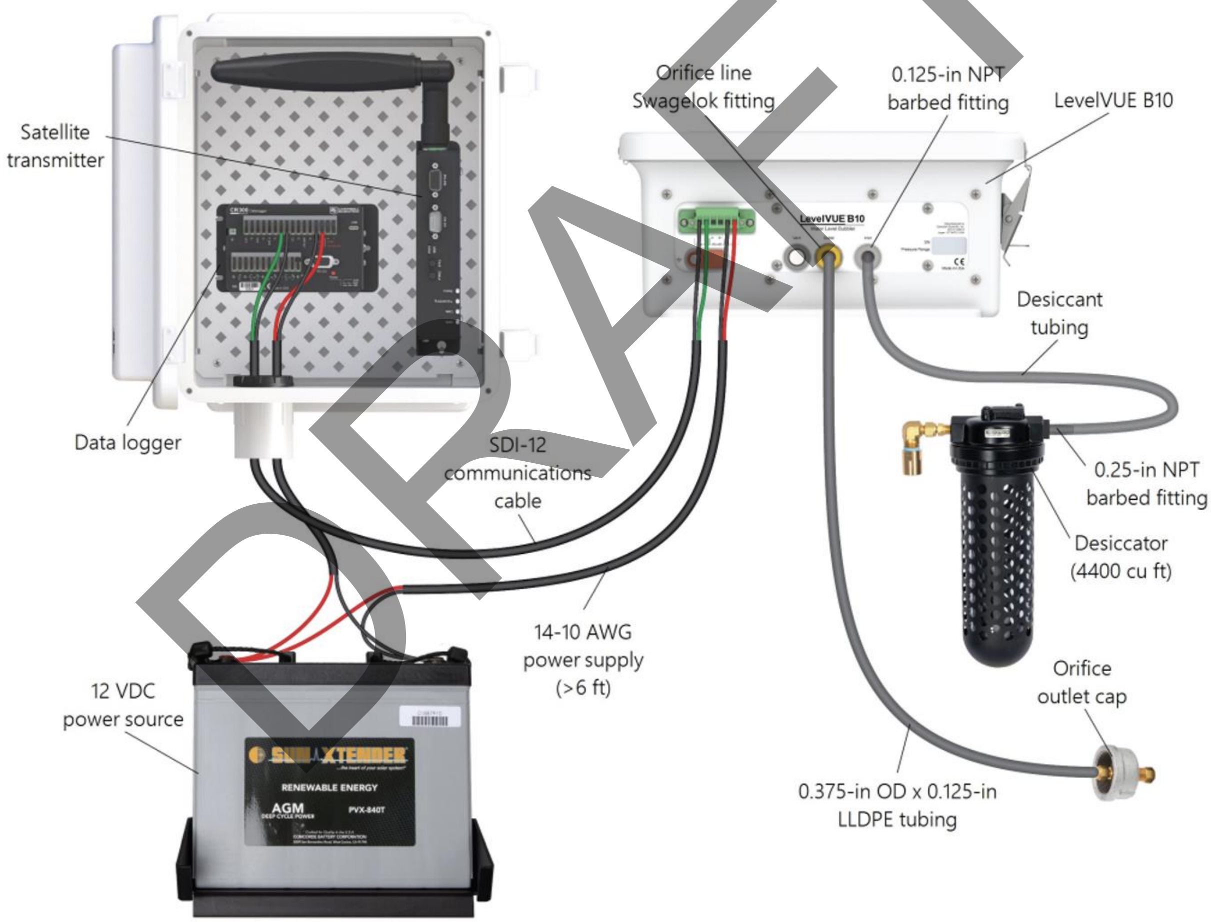

Figure 15.3. LevelVUE™B10 Wiring Diagram

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Isco Sampler Setup – Single 20 Liter Carboy

If needed, halt the system by pressing [Run Stop] hard key. Screen will say "Halted"

Next check Time and Date:

Press [Main Menu] hard key. On screen press "Options", then press "Time/Date". Check that time is in 24-hour format.

If time and date are correct, press "accept".

If time and date are incorrect, modify by pressing "clear entry" and use key pad to enter correct information. Press "accept".

Modify Settings:

Press [Main Menu] hard key then press "Set Up", then press "Modify all items". Doing this will walk you through all fields to be programmed prior to entering the Advanced Options mode. Each field gives the user options to select, this chart will reference only what is used for our program.

