STORMWATER MANAGEMENT

Guidance Manual

for

LOW IMPACT DEVELOPMENT &

POST-CONSTRUCTION REQUIREMENTS

June 2015

City of Gilroy, City of Morgan Hill and County of Santa Clara

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Section 1

Does My Project Need to Meet Post-Construction Performance Requirements?

Introduction

Gilroy, Morgan Hill and the portion of Santa Clara County that drains to the Pajaro River-Monterey Bay watershed (herein referred to as South Santa Clara County) are traditional Permittees under the State's Phase II Small MS4 General Permit ("Phase II Permit"). Since Gilroy, Morgan Hill and South Santa Clara County are located in Regional Water Quality Control Board Region 3 (Central Coast Region), they are subject to the Central Coast Post-Construction Requirements per Provision E.12.k of the Phase II Permit. The Central Coast Post-Construction Requirements were adopted in Resolution R3-2013-0032 and are specific to the Central Coast Region. These Post-Construction Requirements became effective March 6, 2014.

Post-construction controls are permanent features of a new development or redevelopment project designed to reduce pollutants in stormwater and/or erosive flows during the life of the project. Types of post-construction controls include low impact development (LID) site design, pollutant source control, stormwater treatment, and hydromodification management measures. The LID approach reduces stormwater runoff impacts by minimizing disturbed areas and impervious surfaces, maximizing opportunities for infiltration and evapotranspiration, and using stormwater as a resource (e.g. rainwater harvesting for non-potable uses).

Regulated Projects

Projects subject to the Central Coast Post-Construction Requirements include all New Development or Redevelopment projects that create and/or replace $\geq$2,500 square feet of impervious surface (collectively over the entire project site). This includes single family homes and the following road projects:

a) Removing and replacing a paved surface resulting in alteration of the original line and grade, hydraulic capacity or overall footprint of the road.

b) Extending the pavement edge, or paving graveled shoulders.

c) Resurfacing by upgrading from dirt to asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment ("chip seal") to asphalt or concrete.

Excluded Projects

Projects that are exempt from the Post-Construction Requirements are as follows:

a) New Development or Redevelopment projects that create and/or replace ≤2,500 square feet of impervious surface (collectively over the entire project site)

b) Road and Parking Lot maintenance:

- Road surface repair including slurry sealing, fog sealing, and pothole and square cut patching
- Overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage
- Shoulder grading
- Cleaning, repairing, maintaining, reshaping, or re-grading drainage systems
- Crack sealing
- Resurfacing with in-kind material without expanding the road or parking lot
- Practices to maintain original line and grade, hydraulic capacity, and overall footprint of the road or parking lot
- Repair or reconstruction of the road because of slope failures, natural disasters, acts of God or other man-made disaster

c) Sidewalk and bicycle path or lane projects, where no other impervious surfaces are created or replaced, built to direct stormwater runoff to adjacent vegetated areas

d) Trails and pathways, where no other impervious surfaces are replaced or created, and built to direct stormwater runoff to adjacent vegetated areas

e) Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics

f) Curb and gutter improvement or replacement projects that are not part of any additional creation or replacement of impervious surface area (e.g., sidewalks, roadway)

g) Second-story additions that do not increase the building footprint

h) Raised (not built directly on the ground) decks, stairs, or walkways designed with spaces to allow for water drainage

i) Photovoltaic systems installed on/over existing roof or other impervious surfaces, and panels located over pervious surfaces with well-maintained grass or vegetated groundcover, or panel arrays with a buffer strip at the most down gradient row of panels

j) Temporary structures (in place for less than six months)

k) Electrical and utility vaults, sewer and water lift stations, backflows and other utility devices

l) Above-ground fuel storage tanks and fuel farms with spill containment system

A checklist of the excluded projects is available in Appendix A.

Performance Requirements

A project may be required to meet different post-construction requirements or Performance Requirements (PR) depending on the type and location of the project and amount of impervious surface created and/or replaced. Performance Requirements include:

- PR-1 - Site Design and Runoff Reduction
- PR-2 - Water Quality Treatment
- PR-3 - Runoff Retention
- PR-4 - Peak Management

See the Table 1 for a summary of the Performance Requirements. Details on the implementation of these Performance Requirements are provided in the following Chapters.

Table 1. Post Construction Requirements at a Glance[1]

Type of Project	Requirements
Tier 1 Projects, including single-family homes, that create or replace 2,500 square feet or more of impervious surface	**PR-1 - Implement LID Measures:** • Limit disturbance of natural drainage features. • Limit clearing, grading, and soil compaction. • Minimize impervious surfaces. • Minimize runoff by dispersing runoff to landscape or using permeable pavements.
Tier 2 Projects, other than single-family homes, that create or replace 5,000 SF or more of net impervious surface[2] Detached single-family homes that create or replace 15,000 SF or more of net impervious surface	**PR-1 requirements, plus PR-2:** • Treat runoff with an approved and appropriately sized LID treatment system prior to discharge from the site.
Tier 3 Projects, other than single-family homes, that create or replace 15,000 SF or more of impervious surface. Detached single-family homes that create or replace 15,000 SF or more of net impervious surface[2].	**PR-2 requirements, plus PR-3:** • Prevent offsite discharge from events up to the 95th percentile rainfall event using Stormwater Control Measures[3].
Tier 4 Projects, including single-family homes, that create or replace 22,500 square feet or more of impervious surface.	**PR-3 requirements, plus PR-4:** • Control post-project peak flows to not exceed pre-project peak flows for the 2- through 10-year storm events. (May be satisfied by Tier 3 requirements for some projects.)

Notes:

[1]Adapted from "Stormwater Technical Guide for Low Impact Development: Compliance with Stormwater Post-Construction Requirements in Santa Barbara County", Project Clean Water, County of Santa Barbara, Water Resources Division, February 18, 2014

[2]Net impervious surface equals new and replaced impervious area minus the total pre-project to post-project reduction in impervious area (if any).

[3]Single-family home projects in some areas of Santa Clara County may be allowed to retain runoff from the 85th percentile rainfall event if they are in Watershed Management Zones 5, 6 or 9.

Source Control Measures

Regulated Projects with pollutant-generating activities and sources are required to implement structural and/or operational source control measures. Structural source controls are permanent design features that reduce pollutant sources. For example, some structural source controls are covered trash enclosures, labels on storm drain inlets and draining non-stormwater discharges to landscaping or the sanitary sewer. Operational source controls are practices conducted on an ongoing basis to reduce pollutant sources. An example operational source control is integrated pest management for landscaping. Source control measures should be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment[1] (or equivalent). Pollutant generating activities and sources include:

- Accidental spills or leaks
- Interior floor drains
- Parking/storage areas and maintenance
- Indoor and structural pest control
- Landscape/outdoor pesticide use
- Pools, spas, ponds, decorative fountains and other water features
- Restaurants, grocery stores and other food service operations
- Refuse areas
- Industrial processes
- Outdoor storage of equipment and materials
- Vehicle and equipment cleaning
- Vehicle and equipment repair and maintenance
- Fuel dispensing areas
- Loading docks
- Fire sprinkler test water
- Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources
- Unauthorized non-stormwater discharges
- Building and grounds maintenance

A Source Control Checklist is provided in Appendix A.

Site Design and Stormwater Control Measures Concepts

The key to meeting the performance requirements is to plan and design stormwater control measures (SCMs) integrally with the conceptual site plan and landscaping for the project. Lay out the site to protect and preserve natural areas and drainage patterns. Delineate drainage management areas (DMAs) on your site. Develop your stormwater control plan to take

[1] https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook

advantage of vegetated areas for infiltration. If applicable, locate and size your LID facilities as part of the site plan.

Small, Tier 1 projects only need to implement site design measures to reduce runoff from the site. Site design measures include dispersing runoff to landscaping, using permeable pavement or capturing runoff (rain barrels and cisterns) for reuse. Site design measures are also required in larger projects and should be used to reduce the amount of runoff that must be treated (PR-2) or retained (PR-3). This is accomplished by designing self-treating and/or self-retaining areas.

Self-Treating Areas

A self-treating area is a pervious area that treats rain falling on itself only, by ponding, infiltration and evapotranspiration. The pervious area can be undisturbed vegetation, planted with native drought tolerant or LID appropriate vegetation, pervious paving, artificial turf or a green roof. Self-treating areas are flat or slightly concave, and retain and infiltrate rainfall up to the design rainfall depth. If the pervious area infiltrates the design rainfall, then the additional runoff can be directed directly to the storm drain system with no additional treatment. The example in Figure 1 demonstrates that by having a pervious self-treating area on the site, the runoff from the impervious areas may flow to a smaller treatment measure.

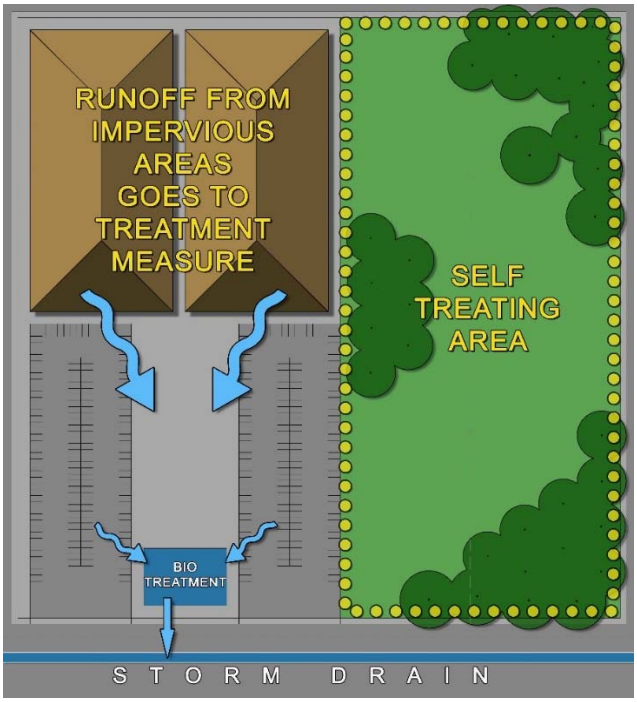

Figure 1. Schematic Diagram of a Site with a Self-Treating Area
(Reference: SCVURPPP C.3 Stormwater Handbook, 2012)

Self-Retaining Areas

A self-retaining area is a pervious area that retains rainfall that falls on itself and the runoff from an adjacent impervious area. A maximum 2:1 ratio of impervious area to the receiving pervious area is acceptable[2]. The pervious area is designed as a landscaped area that is slightly concave to allow up to 3 inches of ponding or pervious paving with additional storage. If the pervious area is able to infiltrate the design runoff volume without discharge to the storm drain system and without creating nuisance ponding that may affect vegetation health or contribute to vector problems, then no additional stormwater management is required for the contributing impervious area. The example in Figure 2 demonstrates that self-retaining areas reduce the amount of impervious area that requires treatment and allow a smaller treatment measure to be used.