For the following, use the "change choice" key or scroll arrows to obtain desired choice, "accept" key to accept and/or move on and "return" key to return to previous menu with no changes.

- Number of Bottles: enter 1 and accept
- Bottle Volume: 20000 ml and accept
- Intake Tube Length: *Set to correct length and accept*
- Program Lock: choose Disabled
- Program Delay: choose Disabled
- Sample Collection: choose Flow Proportional
- Flow Pacing Mode: choose Const Vol/Var Time
- Flow Meter: choose External
- Take Samples Every: enter 1 (counts)
- Timed Over-Ride: Disabled
- Take First Sample: After First Interval
- Run Mode: choose Stop After Last Sample
- Samples to collect: *Set to your choice and accept*. (e.g., 20 for 1000ml samples)
- Liquid Sensors: choose Enabled

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- Sample Volume: *Set to your choice (e.g., 1000ml)and accept*.
- Intake Rinses: 0
- Sample Retries: 0
- Site ID: *Enter your site ID*

After you enter and accept the above settings you will then be asked if you wish to access "advanced sampling features." Select YES. You will use the arrow keys on the right side of the Main Menu to scroll and the "select" key on the left side of the Main Menu to select options. An arrow next to it lets you know that it's active.

- All options should be disabled (no indicating arrow), except:
- Special Output: Select, choose Enabled
    - When To Turn On Special Output: choose After Each Sample
- Review all other options to ensure that they are disabled (no arrow)

Once set up is complete and any necessary calibrations are complete, press [Run/Stop] and you are prompted: To Start Program: Press any Key. Screen should now say "running".

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ISCO Sampler Setup – 4 Bottle carousel, 8 Samples Per Bottle

If needed, halt the system by pressing [Run Stop] hard key. Screen will say "Halted"

Check Time and Date:

Press [Main Menu] hard key. On screen press "Options", then press "Time/Date". Check that time is in 24-hour format.

If time and date are correct, press "accept".

If time and date are incorrect, modify by pressing "clear entry" and use key pad to enter correct information. Press "accept".

Modify Settings:

Press [Main Menu] hard key then press "Set Up", then press "Modify all items". Doing this will walk you through all fields to be programmed prior to entering the Advanced Options mode. Each field gives the user options to select, this chart will reference only what is used for our program.

For the following, use the "change choice" key or scroll arrows to obtain desired choice, "accept" key to accept and/or move on and "return" key to return to previous menu with no changes.

- Number of Bottles: enter 4 and accept
- Bottle Volume: 4000 ml and accept
- Intake Tube Length: Set to correct length and accept

  -Intake Tube Type: select correct type and accept
- Program Lock: choose Disabled
- Program Delay: choose Disabled
- Sample Collection: choose Flow Proportional
- Flow Pacing Mode: choose Const Vol/Var Time
- RUN MODE: Stop after last sample
- Samples to collect: 32
- Liquid Sensors: choose Enabled
- Sample Volume: Set to 500ml
- Intake Rinses: 0
- Sample Retries: 0

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- Site ID: *Enter your site ID*

After you enter and accept the above settings you will then be asked if you wish to access "advanced sampling features." Select YES. You will use the arrow keys on the right side of the Main Menu to scroll and the "select" key on the left side of the Main Menu to select options. An arrow next to the option lets you know that it's active.

- All options should be disabled (no indicating arrow), except:
- Special Output: Select, choose Enabled
    - o When To Turn On Special Output: choose After Each Sample
- Review all other options to ensure that they are disabled (no arrow)

Once set up is complete press [Run/Stop] and you are prompted: "To start program, press any key". NOTE: this will erase all logged data! Make sure all information has been downloaded prior to doing so if you want this data. When ready, press any key to begin program. Screen should say "Running".

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Attachment C – Field Datasheets

LID Monitoring Project
Field Data Log Sheet

GENERAL INFORMATION:

Site ID:	Site Name:	
Field Personnel:		Stormwater Consultant:
Arrival Date:	Arrival Time:	Departure Time:

Purpose of visit: ☐ Pre-Storm Inspection ☐ During-Storm monitoring ☐ Post-Storm Inspection

FIELD QA/QC SAMPLES COLLECTED (check all that apply):

☐ Field duplicate (specify type and time of collection) ______________________________
☐ MS/MSD (specify type and time of collection) ______________________________
☐ Field blank (included for completeness) ______________________________

FIELD MEASUREMENTS:

Level (staff gauge reading in inches) _________ Level (from LevelVUE) _________ Time of reading: __________
pH ____________ Temperature (°C) _____________ Time of pH and temp. measurement ____________________
Dup pH ________ Dup Temperature _____________ Time of dup pH and temp. measurements _________________

STANDARD OBSERVATIONS:

Rainfall: ☐ None ☐ Intermittent ☐ Light ☐ Moderate ☐ Heavy
Oil ☐Yes ☐No (extent)_____________________ Floating material ☐Yes ☐No (type) _______________________
Odor ☐Yes ☐No _______________ Turbidity ☐Yes ☐No _______________ Color ☐Yes ☐No ________________
Other observations (wildlife, construction, recreational activity)
____
Photos taken No Yes (subjects) ______________________________________

AUTOSAMPLER:

Sampler Pacing (l) ___________Time______ Aliquot Volume (ml) _________Time______ First Aliquot Time ______
Most Recent Aliquot Time _____________ Sample Count _________Time______ (Note: Use back of paper if space is insufficient)
Number of missed samples and time of each failure ______________________________________
Carboy removed/replaced? Order (e.g., 1st, 2nd…) ________ Bottle ID ________________________________
Estimated bottle volume (l)_______________________ Estimated number of aliquots ______________________

INSPECTION CHECKLIST:

Is the intake tubing free of kinks and are joints well connected?	☐ Yes ☐ No ☐ See comments
Is the intake strainer clear and free of obstructions?	☐ Yes ☐ No ☐ See comments
Are the 12-volt batteries fully charged?	☐ Yes ☐ No ☐ See comments
Is the solar panel charging the batteries?	☐ Yes ☐ No ☐ No sunlight ☐ See comments
Are the equipment desiccant packs/cartridges acceptable?	☐ Yes ☐ Replaced ☐ See comments
Does the bubbler stage agree with the staff gauge?	☐ Yes ☐ Adjusted ☐ See comments
Has the autosampler program been enabled and is running?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Has the sample aliquot volume been calibrated?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Is the carboy installed, iced, and does tubing extend into bottle?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Is flow meter program running?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Has the pacing value been entered, and flow-paced sampling enabled?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Are the sampler and flow meter clocks accurate?	☐ Yes ☐ Adjusted ☐ Not applicable ☐ See comments
Has the flow meter volume been reset to 0 for start of storm?	☐ Yes ☐ No ☐ Not applicable ☐ See comments
Is the rain gauge free of obstructions?	☐ Yes ☐ Cleared ☐ Not applicable ☐ See comments

COMMENTS / ACTION TAKEN (continue on back of page if needed):

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LID Monitoring Project
Mobilization/Demobilization Log Sheet

GENERAL INFORMATION:			Page __ of __
Station ID:	Site Name:		
Date:	Time of arrival:	Time of departure:	
Team leader's name:	Stormwater consultant:		
Other field personnel:			
Purpose of visit:	☐ Mobilization	☐ Demobilization	☐ Decommissioning

STANDARD OBSERVATIONS:

Weather:____.

Trash: ☐ yes ☐ no Trash Characteristics (type, quantity, removed, etc.): ______________________.

Photographs (describe): ____.

Other observations (vandalism, safety meeting, wildlife, construction/maintenance activities): ______________________

____.

EQUIPMENT INSTALLED OR REMOVED:

Model or Type	**Serial Number or Description**
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________
____________	______________________

DESCRIBE ACTIVITIES:

____
(Team Leader's Signature)

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LID Monitoring Project
Maintenance Log Sheet

GENERAL INFORMATION:

TMDL No.	Site Name:	
Date:	Time of arrival:	Time of departure:
Team leader's name:	Stormwater consultant:	
Other field personnel:		
Purpose of visit: ☐ Monthly Maintenance ☐ Maintenance during Storm Monitoring ☐ Special inspection		

STANDARD OBSERVATIONS:

Weather:____.

Oil (extent):_______________________ Floating material:_______________________.

Other observations (water color or odor, recent road work/repairs, illicit dumping, wildlife, hillside erosion):

FLOWMETER LEVEL CALIBRATION:

Check flowmeter level reading against actual level measured with a ruler; calibrate if necessary. Calibrate at level of average storm flow; check other levels (i.e. low storm level and high storm level)

Before Calibration: Flowmeter level reading/time:_____________ Actual level/time:_____________.
After Calibration (if performed): Flowmeter level reading/time:_____________ Actual level/time:_____________.
Additional levels: Flowmeter level reading/time:_____________ Actual level/time:_____________.
Flowmeter level reading/time:_____________ Actual level/time:_____________.