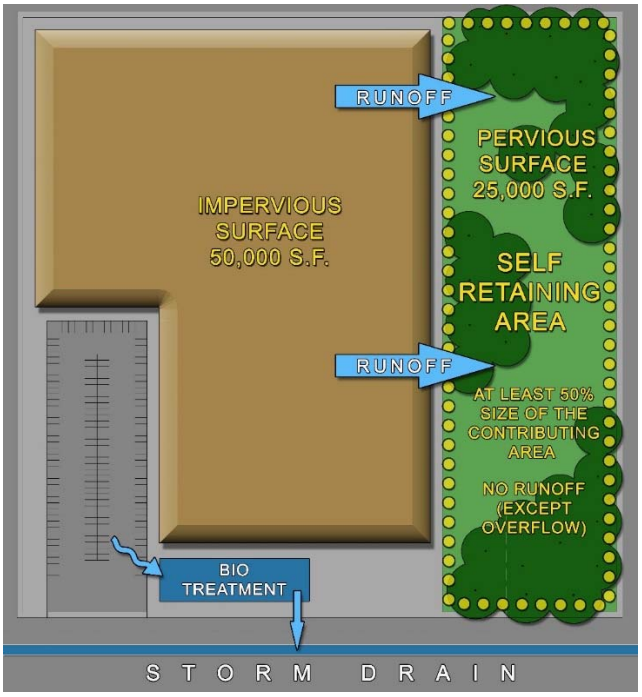

Figure 2. Schematic Drainage Plan for Site with a Self-Retaining Area
(Reference: SCVURPPP C.3 Stormwater Handbook, 2012)

LID Treatment and Retention Options

LID treatment methods are the preferred option when stormwater treatment (PR-2) is required. LID treatment is defined as rainwater harvesting/use, infiltration, and evapotranspiration, and biotreatment. LID options can also be used to meet the runoff retention requirements (PR-3) where site conditions allow.

[2]This rule of thumb may not be applicable if designing for 95th percentile storm retention (PR-3). It is being investigated and this Manual will be updated when new information is available.

For rainwater harvesting and use, rainwater is collected in rain barrels or cisterns and used for non-potable uses such as toilet flushing or irrigation. Possible barriers to large scale rainwater harvesting systems are a lack of demand to use the entire water quality design volume, competition with recycled water use, complex maintenance requirements, and higher capital and O&M costs than other options.

Infiltration facilities (e.g., infiltration trench, as in Figure 3) store water in the void space of rocks, allowing it to infiltrate to the surrounding soils. This approach requires reasonably infiltrative soils (i.e., minimum infiltration rate of 0.5 in/hr). There are also subsurface infiltration systems that use underground pipes, vaults, or modular units to store and infiltrate runoff. These systems provide more capacity in a smaller footprint but are not recommended for poorly infiltrating soils due to the potential for standing water. These systems can be installed under parking lots, vegetated areas or other at-grade features.

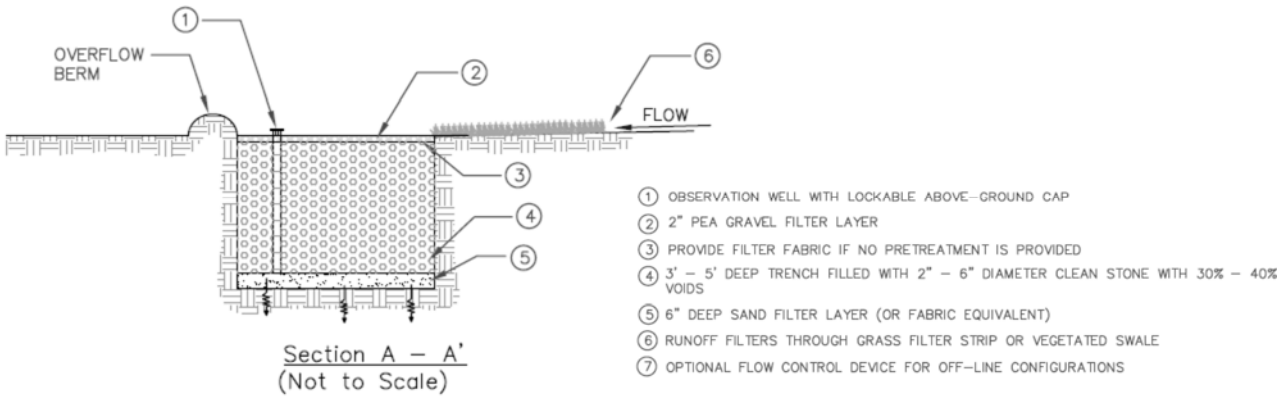

Figure 3. Example Infiltration Trench Design
(Reference: SCVURPPP C.3 Stormwater Handbook, 2012)

Bioretention areas are concave landscaped areas, of any shape, that provide treatment via filtration through special biotreatment soil that has a specified infiltration rate (typically 5 inches per hour). Bioretention design details are available at the Central Coast Low Impact Development Initiative (LIDI) website.[3]

When bioretention areas are unlined and have no underdrain (Figure 4), they are able to provide runoff retention via infiltration and evapotranspiration in addition to treatment. If the bioretention area has an underdrain placed near the top of the subsurface drainage/storage (gravel) layer (Figure 5), it provides some infiltration and evapotranspiration prior to discharge of treated stormwater through the underdrain. This is a typical design used on sites with C & D type (loamy or clayey) soils. If a bioretention area is lined, with an underdrain placed at the bottom of the facility, it is often referred to as a biotreatment area and is considered a non-

[3] http://www.centralcoastlidi.org/Central_Coast_LIDI/LIDI_Details.html

retention based treatment system. Other non-retention based treatment systems include flow-through planters, manufactured tree well filters, and media filters.

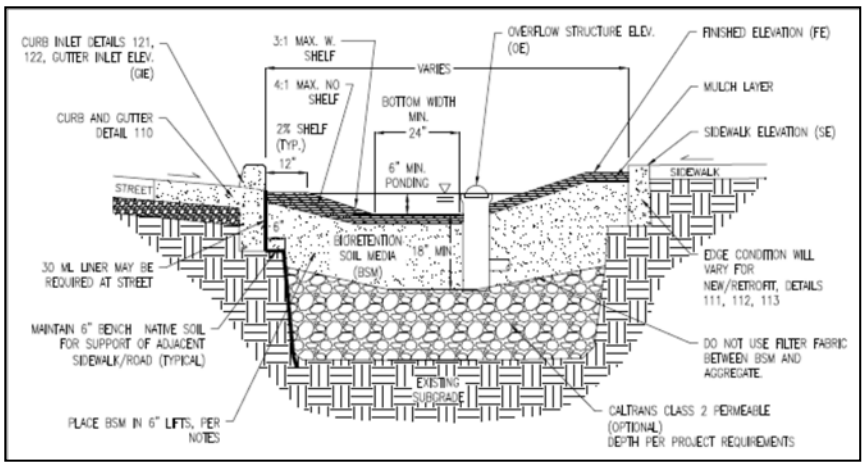

Figure 4. Street Bioretention Facility (sloped sided, without underdrain)
(Reference: Central Coast LIDI)

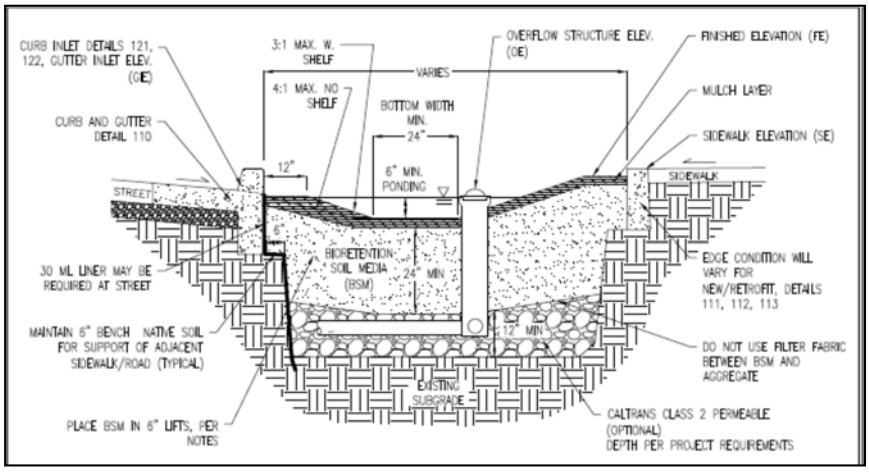

Figure 5. Street Bioretention Facility (sloped sided, <u>with</u> underdrain)
(Reference: Central Coast LIDI)

For additional resources on site design and stormwater control measures, see Appendix J.

<u>Peak Management Stormwater Control Measures</u>

SCMs used to manage peak flows include ponds, detention basins, tanks or vaults that have a specialized outlet to control the rate of flow to match pre-project conditions. SCMs used to meet the runoff retention requirements also help reduce peak flows and may be able to meet peak management requirements if additional storage capacity is provided.

Stormwater Control Measures Sizing Methodology

Drainage Management Areas

The first step for sizing water quality treatment (PR-2) or runoff retention (PR-3) SCMs is to delineate the site's drainage management areas (DMAs). DMAs are catchments or portions of a project site that drain to a common point. Follow roof ridges and grade breaks when delineating DMAs. There must be a different DMA for each type of surface (e.g, landscaped, impervious, or pervious pavement). There are four types of DMAs:

- Self-treating area,
- Self-retaining area,
- Area draining to self-retaining area and
- Area draining to a SCM.

Note, multiple DMAs may drain to one SCM, but one DMA may not drain to multiple SCMs. For each DMA draining to a SCM, determine the square footage, type of surface, and corresponding runoff factor. This information is used for sizing runoff retention and/or water quality treatment SCMs.

The runoff factors used will depend on the chosen tools for sizing SCMs:

- Table 2 lists runoff factors that are used for the 4% simplified sizing method discussed in Section 3 for water quality treatment SCMs.
- The Santa Barbara Sizing Calculator, used for designing water quality treatment or runoff retention SCMs (see Section 4), uses slightly different runoff factors, e.g., 0.9 for impervious surfaces instead of 1.0, and 0.2 for unit pavers on sand instead of 0.5.
- Attachment D of the Central Coast Post-Construction Requirements sizing guidance provides a formula that utilizes the fraction of impervious area to calculate the runoff coefficient for the runoff retention simple sizing method (see Appendix D).
- Attachment E of the Central Coast Requirements provide specific correction factors the Regulated Project must use when calculating the ten percent adjustment to the runoff retention requirement (see Appendix F).

Table 2. Runoff Factors for LID Design (small storms)

DMA Surface Type	Runoff Factor
Roofs and paving	1.0
Landscaped areas	0.1
Bricks or solid pavers on sand base	0.5
Pervious concrete or asphalt	0
Turf block or gravel – total section ≥ 6" deep	0

(Reference: Santa Barbara County Stormwater Technical Guide, 2014)

Hydraulic Sizing Criteria

SCMs can be sized using a flow-based or volume-based hydraulic sizing method. An example of using flow-based sizing criteria will be discussed in Section 3 and volume based criteria discussed in Section 4. Table 3 shows which hydraulic sizing method is appropriate for commonly used SCMs.

Table 3. Flow and Volume Based Stormwater Control Measure Sizing Criteria

SCM Type	Hydraulic Sizing Criteria
Rainwater harvesting and reuse	Volume-based
Infiltration trench	Volume–based
Subsurface infiltration system	Volume-based
Bioretention area	Flow- or volume-based
Tree well filter	Flow-based
Media filter	Flow-based
Extended detention basin	Volume-based

Section 2

Performance Requirement No. 1

Site Design and Runoff Reduction

Projects subject to Performance Requirement No. 1 (PR-1) Site Design and Runoff Reduction are Projects that create and/or replace ≥ 2,500 square feet of impervious surface (collectively over the entire project site), including detached single-family homes. PR-1 requires the use of site design LID strategies. Projects are required to implement at least the following measures:

- Limit disturbance of creeks and natural drainage features
- Minimize compaction of highly permeable soils
- Limit clearing and grading of native vegetation
- Minimize impervious surfaces
- Minimize stormwater runoff by implementing one or more of the following site design measures:
    - Direct roof runoff into cisterns or rain barrels for reuse
    - Direct roof runoff onto vegetated areas
    - Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas
    - Direct runoff from driveways and/or uncovered parking lots onto vegetated areas
    - Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways and patios with permeable surfaces

When dispersing runoff to landscape areas, ensure it is safely away from building foundations and footings, consistent with the California Building Code.

The Project Engineer must submit a stamped and signed copy of the Performance Requirement No. 1 Certification, as included in Appendix A, stating that LID design strategies are included in the project design.

Section 3

Performance Requirement No. 2

Water Quality Treatment

Projects subject to Performance Requirement No. 2 (PR-2) Water Quality Treatment are:

- Projects with ≥ 5,000 square feet (sf) of Net Impervious Area, except detached single-family homes.
- Detached single-family homes ≥ 15,000 sf of Net Impervious Area.

For the purpose of determining if a project is subject to PR-2, Net Impervious Area is the total (including new and replaced) post-project impervious area, minus any reduction in total imperviousness from the pre-project to post-project condition:

Net Impervious Area = (New and Replaced Impervious Area) - (Reduced Impervious Area Credit)

where

Reduced Impervious Area Credit = (Total Pre-Project Impervious Area) - (Total Post-Project Impervious Area)

Two example calculations of Net Impervious Area are provided below:

Net Impervious Area Calculation Example 1

1. An existing commercial shopping center has 100,000 sf of impervious surface.
2. The new project will have a total impervious area of 85,000 sf.
3. The **Reduced Impervious Area Credit** is: 100,000 – 85,000 = 15,000 sf
4. The **Net Impervious Area** is: 85,000 – 15,000 = 70,000 sf
5. The Net Impervious Area is > 5,000 sf therefore the project is subject to PR-2 Water Quality Treatment

Net Impervious Area Calculation Example 2

1. An existing commercial shopping center has 100, 000 sf of impervious surface.
2. The new project will redesign the site with a total impervious area of 50,000 sf (the developer proposes a significant amount of landscaping and green roofs).
3. The **Reduced Impervious Area Credit** is: 100,000 – 50,000 = 50,000 sf
4. The **Net Impervious Area** is: 50,000 – 50,000 = 0 sf
5. The Net Impervious Area is < 5,000 sf; therefore the project is NOT subject to PR-2 Water Quality Treatment.

If it is determined that a project is subject to the PR-2 requirements, the Water Quality Treatment measure must be designed to treat runoff from all post-project impervious surfaces (except those that drain to self-retaining areas), unless runoff from the existing surfaces can be separated from the new and replaced impervious surfaces.

A Stormwater Control Plan is required for all Regulated Projects subject to PR-2. Appendix B provides a checklist of the Stormwater Control Plan required information. A Stormwater Control Plan template with additional guidance is available on the Central Coast Regional Water Board website[4]. Note that Regulated Projects subject to PR-2 must also meet PR-1 requirements and submit a Performance Requirement No. 1 Certification.

The on-site Water Quality Treatment measures available to Regulated Projects (in order of preference) and the associated design criteria are provided in Table 4:

Table 4. Water Quality Treatment Measures Design Criteria

Water Quality Treatment Measure*	**Design Criteria**
LID Treatment System - *Harvesting and use, infiltration, evapotranspiration, and bioretention (without an underdrain) SCMs*	Retain stormwater runoff from 85th percentile 24-hour storm event (based on local rainfall data)
Biofiltration Treatment System - *Bioretention with raised underdrain, or other facilities at least as effective as a system with the specified design criteria*	Design rain event of 0.2 in/hr intensity OR 2 x 85th percentile hourly rainfall intensity Other specified design criteria include: • Maximum surface loading rate 5 in/hr • Minimum surface reservoir depth (6") • Minimum planting medium depth (24") • Proper plant selection • Subsurface gravel layer (minimum depth of 12") • Underdrain placement near top of gravel layer • No compaction of soils beneath facility • No liners preventing infiltration
Non-Retention Based Treatment Systems - *Lined bioretention, flow-through planters, and high rate tree well filters and media filters*	Volume Hydraulic Design Basis: 85th percentile 24-hr storm event Flow Hydraulic Design Basis: 0.2 in/hr intensity OR 2 x 85th percentile hourly rainfall intensity

*Multiple SCMs may be used to collectively achieve the design criteria.

[4] http://www.swrcb.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

The 85th percentile rainfall map is available in Appendix C and can be obtained as GIS shape files on the Central Coast Water Board website[5]. There are several methods and tools for sizing water quality treatment measures to meet the design criteria above. These are discussed in more detail in Section 4.

There is a simplified sizing method for bioretention facilities meeting the design loading rate (infiltration rate) of 5 inches per hour to detain and treat runoff produced by a rainfall intensity of 0.2 inches per hour . If it is assumed that 100% of rainfall ends up as inflow to the bioretention facility, then the ratio of bioretention surface area to tributary impervious area (or sizing factor) needs to be 0.04 (0.2 in/hr ÷ 5 in/hr) (see Figure 6). An example calculation is shown in Table 5.

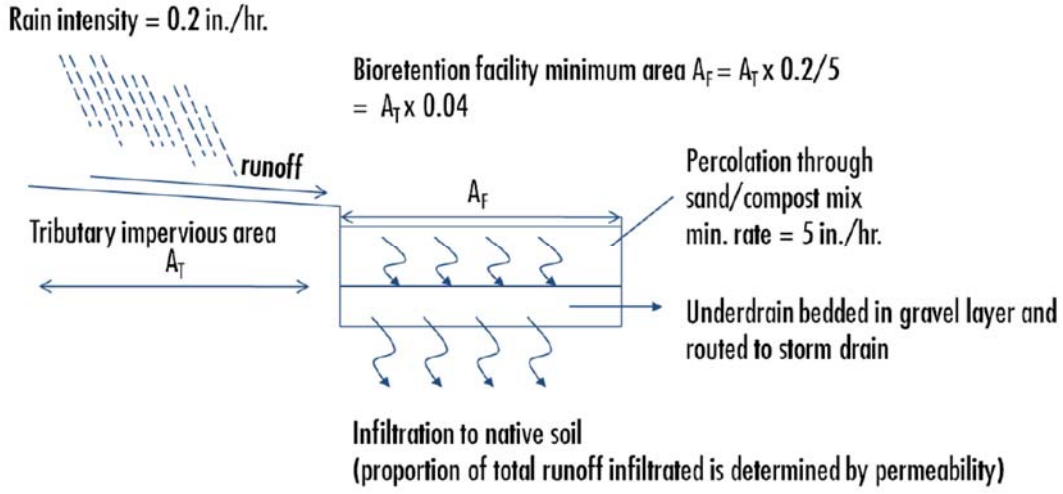

Figure 6. Derivation of Sizing Factor of 0.04 for Sizing Tier 2 Bioretention Facilities
(Reference: Santa Barbara County Stormwater Technical Guidance February 2014).

Table 5. Sizing Example for Water Quality Treatment Bioretention Facility

DMA Name	DMA Area (sq ft)	Post-project surface type	DMA Runoff Factor	DMA Area x runoff factor	Facility Sizing Factor	Minimum Facility Size (sq ft)
DMA-1	2,200	Roof	1.0	2,200		
DMA-2	2,200	Roof	1.0	2,200		
DMA-4	9,100	Paved	1.0	9,100		
Total				13,500	0.04	540

[5] http://www.waterboards.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

The Project Engineer shall identify which of the on-site water quality treatment measures are included in the design, as identified on the PR-2 Certification in Appendix A. The on-site water quality treatment measures are listed in order of preference. The plans shall clearly identify the type, location, and size of all on-site water quality treatment measures. Initial each on-site water quality treatment measure and note the plan sheet that shows the location and detail, or mark NA if not applicable. Submit a signed copy of the PR-2 Certification.

Section 4

Performance Requirement No. 3

Runoff Retention

Regulated Projects subject to Performance Requirement No. 3 (PR-3) Runoff Retention are:

- Projects that create and/or replace ≥15,000 sf of impervious surface, except detached single-family homes
- Detached single-family homes with ≥15,000 sf of Net Impervious Area (as defined in PR-2)

These requirements apply to Regulated Projects located in the following areas:

- Watershed Management Zones (WMZs) 1, 2, 5, 6, 8 and 9; and
- Portions of WMZs 4, 7, and 10 that overlie designated Groundwater Basins.

Regulated Projects subject to PR-3 must also meet PR-1 and PR-2 requirements and submit PR-1 and PR-2 Certifications. In addition to the Stormwater Control Plan requirements in PR-2, there is specific information that must be included in the Stormwater Control Plan for Regulated Projects subject to PR-3. See Appendix B for a checklist of information required in the Stormwater Control Plan. A Stormwater Control Plan template with additional guidance is available on the Central Coast Regional Water Board website[6].

PR-3 requires the applicant to retain stormwater runoff on the site. The retention volumes and method depend on the Watershed Management Zone (WMZ) in which the project is located (see checklist in Appendix A). WMZ maps are available in Appendix C and can be found on the County of Santa Clara Development Services Office webpage[7].

Most developable land in Morgan Hill, Gilroy and South Santa Clara County is in WMZ 1 or 2. The Runoff Retention Performance Requirements for WMZ 1 and 2 are as follows:

- WMZ 1: Retain the 95th percentile 24-hour rainfall event by optimizing infiltration. Retention of the remaining volume must be achieved via storage, rainwater harvesting and/or evapotranspiration.
- WMZ 2: Retain the 95th percentile 24-hour rainfall event through storage, rainwater harvesting, infiltration, and/or evapotranspiration.

The 95th percentile rainfall map is available in Appendix C and can be found on the County of Santa Clara Development Services Office webpage[7]. The map can be used to determine the design storm depth based on the project's location.

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[6] http://www.swrcb.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

[7] http://www.sccgov.org/sites/dso/Stormwater/Pages/Clean-Water-Program.aspx

Regulated Projects are required to meet the Runoff Retention Performance Requirements using specified LID development standards related to:

- Site Assessment Measures – identify opportunities and constraints to implement LID Stormwater Control Measures (see Checklist in Appendix A),
- Site Design Measures – optimize site design measures from PR-1 and augment with additional measures (see Checklist in Appendix A),
- Delineation of discrete Drainage Management Areas, and
- Use of undisturbed natural landscaped areas[8] as self-treating or self-retaining areas

Once site design measures, self-treating areas and self-retaining areas have been maximized to the extent feasible, the Project Applicant can use structural Stormwater Control Measures (SCM) to retain runoff.

The size of the SCMs is calculated based on the Retention Tributary Area.

> *Retention Tributary Area = (Entire Project Area) – (Self-treating Areas) – (Self-Retaining Areas and the Impervious Areas that Drain to Them)*

This is accounted for in the method used in Section 1 to delineate DMAs into four categories: self-treating area, self-retaining area, area draining to self-retaining area and area draining to a LID facility.

Adjustments can be made to the Retention Tributary Area if the Regulated Project includes replaced impervious surface. The adjustments are based on whether the project is located outside or inside of an Urban Sustainability Area (USA). **There are currently no USAs in Morgan Hill, Gilroy or South Santa Clara County**. Therefore, all projects are considered to be outside of an approved USA and the total amount of <u>replaced</u> impervious surface area is multiplied by 0.5 when calculating the Retention Tributary Area. See the example calculation below.