INSPECTION CHECKLIST:

Power supply functioning:	☐ Yes	☐ No	☐ Not applicable	☐ See comments below	
Flow meter functioning normally:	☐ Yes	☐ No	☐ Not applicable	☐ See comments below	
Flow meter desiccant OK or replaced:	☐ OK	☐ Replaced	☐ Not applicable	☐ See comments below	
Flow meter calibration:	☐ OK	☐ Recalibrated	☐ Not applicable	☐ See comments below	
Sampler functioning normally:	☐ Yes	☐ No	☐ Not applicable	☐ See comments below	
Sampler desiccant:	☐ OK	☐ Replaced	☐ Not applicable	☐ See comments below	
Sampler suction line:	☐ OK	☐ Cleared	☐ Replaced	☐ Not applicable	☐ See comments below
Sampler intake:	☐ OK	☐ Cleared	☐ Replaced	☐ Not applicable	☐ See comments below
Peristaltic pump tubing:	☑ OK	☐ Cleared	☐ Replaced	☐ Not applicable	☐ See comments below

BATTERY VOLTAGE MEASUREMENT:

Replaced battery? ☐ Yes ☐ No
Battery voltage measured with a load tester/time:_______________________volts.`

DESCRIBE MAINTENANCE ACTIVITIES:

____
(Team Leader's Signature)

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Attachment D – LID Field Blank Standard Operating Procedure

BAMSC Field Monitoring Procedures

Low Impact Development Monitoring

Collection of End of Season Field Blanks

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Bay Area Municipal

Stormwater Collaborative (BAMSC)

June 26, 2024

Version 0 (draft)

- Introduction

This document provides a summary of basic steps for end of season field blank sample collection at the Low Impact Development (LID) automated sampling stations. This SOP was developed for use at the ACCWP sampling locations at the Oakland Army Base (OAB) but can be adapted for use at all BAMSC monitoring locations.

- Office

Sampling personnel will order field blank water and sample containers from all necessary analytical laboratories (PFAS and PCBs appropriate blank water and containers from Enthalpy Analytical of El Dorado Hills, California, and remaining supplies from Caltest Analytical Laboratory of Napa, California). Sampling personnel will confirm timing of sample collection with field staff and laboratories after blank water and sample containers have been delivered but in advance of the sample collection effort. For field blank sampling events, staff will take the following steps:

1. Contact laboratories (e.g., Caltest, Enthalpy) and request blank water and sample containers.
2. Review mobilization kit to confirm completeness (e.g. lock box key, clean tubing, gloves, deionized water, and tubing cutters are needed for field blank sampling at a minimum).
3. Notify laboratories (e.g., Caltest, Enthalpy) when field blank sampling will take place and when to expect sample delivery.
4. Confirm field staffing, requires a minimum of four persons in the field.
5. Pre-populate laboratory chain of custody forms.

- Safety

Refer to project-specific Health and Safety Plan (HSP) before conducting any field activities. Items of particular note for this work include:

- Park in center turn lane when possible and bike lane if center lane not available. If parking in the bike lane, deploy traffic control devices per the California Manual on Uniform Traffic Control Devices.
- Place road work signage out before starting maintenance / sampling.
- There may be heavy truck traffic near the facility. Watch out for passing traffic in the roadway and water spray when conditions are wet.
- Footing may be slippery and uneven so pay particular attention to potential for slips, trips, and falls
- Use care and get help from a coworker when lifting filled coolers, as when full they may weigh upwards of 40 lbs.
- Conduct relevant portions of the sampling process consistent with appropriate Confined Space Entry protocols.

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- Mobilization

Staff should keep a mobilization kit prepped at the beginning of the water year and maintain it throughout the sampling season. Equipment and supplies to be included in the kit are detailed in the LID Mob/Demob SOP.

    - Sampling Site

Field staff should be sure to complete field logs and photo document any findings from all stages of mobilization, sampling, and demobilization that may help interpret results of field blank samples.