<u>Adjusted Retention Tributary Area Example 1</u>
Total DMA surface area: 12,400
New Impervious surface in DMA: 11,100 sq ft
Replaced Impervious surface in DMA: 1,300 sq ft
Adjusted Retention Tributary Area = (1,300 x 0.5) + 11,100 = 11,750 sq ft

The SCMs can be sized using one of three methodologies: 1) continuous simulation hydrologic modeling, calibrated to local conditions; 2) the simple method (single event-based); or 3) the routing method (single event-based). Sizing guidance for the simple method and the routing method can be found in Appendix D. The simple method sizes the SCM with a volume equal to

[8]Natural landscaped areas are those planted with native, drought-tolerant, or LID appropriate vegetation.

the runoff volume produced by the design storm. The routing method uses iterative calculations routing the design storm hydrograph through the facility to account for infiltration that occurs simultaneously with inflow, which results in a smaller facility. Santa Barbara County developed a "Stormwater Control Measures Sizing Calculator" Excel Workbook that uses the routing method. The calculator and instructions are available on the Santa Barbara County website[9]. The State Water Resources Control Board developed a Phase II LID Sizing Tool that is web based[10]. This Phase II tool was primarily developed to calculate SCM sizes to meet the statewide Phase II Permit requirements. The tool was amended to include results for the Central Coast (Region 3) simple sizing method.

Two examples of sizing SCMs for development projects can be found in Appendix H. The Project Engineer must certify that the Runoff Retention requirements were included in the design either onsite or through an Alternative Compliance agreement (see Section 7).

Technical Infeasibility Adjustment

If a Regulated Project demonstrates it is technically infeasible, as described in Section 7, to retain the full Retention Volume on-site, as required by PR-3, then the project must dedicate at least 10% of the Equivalent Impervious Surface Area to retention based SCMs.

> *Equivalent Impervious Surface Area = (Impervious Tributary Surface Area) + [(Pervious Tributary Surface Area) * (Runoff Coefficient)]*

Use the Appendix F instructions to calculate the ten percent adjustment. PR-2 Water Quality Treatment is not subject to this adjustment. Water quality treatment must be provided for impervious area on the entire site.

Off-Site Mitigation

Off-site mitigation is required when Regulated Projects do not retain the full Retention Volume and fail to demonstrate technical infeasibility, as described in Section 7, or technical infeasibility was demonstrated and less than ten percent of a project's Equivalent Impervious Surface Area has been dedicated to retention-based SCMs. Use the Appendix G instructions to calculate the off-site retention requirements when a Project cannot allocate the full ten percent of the project site's Equivalent Impervious Surface Area to retention-based SCMs.

[9] http://www.sbprojectcleanwater.org/development.aspx?id=76

[10] http://owp-web1.saclink.csus.edu/LIDTool/Start.aspx

Section 5

Performance Requirement No. 4

Peak Management

Regulated Projects subject to Performance Requirement No. 4 (PR-4) Peak Management are:

- Projects that create and/or replace ≥22,500 square feet of impervious surface (collectively over the entire project site); and are In Watershed Management Zones 1, 2, 3, 6, and 9

Regulated Projects subject to PR-4 must also meet PR-1, PR-2 and PR-3 requirements and submit Performance Requirement No. 1, 2 and 3 Certifications. In addition to the Stormwater Control Plan requirements in PR-2 and PR-3, there is specific information that must be included in the Stormwater Control Plan for Regulated Projects subject to PR-4. See Appendix B for a checklist of information required in the Stormwater Control Plan. A Stormwater Control Plan template with additional guidance is available on the Central Coast Regional Water Board website[11].

PR-4 requires the applicant to manage post-development peak flows discharged from the site. The Project Engineer shall provide a Hydrology Report demonstrating that post-development stormwater runoff peak flows discharged from the site do not exceed pre-project peak flows for the 2- through 10- year storm events. Peak flow controls must also meet the flood control standards established by the Santa Clara County Drainage Manual (2007)[12].

Pre-project refers to the stormwater runoff conditions that exist onsite immediately before development occurs. Since PR-4 applies to additional runoff from increased impervious surfaces on site, redevelopment sites may be exempt from PR-4 if they do not increase the impervious area above the pre-project condition, or may be able to meet PR-4 requirements without any additional control measures.

[11] http://www.swrcb.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

[12] The Drainage Manual requires projects to be designed such that the stormwater runoff generated from the 10-year design storm is conveyed in the storm drainage system (underground pipes and/or stable open channels) and the stormwater runoff generated from the 100-year design storm is safely conveyed away from the project site without creating and/or contributing to downstream or upstream flooding conditions. The Manual is available at: http://www.sccgov.org/sites/dso/Land%20Development%20Engineering/Documents/Manual_Drainage.pdf

Section 6

Performance Requirement No. 5

Special Circumstances

Regulated Projects may be designated by the Municipality as subject to Performance Requirement No. 5 (PR-5) Special Circumstances based on certain site and/or receiving water conditions. Special Circumstances designation exempts the Regulated Project from Runoff Retention and/or Peak Management Performance Requirements where those Performance Requirements would be ineffective to maintain or restore beneficial uses of receiving waters.

Special Circumstances are defined as projects that discharge stormwater to the following:

- Highly Altered Channels
- Intermediate Flow Control Facility
- Historic Lake and Wetland

Projects subject to Special Circumstances must still comply with the Water Quality Treatment Performance Requirements.

These Special Circumstances do not apply to any property within the City of Gilroy, the City of Morgan Hill, or South Santa Clara County.

Section 7

Alternative Compliance (Off-Site Measures)

Regulated Projects may be allowed to comply with PR-2, PR-3 and PR-4 through off-site mechanisms (e.g. regional facilities, developer fee-in-lieu arrangement) under the following conditions:

- Technical infeasibility is established
- Project is in a Watershed or Regional Management Plan,
- Project is in an Urban Sustainability Area, or
- Other situations approved by the Central Coast Water Board Executive Officer.

Morgan Hill, Gilroy and South Santa Clara County do not have approved Watershed/Regional Management Plans or an approved Urban Sustainability Area, so these options are not available to projects within these jurisdictions.

Technical Infeasibility

An application for approval of Alternative Compliance based on technical infeasibility must include a site-specific hydrologic design analysis conducted and endorsed by a registered professional engineer, geologist, architect, and/or landscape architect, demonstrating that compliance with the applicable numeric Post-Construction Stormwater Management Requirements is technically infeasible.

Technical infeasibility may be caused by site conditions, including:

a) Depth to seasonal high groundwater limits infiltration and/or prevents construction of subgrade stormwater control measures;

b) Depth to an impervious layer such as bedrock limits infiltration;

c) Sites where soil types significantly limit infiltration;

d) Sites where pollutant mobilization in the soil or groundwater is a documented concern;

e) Space constraints (e.g., infill projects, some redevelopment projects, high density development);

f) Geotechnical hazards;

g) Stormwater Control Measures would be located within 100 feet of a groundwater well used for drinking water;

h) Incompatibility with surrounding drainage system (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning treatment or flow control facility).

Technical Infeasibility Related to Groundwater Protection

The Santa Clara Valley Water District (SCVWD) manages drinking water resources and provides stewardship for Santa Clara County's watersheds, reservoirs, streams and groundwater basins. As such, the SCVWD is responsible for groundwater quality protection. Concerns regarding the contamination of groundwater may limit the types and locations of stormwater treatment measures that may be used on a project site. The treatment measures of most concern are "infiltration devices", defined as structures that are designed to bypass the natural filtration of surface soils and to transmit runoff directly to subsurface soils and groundwater aquifers. Other treatment measures that treat stormwater prior to subsurface infiltration, including landscape measures that utilize infiltration through surface or imported soils (indirect infiltration), and treatment measures that discharge directly to storm drains without infiltration pose minimal risk to groundwater quality.

The Santa Clara Valley Water District's guidelines for infiltration devices are provided in Table 6 on the following page. The guidelines include required horizontal setbacks from drinking water wells, septic systems, underground storage tanks and known contamination sites; required vertical separation from seasonally high groundwater; and whether pretreatment prior to infiltration is required. Pretreatment can be provided by infiltration through surface soils, such as the use of an indirect infiltration measure. ***If the guidelines are not met, i.e., if there are any variances from the required setbacks or separations, SCVWD review and approval of the stormwater treatment plan is required.***

Table 6 – SCVWD Guidelines for Stormwater Infiltration Devices (from SCVURPPP C.3 Stormwater Handbook, Appendix A)

Site Use/Condition		Required Horizontal Setbacks (feet)				Required Vertical Separation from Seasonally High Groundwater (feet)	Pretreatment Required[i]
		Drinking Water Wells	Septic Systems	Underground Storage Tanks	Known Contamination Site[d]		
Residential	Single Residential Lot (<10,000 sq. feet)	Exempt from setback and separation requirements; however, should still comply with construction and maintenance BMPs					
	Single Residential Lot (10,000 sq. feet to 1 acre)	600[e]	100[g]	Dependent upon depth to water[h]	Regulatory Agency Approval Required if within 1,500 feet	10	No
	Residential Subdivision (>1 acre)	600[e]	100[g]	Dependent upon depth to water[h]	Regulatory Agency Approval Required if within 1,500 feet	10	Individual Residences - No Runoff from Subdivision Roads - Yes
Commercial, Industrial, and Transportation	Transportation Corridor - Main Roads[a]	1,500[f]	100[g]	Dependent upon depth to water[h]	Regulatory Agency Approval Required if within 1,500 feet	30	Yes
	Transportation Corridor - Minor Roads[a]	1,500[f]	100[g]	Dependent upon depth to water[h]	Regulatory Agency Approval Required if within 1,500 feet	10	Yes
	Transportation Corridor - Other[a]	Not Allowed					
	High Risk Commercial/Industrial[b]	Not Allowed					
	Other Commercial/Industrial[c]	1,500[f]	100[g]	Dependent upon depth to water[h]	Regulatory Agency Approval Required if within 1,500 feet	30	Yes
Other	Known Contamination Sites[d]	Not allowed					

Alternative Compliance Project(s) Requirements

If the technical infeasibility analysis is approved, an Alternative Compliance Plan detailing the project(s) that will provide off-site mitigation must be submitted. The proposed off-site projects may be existing facilities and/or prospective projects that are as effective in maintaining watershed processes as implementation of the applicable Post-Construction Stormwater Requirements on-site. The Plan must include:

- The location of the proposed off-site project(s), which must be within the same watershed as the Regulated Project. Alternative Compliance project sites located outside the watershed may be approved by the Central Coast Water Board Executive Officer.
- A schedule for completion of offsite mitigation project(s), including milestone dates to identify funding, design, and construction of the off-site projects, where the off-site mitigation project(s) has not been constructed.

Additional requirements include the following:

a) The off-site mitigation project(s) must be completed as soon as practicable and no longer than four years from the date of the certificate of occupancy for the project for which off-site mitigation is required, unless a longer period is authorized by the Central Coast Water Board Executive Officer.

b) The timeline for completion of the off-site mitigation project may be extended up to five years with prior Central Coast Water Board Executive Officer approval. Central Coast Water Board Executive Officer approval will be granted contingent upon a demonstration of good faith efforts to implement an Alternative Compliance project, such as having funds encumbered and applying for the appropriate regulatory permits.

c) Off-site mitigation projects on public property must be fully funded by the applicants.

d) Off-site mitigation projects on private property must include all documentation necessary to provide legal authority to use the property for the mitigation and must include project bonding.

Section 8

Operation and Maintenance Requirements

Stormwater Control Measures (SCMs) designed for Water Quality Treatment, Runoff Retention and/or Peak Management must be maintained to ensure proper performance. Regulated Projects with structural SCMs (i.e., meeting PR-2, PR-3 and/or PR-4 requirements) are required to have an Operation and Maintenance (O&M) Plan and Maintenance Agreement that clearly establishes responsibility for all structural SCMs.

The O&M Plan must include

- A site map with the location of all structural SCMs;
- O&M procedures for each structural SCM;
- Short and long term maintenance requirements, recommended frequency of maintenance and estimated cost for maintenance.