    - Prepare Tubing for Field Blank Sampling

- Use clean, powder-free nitrile gloves for all handling of tubing and sample bottles
    - For trace metal samples, use lab provided mercury free gloves
- Cut SEB tubing length 6” longer than the old tubing within pump so there is enough tubing length to direct the blank water into the lab provided sample containers
- Ensure that the correct length of tubing is inserted into the pump roller housing, secure with both screw and clamp
- Sampling end of clean tubing should be covered with a protocol cleaned Ziploc® bag until it is attached to the HDPE intake tubing
- When coupling the SEB tubing to the HDPE intake tubing, ensure 1” minimum overlap and secure with zip ties
- Check that there are no kinks in the SEB tubing or HDPE intake tubing
- Remove intake strainer from influent tubing, detach influent intake tubing at the weir
- Detach effluent and intake tubing at the weir
    - For effluent, this will require confined entry personnel and gear
- Remove visible debris from outside of influent/effluent rigid tubing by pouring UPLC water
- Backflush all tubing with approx 1 gallon of UPLC water
    - Using up / down arrows, set the ISCO to operate in manual mode (Other Functions / Manual / Reverse Pump)
    - Let pump run after backflush water is empty to so that all backflush water is removed from the HDPE intake tubing
- Insert two-foot segment of protocol-cleaned SEB tubing onto outside of influent/effluent HDPE tubing at the intake end prior to field blank collection
    - The SEBS tubing is clean on both inside and outside surfaces. Each site’s influent and effluent station will use its own clean section of SEBS tubing

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Figure 2. Peristaltic SEB (styrene ethylene butylene styrene) pump tubing that is replaced prior to each sampling event and prior to the field blank sampling.

- Field Blank Sampling

- Place an empty cooler into container space below the ISCO sampler to use as a sampling platform
- Complete bottle labels, adding date and time, sampler's initials and 'MMDD' to the Sample ID
- Ensure correct field blank water and sample bottles for each lab are paired together
    - i.e., Distinct Enthalpy field blank water for PFAS versus PCBs, and distinct water for Caltest constituents only
- Collect field blank samples in this order:
    - PFAS
    - PCBs
    - Conventional parameters
    - Metals (copper and zinc)

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- Mercury (be sure to use clean hands/dirty hands collection protocol)

- Two persons will be on the intake end to swap and insert tubing into field blank water as needed
    - To minimize contamination while sampling, draw blank water from containers by inserting tubing slowly into water following the receding water line as water is pumped by the sampler
- Two personnel will be at the pump for sampling (one to operate pump and direct sample tubing, the other to cap/uncap and fill sample bottles)
- Run pump forward to collect field blank sample using the correct blank water from each lab per analyte
    - Using up / down arrows, set the ISCO to operate in manual mode (Other Functions / Manual / Forward Pump)
- Once water starts flowing, count 5 - 10 seconds (depending on length of tubing) to ensure lab blank water will be collected
    - Direct water away from sample bottles during this time – a slightly longer SEB tubing length helps
- Fill lab appropriate sample containers to the shoulder, making sure not to overfill (some sample bottles contain acid or preservatives)
- Occasionally the pump may be stopped during sampling as the team on intake side swaps lab blank water bottles
- Once sample bottle is swapped (for another of the same type), pump can be turned on and sampling resumed immediately
- After all samples using the first water type are collected, backflush until tubing is empty to purge any remaining water before moving onto next water type
- Repeat process as above, using next blank water type and samples. Make sure to backflush after switching water types. Let water run for 5-10 seconds before collecting samples
    - Complete COCs
- Complete a COC for both Caltest and Enthalpy. Partially completed forms are included in the field binder.
- All sample bottles will have labels with the same naming convention
- Caltest and Enthalpy COCs should be entirely filled out (including signed) with sample ID naming convention as follows:

SITE-L-FB-YYYYMMDD

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where:

SITE - Site ID (e.g., OAB18W)

L - Location (I = influent; E = effluent)

FB - Field Blank

YYYYMMDD - Sample year, month, date

- Sample ID and Sample date and time should be recorded on the bottle label as well as the COCs.

    - Secure Facility and Dry Season Demob

- KEI will demob and remove all equipment for secure offsite dry season storage
- Close job boxes and secure locks (making sure hasps are in correct orientation if locks will not close).

    - Deliver samples to lab

As soon as possible after sampling, deliver filled sample bottles to Caltest at 1885 N. Kelly Road, Napa, CA.

- Sample receiving is identified by a green awning near the corner of the lab
- Inform the laboratory staff that metals filtering and pH analysis are required immediately.

As soon as possible after sampling, ship Enthalpy samples on wet ice to:

Enthalpy Analytical – El Dorado Hills

1104 Windfield Way

El Dorado Hills, CA95762

Phone: 916-673-1520

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