Where a property owner is responsible for maintenance, the property owner will be required to provide assurance of long term maintenance. This may be in the form of a maintenance agreement with the municipality, or conditions of approval, or another mechanism. The maintenance agreement must be transferred to the new owner if the land is sold. For residential properties where the SCMs are located within a common area that will be maintained by a homeowner's association, language regarding the responsibility for maintenance must be included in the project's conditions, covenants and restrictions (CC&Rs).

Example O&M Plans can be found in Appendix G of the SCVURPPP C.3 Stormwater Handbook (see list of resources in Appendix J of this Manual).

APPENDIX A

CHECKLISTS

EXEMPT PROJECTS CHECKLIST

Projects that are exempt from the Post-Construction Performance Requirements include the following:

- ☐ Road and Parking Lot maintenance:
    - o Road surface repair including slurry sealing, fog sealing, and pothole and square cut patching
    - o Overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage
    - o Shoulder grading
    - o Cleaning, repairing, maintaining, reshaping, or re-grading drainage systems
    - o Crack sealing
    - o Resurfacing with in-kind material without expanding the road or parking lot
    - o Practices to maintain original line and grade, hydraulic capacity, and overall footprint of the road or parking lot
    - o Repair or reconstruction of the road because of slope failures, natural disasters, acts of God or other man-made disaster
- ☐ Sidewalk and bicycle path or lane projects, where no other impervious surfaces are created or replaced, built to direct stormwater runoff to adjacent vegetated areas
- ☐ Trails and pathways, where no other impervious surfaces are replaced or created, and built to direct stormwater runoff to adjacent vegetated areas
- ☐ Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics
- ☐ Curb and gutter improvement or replacement projects that are not part of any additional creation or replacement of impervious surface area (e.g., sidewalks, roadway)
- ☐ Second-story additions that do not increase the building footprint
- ☐ Raised (not built directly on the ground) decks, stairs, or walkways designed with spaces to allow for water drainage
- ☐ Photovoltaic systems installed on/over existing roof or other impervious surfaces, and panels located over pervious surfaces with well-maintained grass or vegetated groundcover, or panel arrays with a buffer strip at the most down-gradient row of panels
- ☐ Temporary structures (in place for less than six months)
- ☐ Electrical and utility vaults, sewer and water lift stations, backflows and other utility devices
- ☐ Above-ground fuel storage tanks and fuel farms with spill containment system

PERFORMANCE REQUIREMENT NO. 1
SITE DESIGN AND RUNOFF REDUCTION

CERTIFICATION

	DESIGN STRATEGY	INCORPORATED?
1.	Limit disturbance of creeks and natural drainage features.	
2.	Minimize compaction of highly permeable soils.	
3.	Limit clearing and grading of native vegetation at the site to the minimum area needed to build the project, allow access, and provide fire protection.	
4.	Minimize impervious surfaces by concentrating improvements on the least sensitive areas of the site, while leaving the remaining land in a natural undisturbed state.	
5.	Minimize stormwater runoff by implementing one or more of the following design measures:	
	a) Direct roof runoff into cisterns or rain barrels for reuse.	
	b) Direct roof runoff onto vegetated areas safely away from building foundations and footings.	
	c) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings.	
	d) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings.	
	e) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces.	

I, _____, acting as the Project Engineer for _____ project, located at _____, hereby state that the Site Design and Runoff Reduction design strategies indicated above have been incorporated into the design of the project.

_____ _____

Signature Date

SOURCE CONTROL CHECKLIST	
ON-SITE SOURCE CONTROL MEASURES	**INCORPORATED?**
Wash area/racks, drain to sanitary sewer[1]	☐
Covered dumpster area, drain to sanitary sewer[1]	☐
Sanitary sewer connection or accessible cleanout for swimming pool/spa/fountain[1]	☐
Parking garage floor drains plumbed to sanitary sewer[1]	☐
Fire sprinkler test water/condensate drain lines drain to landscape/sanitary sewer[1]	☐
Interior floor drains/boiler drain lines plumbed to sanitary sewer	☐
Beneficial landscaping/IPM (minimize irrigation, runoff, pesticides and fertilizers; promotes treatment)	☐
Outdoor material storage protection	☐
Covers, drains for loading docks, maintenance bays, fueling areas	☐
Maintenance (pavement sweeping, catch basin cleaning, good housekeeping)	☐
Storm drain labeling	☐
Other[2] _____	☐

Notes:

[1] Subject to sanitary sewer authority requirements.

[2] See CASQA Stormwater BMP Handbook for New Development and Redevelopment for additional BMPs for vehicle service repair facilities, fuel dispensing areas, industrial processes, rooftop equipment and other pollutant generating activities and sources: https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook

PERFORMANCE REQUIREMENT NO. 2:
WATER QUALITY TREATMENT

CERTIFICATION

	ON-SITE WATER QUALITY TREATMENT MEASURES (IN ORDER OF PRIORITY)	INCORPORATED?
1.	Low Impact Development (LID) Treatment Systems designed to retain stormwater runoff generated by the 85th percentile 24-hour storm. Stormwater Control Measures implemented (circle all that apply, design documentation is required): • Harvesting and Use, • Infiltration, • Evapotranspiration	
2.	Biofiltration Treatment Systems – with the following design parameters: a) Maximum surface loading rate appropriate to prevent erosion, scour and channeling within the biofiltration treatment system itself and equal to 5 inches per hour, based on the flow of runoff produced from a rain event equal to or at least: i. 0.2 inches per hour intensity; or ii. Two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depth b) Minimum surface reservoir volume equal to the biofiltration treatment system surface area times a depth of 6 inches c) Minimum planting medium depth of 24 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used. A Regulated Project may utilize an alternative planting medium if it demonstrates its planting medium is equal to or more effective at attenuating pollutants than the specified planting medium mixture. d) Proper plant selection[13] e) Subsurface drainage/storage (gravel) layer with an area equal to the biofiltration treatment system surface area and having a minimum depth of 12 inches f) Underdrain with discharge elevation at top of gravel layer g) No compaction of soils beneath the biofiltration facility (ripping/loosening of soils required if compacted) h) No liners or other barriers interfering with infiltration, except for situations where lateral infiltration is not technically feasible	

[13] Technical guidance for designing bioretention facilities is available from the Central Coast LID Initiative. The guidance includes design specifications and plant lists appropriate for the Central Coast climate: http://www.centralcoastlidi.org/Central_Coast_LIDI/LID_Structural_BMPs.html

3.	Non-Retention Based Treatment Systems – designed to meet at least one of the following hydraulic sizing criteria:	
	(a) Volume Hydraulic Design Basis – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, based on local rainfall data.	
	(b) Flow Hydraulic Design Basis – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat: (i) The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or (ii) The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.	

I, _____, acting as the Project Engineer for _____ project, located at _____, hereby state that the On-Site Water Quality Treatment Measures indicated above have been incorporated into the design of the project.

_____ _____

Signature Date

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

Design Rainfall Events & Treatment Requirements for WMZs

WMZ[1]	Treatment Options & Design Rainfall	Check Applicable WMZs
WMZ 1	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 2	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	
WM 4 *	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 5	Via optimized infiltration[2] prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 6	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 9	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 10 *	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data	

Notes:

* Applicable only to those areas that overlay designated Groundwater Basins

1. Includes only those WMZs contained in Santa Clara County.
2. Storage, rainwater harvesting, and/or evapotranspiration may be used when infiltration is optimized.

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

LID Site Assessment Checklist

ITEMS TO DOCUMENT:	INCLUDED?
1. Site topography	☐
2. Hydrologic features including contiguous natural areas, wetlands, watercourses, seeps, or springs	☐
3. Depth to seasonal high groundwater	☐
4. Locations of groundwater wells used for drinking water	☐
5. Depth to an impervious layer such as bedrock	☐
6. Presence of unique geology (e.g., karst)	☐
7. Geotechnical hazards	☐
8. Documented soil and/or groundwater contamination	☐
9. Soil types and hydrologic soil groups	☐
10. Vegetative cover/trees	☐
11. Run-on characteristics (source and estimated runoff from offsite which discharges to the project area)	☐
12. Existing drainage infrastructure for the site and nearby areas including the location of municipal storm drains	☐
13. Structures including retaining walls	☐
14. Utilities	☐
15. Easements	☐
16. Covenants	☐
17. Zoning/Land Use	☐
18. Setbacks	☐
19. Open space requirements	☐
20. Other pertinent overlay(s)	☐

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

LID Site Design Measures

	DESIGN MEASURE	INCORPORATED?
1.	Defining the development envelope, identifying the protected areas, and identifying areas that are most suitable for development and areas to be left undisturbed	
2.	Identifying conserved natural areas, including existing trees, other vegetation, and soils (shown on the plans)	
3.	Limit the overall impervious footprint of the project	
4.	Design of streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided that public safety or mobility uses are not compromised	
5.	Set back development from creeks, wetlands, and riparian habitats	
6.	Design conforms the site layout along natural landforms	
7.	Design avoids excessive grading and disturbance of vegetation and soils	

I, _____, acting as the Project Engineer for _____ project, located at _____, hereby state that LID Site Design Measures indicated above have been incorporated into the design of the project.

_____ _____

Signature Date

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

Technical Infeasibility Checklist

	Site Conditions	Check If Applicable
1.	Depth to seasonal high groundwater limits infiltration and/or prevents construction of subgrade stormwater control measures[14]	☐
2.	Depth to an impervious layer such as bedrock limits infiltration	☐
3.	Sites where soil types significantly limit infiltration	☐
4.	Sites where pollutant mobilization in the soil or groundwater is a documented concern	☐
5.	Space constraints (e.g., infill projects, some redevelopment projects, high density development)	☐
6.	Geotechnical hazards	☐
7.	Stormwater Control Measures located within 100 feet of a groundwater well used for drinking water	☐
8.	Incompatibility with surrounding drainage system (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning treatment or flow control facility)	☐

[14] See Santa Clara Valley Water District guidelines for minimum groundwater separation from stormwater infiltration devices (Section 7, Table 6, of this Manual).

APPENDIX B

Stormwater Control Plan Checklist

Stormwater Control Plan Required Contents	PR Level	Done?
1. Project Information	All	
• Project name		
• Application number		
• Address and assessor's parcel number		
• Name of Applicant		
• Project Phase number (if project is being constructed in phases)		
• Project Type (e.g., commercial, industrial, multi-unit residential, mixed-use, public), and description		
2. Project Areas	All	
• Total project site area		
• Total new impervious surface area		
• Total replaced impervious surface area		
• Total new pervious area		
• Calculation of Net Impervious Area		
3. Statement of Performance Requirements that apply to the project:	All	
• Performance Requirement No.1 – Site Design and Runoff Reduction		
• Performance Requirement No.2 – Water Quality Treatment		
• Performance Requirement No. 3 – Runoff Retention		
• Performance Requirement No. 4 – Peak Management		
4. Delineation of Drainage Management Areas (DMAs)	All	
5. Summary of Site Design and Runoff Reduction Performance Requirement measures selected for the project (see PR-1 checklist)	PR-1	
6. Description of Runoff Reduction Measures and Structural Stormwater Control Measures, by Drainage Management Area and for entire site	PR-2, 3, and 4	
7. Water quality treatment calculations used to comply with the Water Quality Treatment Performance Requirement and any analysis to support infeasibility determination	PR-2	
8. Documentation certifying that the selection, sizing, and design of the Stormwater Control Measures meet the full or partial Water Quality Treatment Performance Requirements (see PR-2 checklist)	PR-2	

Stormwater Control Plan Required Contents	PR Level	Done?
9. Statement that Water Quality Treatment Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements • Statement of intent to comply with Water Quality Treatment Performance Requirement through Alternative Compliance	PR-2	
10. LID Site Assessment Summary (see PR-3 checklist)	PR-3	
11. LID Site Design Measures Used (see PR-3 checklist)	PR-3	
12. Supporting calculations used to comply with the applicable Runoff Retention Performance Requirements	PR-3	
13. Documentation demonstrating infeasibility where Site Design and Runoff Reduction measures and retention-based Stormwater Control Measures cannot retain required runoff volume	PR-3	
14. Documentation demonstrating percentage of the project's Equivalent Impervious Surface Area dedicated to retention-based Stormwater Control Measures	PR-3	
15. Statement that Runoff Reduction Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements • Statement of intent to comply with Runoff Retention Performance Requirements through an Alternative Compliance agreement	PR-3	
16. Supporting calculations used to comply with the applicable Peak Management Performance Requirements	PR-4	
17. Documentation demonstrating infeasibility where on-site compliance with Peak Management Performance Requirements cannot be achieved	PR-4	
18. Statement that Peak Management Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements • Statement of intent to comply with Peak Management Requirements through an Alternative Compliance agreement		
19. O&M Plan for all structural SCMs to ensure long-term performance	PR-2, 3, and 4	
20. Owner of facilities and responsible party for conducting O&M	PR-2, 3, and 4	

APPENDIX C

Rainfall Maps and Watershed Management Zone Map

[TO BE ADDED IN FINAL MANUAL]

APPENDIX D

Hydrologic Analysis and Stormwater Control Measure Sizing Guidance

Project site conditions will influence the ability to comply with the Water Quality Treatment and Runoff Retention Performance Requirements. This Appendix provides the acceptable Stormwater Control Measure (SCM) sizing methodology to evaluate runoff characteristics. This guidance provides a simple event-based approach and a runoff routing approach. Both of these approaches are based on sizing for a single-event and avoid the necessity of using a calibrated, continuous simulation hydrologic model. However, the project applicant may use a locally/regionally calibrated continuous simulation model to improve the hydrologic analysis and SCM sizing.

1) Determination of Retention Tributary Area

Determining the Retention Tributary Area is the basis for calculating the runoff volumes subject to Performance Requirement (PR) No. 3. Retention Tributary Area should be calculated for each individual Drainage Management Area (DMA) to facilitate the design of SCMs for each DMA. The generic equation below illustrates how various portions of the site are addressed when determining the Retention Tributary Area. The Retention Tributary Area calculation must also account for the adjustments for Redevelopment Projects subject to PR-3.

a) Development Projects: Compute the Retention Tributary Area, using the following equation:

Retention Tributary Area = (Entire DMA Area) – (Undisturbed or Planted Areas) – (Impervious Surface Areas that Discharge to Infiltrating Areas)***

*Undisturbed areas or areas planted with native, drought-tolerant, or LID appropriate vegetation that do not receive runoff from other areas (i.e., self-treating areas).

** Impervious surfaces for which runoff from the design rainfall event will drain and infiltrate into undisturbed or planted areas without producing runoff to the storm drain system or receiving waterbody and without creating nuisance ponding that may affect vegetation health or contribute to vector problems (i.e., self-retaining areas).

b) Redevelopment Projects: If the Regulated Project includes replaced impervious surface, compute the Retention Tributary Area as follows:[15]

[15] Only one type of adjustment is allowed, since there are no Urban Sustainability Areas within Santa Clara County.

Retention Tributary Area = (Entire DMA Area) – (Undisturbed or Planted Areas) – (Impervious Surface Areas that Discharge to Infiltrating Areas) – [0.5 x (Replaced Impervious Surface Areas that do not Discharge to Infiltratng Areas)]

2) Determination of Retention Volume

a) Based on the Regulated Project's Watershed Management Zone (WMZ), determine the Regulated Project's Runoff Retention Requirement (e.g., retain 95th Percentile 24-hour Rainfall Event, or, retain 85th Percentile 24-hour Rainfall Event) from the WMZ map in Appendix C of this Manual.

b) Determine the 85th or 95th percentile 24-hour rainfall event depth from the Rainfall Maps in Appendix C of this Manual.

c) Compute the Runoff Coefficient[16] "C" for the area tributary to the SCM, using the equation:

$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$

Where "i" is the fraction of the tributary area that is impervious[17]

Note: If the Retention Tributary Area is 100% impervious (i.e., "I" = 1.0), then C = 0.89.

d) Compute the Retention Volume:

Retention Volume = C x Rainfall Depth x Retention Tributary Area
Retention Volume for 85th Percentile 24-hr Rainfall Depth = C x Rainfall Depth$_{85th}$ x Retention Tributary Area

3) Structural Stormwater Control Measure Sizing

The applicant must use structural SCMs that optimize retention and are designed to infiltrate, evapotranspirate, filter, or capture and use stormwater, to address the volumes calculated in 2 (above). If the Regulated Project is within a Watershed Management Zone where infiltration is required (with adjustments for technical infeasibility), SCM designs that provide infiltration of the entire Retention Volume are required, to minimize the potential need for off-site mitigation. Resources with design guidance for fully infiltrative SCMs are provided in Appendix J of this Manual.

[16] As set forth in WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998), pages 175-178 and based on the translation of rainfall to runoff using a runoff regression equation developed using two years of data from more than 60 urban watersheds nationwide.

[17] As defined in Post-Construction Requirements Attachment D.

a) Calculate SCM Capture Volume – Calculate the required SCM Capture Volume, associated with the Regulated Project's Runoff Retention Requirement, by one of the following methods:

Method 1: Simple Method

SCM Capture Volume = Retention Volume for 95th Percentile 24-hr Rainfall Depth; OR

SCM Capture Volume = Retention Volume for 85th Percentile 24-hr Rainfall Depth

Method 2: Routing Method

Use a hydrograph analysis to determine the SCM Capture Volume needed to retain the Retention Volume for 95th or 85th Percentile 24-hr Rainfall Depth calculated in 2 (above). The SCM Capture Volume shall be based on both the rate of flow from tributary areas into the SCM, and the rate of flow out of the SCM through infiltration into the underlying soil during the rain event. The SCM shall be designed such that a single 95th or 85th Percentile 24-hr Rainfall Event will not overflow the SCM.

Several available tools for conducting the hydrograph analysis are discussed in Appendix E of this Manual. When conducting the hydrograph analysis, the applicant must adhere to the criteria included in Table D-1.

TABLE D-1: Routing Method Criteria

Parameter	Criteria
Hydrograph Analysis Method	National Resources Conservation Service or Santa Barbara Urban Hydrograph
Pond Routing Method	Storage-indication, unless otherwise justified to be more correct based on site and storage conditions.
Infiltration Rate	Underlying soil saturated infiltration rate, as indicated by locally accepted data approved by the Permittee and/or by on-site testing, whichever is more accurate.
Rainfall Distribution	National Resources Conservation Service Type I[18] or based on local rainfall data
Time of Concentration	Permittee's current drainage and flood control standard
Time Increment	0.10 hour, unless otherwise justified to be more correct based on rainfall distribution

[18] The National Resources Conservation Service developed standard 24-hour rainfall distributions for hydrograph analyses. These rainfall distributions were intended to represent intensities associated with shorter duration storms, ranging from durations of 30 minutes to 12 hours. The National Resources Conservation Service Type 1 storm applies to the California West Coast, including the Central Coast Region. The Type 1 rainfall distribution was derived using National Oceanic Atmospheric Administration Atlas 2 rainfall statistics for the 1-year through 100-year storm.

Note that if the Retention Volume cannot infiltrate within 48-hours, a multiplier of 1.20 must be applied to the SCM Capture Volume calculated through the routing method.

b) Demonstrate Compliance with Performance Requirements

   i) Runoff Retention Performance Requirement – The applicant must demonstrate that site SCMs willinfiltrate and/or evapotranspirate the Retention Volume or provide sufficient Capture Volume to retain the Retention Volume. Any outlet (i.e., underdrain) installed in a structural SCM shall be installed above the elevation of any portion of the structural SCM dedicated to Retention Volume storage.

   ii) Water Quality Treatment Performance Requirement – Projects that propose to use retention-based structural SCMs, must also meet the Water Quality Treatment Performance Requirement, and demonstrate in the Stormwater Control Plan that this requirement is being fully met.

APPENDIX E

Tools for Sizing Structural Control Measures for Runoff Retention

Central Coast Region Stormwater Control Measure Sizing Calculator (Santa Barbara County, Version February 26, 2014)

This sizing calculator was developed by the Santa Barbara County Clean Water Program for use in the Central Coast Region, using a grant obtained from the State Water Resources Control Board. The tool can be used to size SCMs to meet runoff retention requirements based on the routing method. Visit the following website for a copy of the calculator and instructions for its use:
http://www.sbprojectcleanwater.org/development.aspx?id=76

HydroCAD

HydroCAD is a commonly used and widely accepted program for performing hydrograph analyses and design of stormwater infrastructure, and can be used to size SCMs using the routing method. HydroCAD is based on U.S. Department of Agriculture Soil Conservation Service's (now Natural Resources Conservation Service) TR-55: Urban Hydrology for Small Watersheds. There is a fee to purchase the software, but there is a free trial version that can be downloaded from the developer's website: http://www.hydrocad.net/,

California Phase II Low Impact Development (LID) Sizing Tool

This web-based tool was developed by CSU Sacramento Office of Water Programs to assist stormwater practitioners in selecting and sizing LID Best Management Practices (BMPs) that meet the sizing requirements set forth in the State's Phase II Small MS4 General Permit. The tool allows users to input their location, soil type, and impervious areas, and then queries a database containing pre-solved sizing factors and design curves for a variety of LID BMP types, performs permit-based sizing calculations, and tabulates allowable sizes for each LID BMP type. Sizing results are provided based on three different sizing methods allowed by the Phase II Permit: a Design Storm Method, a Percent Capture Method, and a Baseline Bioretention or Equivalent Performance Method. Sizing results are also provided for the Central Coast RWQCB (Region 3) simple sizing method. **Note that this tool cannot be used to size SCMs using the routing method.** The tool can be found at:
http://owp-web1.saclink.csus.edu/LIDTool/Start.aspx

APPENDIX F

Ten Percent Adjustment to Retention Requirement – Calculation Instructions

Where technical infeasibility, as described in Section 7, Alternative Compliance, prevents full on-site compliance with the Runoff Retention Performance Requirement, on-site retention of the full Retention Volume per Section 4, PR-3, is not required and the Project is required to dedicate no less than ten percent of the Project's Equivalent Impervious Surface Area to retention-based Stormwater Control Measures. The Water Quality Treatment Performance Requirement is not subject to this adjustment.

Calculating Ten Percent of a Project's Equivalent Impervious Surface Area

The area of the project that must be dedicated to structural SCMs to waive off-site compliance with the Runoff Retention Requirement is equal to ten percent of the project's Equivalent Impervious Surface Area, defined as:

Equivalent Impervious Surface Area (ft^2) = (Impervious Tributary Surface Area (ft^2) + [(Pervious Tributary Surface Area (ft^2)) x (Runoff Coefficient)]

Impervious Tributary Surface Area is defined as the sum of all of the site's conventional impervious surfaces. When calculating Impervious Tributary Area:

- Do include: concrete, asphalt, conventional roofs, metal structures and similar surfaces
- Do not include: green roofs

Pervious Tributary Surface Area is defined as the sum of all of the site's pervious surfaces, which is then corrected by a factor equal to the surface's runoff coefficient. When calculating Pervious Tributary Surface Area:

- Do include surfaces such as: unit pavers on sand; managed turf[19]; disturbed soils; and conventional landscaped areas (see Table 1 for correction factors).

  Example:

  Project Site includes 500 ft^2 of unit pavers on sand.

  Pervious Tributary Surface Area = 500 ft^2 x C = 50 ft^2

  Where C = Correction Factor for unit pavers, 0.1, from Table F-1.

[19] Managed Turf includes turf areas intended to be mowed and maintained as turf within residential, commercial, industrial, and institutional settings.

- Do not include: Infiltration SCM surfaces (e.g., SCMs designed to specific performance objectives for retention/infiltration) including, bioretention cells, bioswales; natural and undisturbed landscape areas, or landscape areas compliant with the Model Water Efficient Landscape Ordinance (California Code of Regulations, Title 23. Waters, Division 2. Department of Water Resources, Chapter 2.7.), or a local ordinance at least as effective as the Model Water Efficient Landscape Ordinance.

TABLE F-1: Correction Factors[20] for Use in Calculating Equivalent Impervious Surface Area

Pervious Surface	Correction Factor
Disturbed Soils/Managed Turf (dependent on original Hydrologic Soil Group)	A: 0.15 B: 0.20 C: 0.22 D: 0.25
Pervious Concrete	0.60
Cobbles	0.60
Pervious Asphalt	0.55
Natural Stone (without grout)	0.25
Turf Block	0.15
Brick (without grout)	0.13
Unit Pavers on Sand	0.10
Crushed Aggregate	0.10
Grass	0.10

[20] Factors are based on runoff coefficients selected from different sources: Turf and Disturbed Soils from *Technical Memorandum: The Runoff Reduction Method.* Center for Watershed Protection & Chesapeake Stormwater Network. p.13, April 18, 2008. http://town.plympton.ma.us/pdf/land/scheuler_runoff_reduction_method_techMemo.pdf. All other correction factors from *C.3 Stormwater Handbook, Santa Clara Valley Urban Runoff Pollution Prevention Program, Appendix F*, p. F-9., May 2004.

APPENDIX G

Calculating Off-Site Retention Requirements When Less Than 10 Percent of the Project Site Equivalent Impervious Surface Area is Allocated to Retention-Based Structural Stormwater Control Measures

The following instructions demonstrate how to determine the Off-Site Retention Requirements when a Project subject to the Runoff Retention Performance Requirement, cannot allocate the full 10% of the project site's Equivalent Impervious Surface Area (see Appendix F of this Manual) to retention-based Stormwater Control Measures (SCMs).

STEP A. Potential Off-Site Mitigation Retention Volume

First calculate the Potential Off-Site Mitigation Retention Volume, which represents the additional volume of runoff that would have been retained on-site, had the full 10% of Equivalent Impervious Surface Area been dedicated to retention-based SCMs.

Equation A:

Potential Off-Site Mitigation Retention Volume = (the portion of the 10% Equivalent Impervious Area not allocated on-site) X (the On-Site Retention Feasibility Factor)

Where:

- *The portion of the 10% Equivalent Impervious Surface Area not allocated on-site* is that portion not allocated to on-site structural retention-based SCMs. For example, if 10% of Equivalent Impervious Surface Area is 1,000 ft^2 and only 8% (800 ft^2) is allocated to retention-based SCMs, the remaining 2% (200 ft^2) is the value inserted in the equation.
- *The On-Site Retention Feasibility Factor* is the ratio of Design Retention Volume[21] managed on-site (ft^3), to actual area (ft^2) allocated to structural SCMs. This establishes the site's retained volume**:**area ratio, expressed as cubic feet of retained runoff volume per square foot of area. For example, if a project is able to infiltrate 3,500 ft^3 of runoff over an 800-ft^2 area, this ratio of 3,500**:**800, or 4.38, is the On-Site Retention Feasibility Factor.

STEP B. Actual Off-Site Mitigation Retention Volume

Next, determine the Actual Off-Site Mitigation Retention Volume, which may be less than the Potential Off-Site Mitigation Retention Volume. The Actual Off-Site Mitigation Retention Volume is the lesser of the volume calculated in Equation A, and the remaining portion of the

[21] Calculate Design Retention Volume using guidance in Appendix D of this Manual, or equivalent method. Final Design Retention Volumes should reflect the applicant's demonstrated effort to use non-structural design measures to reduce the amount of runoff (e.g., reduction of impervious surfaces) as required by the Post-Construction Requirements' LID Development Standards (see Section 4 and Appendix A of this Manual).

Design Retention Volume, calculated per Appendix D, not controlled on-site. There are two possible outcomes when the Runoff Retention Performance Requirement is not met on-site and less than 10% of the site's Equivalent Impervious Surface Area is allocated to retention-based SCMs:

- Potential Off-Site Mitigation Retention Volume is the Actual Off-Site Mitigation Retention Volume
- Remaining Design Retention Volume represents Actual Off-Site Design Retention Mitigation Volume

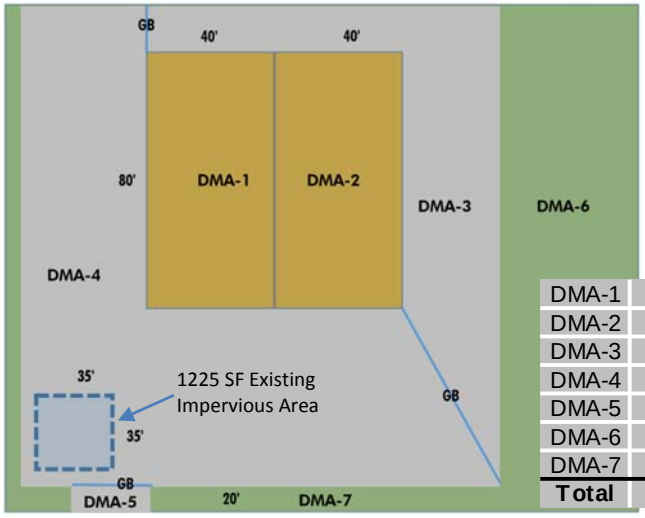
APPENDIX H

Stormwater Control Measures Sizing Examples

Example 1: New Building and Parking Lot[22]

1. Project Data

- Total Impervious Area created/replaced = 23,000 SF
- Existing Impervious Area being replaced = 1,225 SF



DMA-1	3200
DMA-2	3200
DMA-3	3700
DMA-4	12400
DMA-5	500
DMA-6	8500
DMA-7	4200
Total	**35700**

2. Assume the following Drainage Management Areas (DMAs) drain to the same Stormwater Control Measure (SCM). (DMAs 3 and 5 drain to landscaped areas.)

DMA Name	DMA Area (sq ft)	Post-project surface type	DMA Runoff Factor	DMA Area x runoff factor
DMA-1	3,200	Roof	1.0	3,200
DMA-2	3,200	Roof	1.0	3,200
DMA-4	12,400	Paved	1.0	12,400
Total				18,800

[22] Example courtesy of Dan Cloak Environmental Consulting and Santa Barbara County

3. Size the SCM for water quality treatment only:

DMA Name	DMA Area (sq ft)	Post-project surface type	DMA Runoff Factor	DMA Area x runoff factor	Facility Sizing Factor	Minimum Facility Size (sq ft)	Proposed Facility Size (sq ft)
DMA-1	3,200	Roof	1.0	3,200			
DMA-2	3,200	Roof	1.0	3,200			
DMA-4	12,400	Paved	1.0	12,400			
Total				18,800	0.04	752	900

4. Calculate the Design Retention Volume, assuming a storm depth of 1.4 inches (from the 95th percentile 24-hour rainfall depth map)

DMA Name	DMA Area (sq ft)	Post-project surface type	DMA Runoff Factor[b]	DMA Area x runoff factor	95th % storm depth (ft)	Retention Volume (cu. ft)
DMA-1	3,200	Roof	1.0	3,200		
DMA-2	3,200	Roof	1.0	3,200		
DMA-4	11,787[a]	Paved	1.0	11,787		
Total				18,187	0.12	2,182

Notes:

[a] Size reduced by 0.5 x 1,225 SF replaced impervious surface to calculate Retention Tributary Area.

[b] Runoff factor may be calculated using the WEF Manual of Practice equation: C = 0.858i 3- 0.78i2 + 0.774i + 0.04, resulting in a C factor of 0.89.

5. Resize SCM for Retention (Simple Method)

- Bioretention area for treatment = 900 square feet (SF)
- Required retention volume = 2,182 cubic feet (CF)
- Storage in gravel layer with 40% void space: 2,182 ÷ 0.4 = 5,455 CF of gravel (assume underdrain at top of gravel layer)
- If keep same footprint, need 6 feet of gravel depth (5,455 CF ÷ 900 SF = 6 ft).
- If reduce gravel to 2-foot depth, need 2,727 SF.

6. Use 10% Adjustment Factor

- Assume technical infeasibility was demonstrated
- Calculate Equivalent Impervious Surface Area:

*EISA = (Impervious Tributary Surface Area) + [(Pervious Tributary Surface Area) * (Runoff Coefficient)]*

DMA	SF	Factor	Product
DMA-1	3,200	1.0	3,200
DMA-2	3,200	1.0	3,200
DMA-3	3,700	1.0	3,700
DMA-4	12,400	1.0	12,400
DMA-5	500	1.0	500
DMA-6	8,500	0.1	850
DMA-7	4,200	0.1	420
Total	**35,700**		**24,270**

- EISA = 24,270 SF
- 10% of 24,270 = 2,427 SF
- Therefore, the surface area of the bioretention facility could be reduced from 2,727 to 2,427 SF if technical infeasibility is demonstrated.

7. Calculate Off-Site Retention Requirements If Less Than 10% of Project Site Equivalent Impervious Surface Area is Available for SCMs

- Say site can only provide 1,700 SF for retention-based SCMs (7% of 24,270 EISA)
- Volume retained = (1,700 SF) x (2 ft gravel depth) x 0.40 porosity = 1,360 CF
- On-Site Retention Feasibility Factor = Volume retained ÷ surface area = 1,360 ÷ 1,700 = 0.8 CF/SF
- Calculate the Potential Off-Site Mitigation Retention Volume:

  Potential Off-Site Mitigation Retention Volume = (the portion of the 10% Equivalent Impervious Area not allocated on-site) x (the On-Site Retention Feasibility Factor)

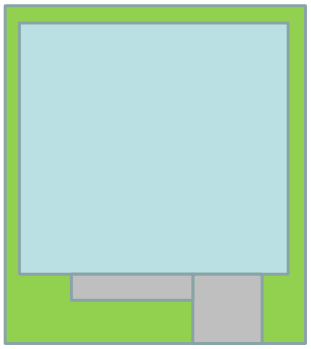
  Potential Off-Site Mitigation Retention Volume = (3% of 24,270 EISA) x 0.8 = 582 CF
- Calculate the Actual Off-Site Mitigation Retention Volume – this is the lesser of the volume calculated just above (582 CF) and the remaining portion of the Design Retention Volume not retained onsite (2,182 – 1,360 = 822 CF).

  The Actual Off-Site Mitigation Retention volume is <u>582 CF</u>.

Example 2: Commercial Building[23]

Project Data

- 1-acre commercial site
- 85% impervious
- Required to infiltrate the 95th percentile storm (2.0 inches)



Impervious area = 37,026 sf
Pervious area = 6,534 sf

1. Calculate Required Retention Volume (using PCR Attachment D)

   - Fraction of impervous, i = 0.85
   - $C = 0.858i^3 – 0.78i^2 + 0.774i + 0.04 = 0.66$
   - Total area = 43,560 sf.
   - Rainfall depth = 2.0 in. (0.167 ft.)
   - Retention Volume = C × Depth × Trib. Area
     = 0.66 × 43,560 × 0.167 ft. = 4,801 cu. ft.

2. Calculate Required SCM Storage Capacity by Simple Method

   - Assume surface area = 10% of impervious area
   - Bioretention surface area = 0.10 (37,026) = 3,703 sf
   - Required water depth = Retention volume ÷ surface area =
     4,801÷3,703 = 1.29 feet (15.5”)

[23] Example from Central Coast Resolution Technical Support Document, Attachment G: Stormwater Control Measure Sizing: Evaluation of Attachment D to the Central Coast Post Construction Requirements (Wallace Group, April 8, 2013).

- Approach: Store volume in ponding area, biotreatment soil, and gravel (no underdrain)
- Surface ponding depth = 6”
- Soil depth = 24” × 0.25 porosity = 6”
- Remaining water depth = 15.5” – 12” = 3.5”
- Gravel depth required (porosity 0.35): 3.5” ÷ 0.35 = 10”
- Summary: Bioretention area has:
    - Ponding depth = 6 inches
    - Soil depth = 24 inches
    - Gravel depth = 10 inches

3. Calculate Required Storage Capacity and Surface Area using the Routing Method (model results for Example Project presented below:)

Soil Type	SCM Infiltration Rate (in/hr)	Required Storage Capacity (cubic feet)	Required Surface Area (square feet)	SCM Size as Percent of Retention Volume	Drawdown Time
A	5.0	800	1,600	17%	24 hours
B	1.0	2,394	1,850	50%	32 hours
B/C	0.6	2,912	2,250	61%	48 hours
C	0.23	3,818	2,950	80%[24]	94 hours
D	0.06	4,529	3,500	95%[25]	12 days

4. Compare to Simple Method (see Step 1 above):

- Required Storage Capacity = 4,801 cubic feet

[24] Note that because the facility has a drawdown time greater than 48 hours, the required storage capacity will need to be increased by 20% (multiplied by 1.2).

APPENDIX I

Definitions Related to Post-Construction Requirements[25]

Bioretention – A Stormwater Control Measure designed to retain stormwater runoff using vegetated depressions and soils engineered to collect, store, treat, and infiltrate runoff. Bioretention designs do not include underdrains.

Biotreatment or Biofiltration Treatment –A Stormwater Control Measure designed to detain stormwater runoff, filter stormwater through soil media and plant roots, and release the treated stormwater runoff to the storm drain system. Biotreatment systems include an underdrain.

Discretionary Approval – A project approval which requires the exercise of judgment or deliberation when the MS4 decides to approve or disapprove a particular activity, as distinguished from situations where the MS4 merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations.

Dispersion – The practice of routing stormwater runoff from impervious areas, such as rooftops, walkways, and patios, onto the surface of adjacent pervious areas. Stormwater runoff is dispersed via splash block, dispersion trench, or sheet flow and soaks into the ground as it moves slowly across the surface of the pervious area.

Drainage Management Area (DMAs) – Following the low impact development principle of managing stormwater through small-scale, decentralized measures, DMAs are designated individual drainage areas within a Regulated Project that typically follow grade breaks and roof ridge lines and account for each surface type (e.g., landscaping, pervious paving, or roofs). Stormwater Control Measures for runoff reduction and structural facilities are designed for each DMA.

Equivalent Impervious Surface Area – is equal to *Impervious Tributary Surface Area* (ft^2) + *Pervious Tributary Surface Area* (ft^2), where *Impervious Tributary Surface Area* is defined as the sum of all of the site's conventional impervious surfaces, and *Pervious Tributary Surface Area* is defined as the sum of all of the site's pervious surfaces, corrected by a factor equal to the surface's runoff coefficient.

Evapotranspiration (ET) – The loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues).

Flow-Through Water Quality Treatment Systems – Stormwater Control Measures that are designed to treat stormwater through filtration and/or settling. Flow-through systems do not provide significant retention or detention benefits for stormwater volume control.

Groundwater Basins – Groundwater basin areas defined by the California Department of Water Resources (DWR) and used in the Central Coast Water Board Joint Effort for Hydromodification Control to identify groundwater receiving-water issues and areas where recharge is a key watershed process. DWR based

[25] From Attachment C to Attachment 1 of the Central Coast Region Post-Construction Requirements, Resolution R3-2013-0032.

identification of the groundwater basins on the presence and areal extent of unconsolidated alluvial soils identified on a 1:250,000 scale from geologic maps provided by the California Department of Conservation, Division of Mines and Geology. DWR then further evaluated identified groundwater basin areas through review of relevant geologic and hydrogeologic reports, well completion reports, court-determined adjudicated basin boundaries, and contact with local agencies to refine the basin boundaries.

Impervious Surface – A hard, non-vegetated surface area that prevents or significantly limits the entry of water into the soil mantle, as would occur under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of Performance Requirements are exceeded. However, for modeling purposes, open, uncovered facilities that retain/detain water (e.g., retention ponds, pools) shall be considered impervious surfaces.

Land recycling – The reuse of abandoned, vacant, or underused properties for redevelopment or repurposing

Landscaped Areas – Areas of soil and vegetation not including any impervious surfaces of ancillary features such as impervious patios, BBQ areas, and pools.

Large River – A river draining 200 square miles or more.

Low Impact Development (LID) – A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

Ministerial Approval – A project approval which involves little or no personal judgment by the MS4 as to the wisdom or manner of carrying out the project and only involves the use of fixed standards or objective measurements.

Native Vegetation – Vegetation comprised of plant species indigenous to the Central Coast Region and which reasonably could have been expected to naturally occur on the site.

Net Impervious Area – The sum of new and replaced post-project impervious areas, minus any reduction in total imperviousness from the pre-project to post-project condition: *Net Impervious Area = (New and Replaced Impervious Area) – (Reduced Impervious Area Credit),* where *Reduced Impervious Area Credit* is the total pre-project to post-project reduction in impervious area, if any.

New Development – Land disturbing activities that include the construction or installation of buildings, roads, driveways and other impervious surfaces. Development projects with pre-existing impervious surfaces are not considered New Development.

Percentile Rainfall Event (e.g., 85th and 95th) – A percentile rainfall event represents a rainfall amount which a certain percent of all rainfall events for the period of record do not exceed. For example, the 95th percentile rainfall event is defined as the measured rainfall depth accumulated over a 24-hour period, for the period of

record, which ranks as the 95th percentile rainfall depth based on the range of all daily event occurrences during this period.

Permeable or Pervious Surface – A surface that allows varying amounts of stormwater to infiltrate into the ground. Examples include pasture, native vegetation areas, landscape areas, and permeable pavements designed to infiltrate.

Pre-Project – Stormwater runoff conditions that exist onsite immediately before development activities occur. This definition is not intended to be interpreted as that period before any human-induced land activities occurred. This definition pertains to redevelopment as well as initial development.

Project Site – The area defined by the legal boundaries of a parcel or parcels of land within which the new development or redevelopment takes place and is subject to these Post-Construction Stormwater Management Requirements.

Rainwater Harvest – Capture and storage of rainwater or stormwater runoff for later use, such as irrigation (without runoff), domestic use (e.g. toilets), or storage for fire suppression.

Receiving Waters – Bodies of water, surface water systems or groundwater that receive surface water runoff through a point source, sheet flow or infiltration.

Redevelopment – On a site that has already been developed, construction or installation of a building or other structure subject to the Permittee's planning and building authority including: 1) the creation or addition of impervious surfaces; 2) the expansion of a building footprint or addition or replacement of a structure; or 3) structural development including construction, installation or expansion of a building or other structure. It does not include routine road maintenance, nor does it include emergency construction activities required to immediately protect public health and safety.

Replaced Impervious Surface – The removal of existing impervious surfaces down to bare soil or base course, and replacement with new impervious surface. Replacement of impervious surfaces that are part of routine road maintenance activities are not considered replaced impervious surfaces.

Retention Tributary Area – The entire project area except for undisturbed areas, planted areas with native, drought-tolerant, or LID appropriate vegetation that do not receive runoff from other areas, and impervious surface areas that discharge to infiltrating areas that will not produce runoff or create nuisance ponding. The Drainage Management Areas are smaller Retention Tributary Areas that cumulatively make up the Retention Tributary Area for the entire site.

Self-Retaining Areas – Areas (also called "zero discharge" areas) designed to retain some amount of rainfall (by ponding and infiltration and/or evapotranspiration) without producing stormwater runoff. Self-Retaining Areas include graded landscaped depressions and pervious pavement, and may receive runoff from adjacent impervious areas.

Self-Treating Areas – Areas in which infiltration, evapotranspiration and other natural processes remove pollutants from stormwater. Self-treating areas may include conserved natural open areas and areas of native landscaping. The self-treating area only treats the rain falling on itself and does not receive stormwater runoff from other areas.

Routine Road Maintenance – includes pothole and square cut patching; overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage; shoulder grading; reshaping/regrading drainage systems; crack sealing; resurfacing with in-kind material without expanding the road prism or altering the original line and grade and/or hydraulic capacity of the road.

Single-Family Residence – The building of one single new house or the addition and/or replacement of impervious surface associated with one single existing house, which is not part of a larger plan of development.

Stormwater Control Measures – Stormwater management measures integrated into project designs that emphasize protection of watershed processes through replication of pre-development runoff patterns (rate, volume, duration). Physical control measures include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water use. Design control measures include but are not limited to conserving and protecting the function of existing natural areas, maintaining or creating riparian buffers, using onsite natural drainage features, directing runoff from impervious surfaces toward pervious areas, and distributing physical control measures to maximize infiltration, filtration, storage, evaporation, and transpiration of stormwater before it becomes runoff.

Stormwater Control Plan – A plan, developed by the Regulated Project applicant, detailing how the project will achieve the applicable Post-Construction Stormwater Management Requirements (for both onsite and offsite systems).

APPENDIX J

Additional Resources

SANTA CLARA COUNTY CLEAN WATER PROGRAM

General information on local watersheds, stormwater management, and pollution prevention:
http://www.sccgov.org/sites/cwp/Pages/about.aspx

SANTA CLARA COUNTY DEVELOPMENT SERVICES OFFICE

Information on submitting an application for a development project and downloading the forms required for the Stormwater Control Plan:
http://www.sccgov.org/sites/dso/Stormwater/Pages/Clean-Water-Program.aspx

CENTRAL COAST REGIONAL WATER QUALITY CONTROL BOARD

The Post-Construction Stormwater Management Requirements, 85th and 95th Percentile Rainfall Depth Maps, and Watershed Management Zone Maps are electronically available at:
http://www.waterboards.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

CENTRAL COAST LOW IMPACT DEVELOPMENT INITIATIVE (LIDI)

http://centralcoastlidi.org/
The Central Coast LIDI is a non-profit organization that provides resources for Low Impact Development. Standard details for LID design may be found at the following web-site:
http://centralcoastlidi.org/bioretention-details-and-specs.php

CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA)

Additional information about Low Impact Development may be found at the CASQA LID Portal:
http://www.casqa.org/LID/tabid/240/Default.aspx

CALIFORNIA PHASE II LID SIZING TOOL

Developed by the Office of Water Programs at the California State University-Sacramento
http://owp-web1.saclink.csus.edu/LIDTool/Start.aspx

COUNTY OF SANTA BARBARA WATER RESOURCES DIVISION

Stormwater Technical Guide and Stormwater Control Measures Sizing Calculator
http://www.sbprojectcleanwater.org/development.aspx?id=76

SANTA CLARA VALLEY URBAN RUNOFF POLLUTION PREVENTION PROGRAM

C.3 Stormwater Handbook (2012) contains design guidelines for stormwater control measures.
http://www.scvurppp-w2k.com/c3_handbook_2012.shtml