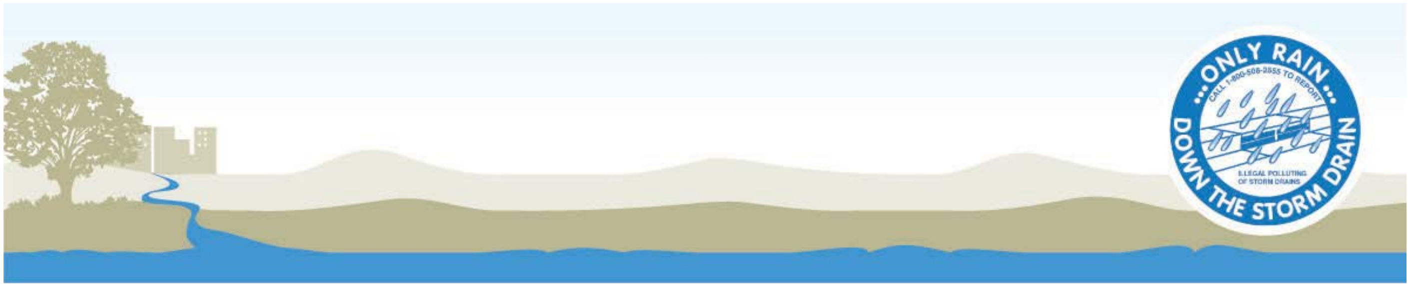
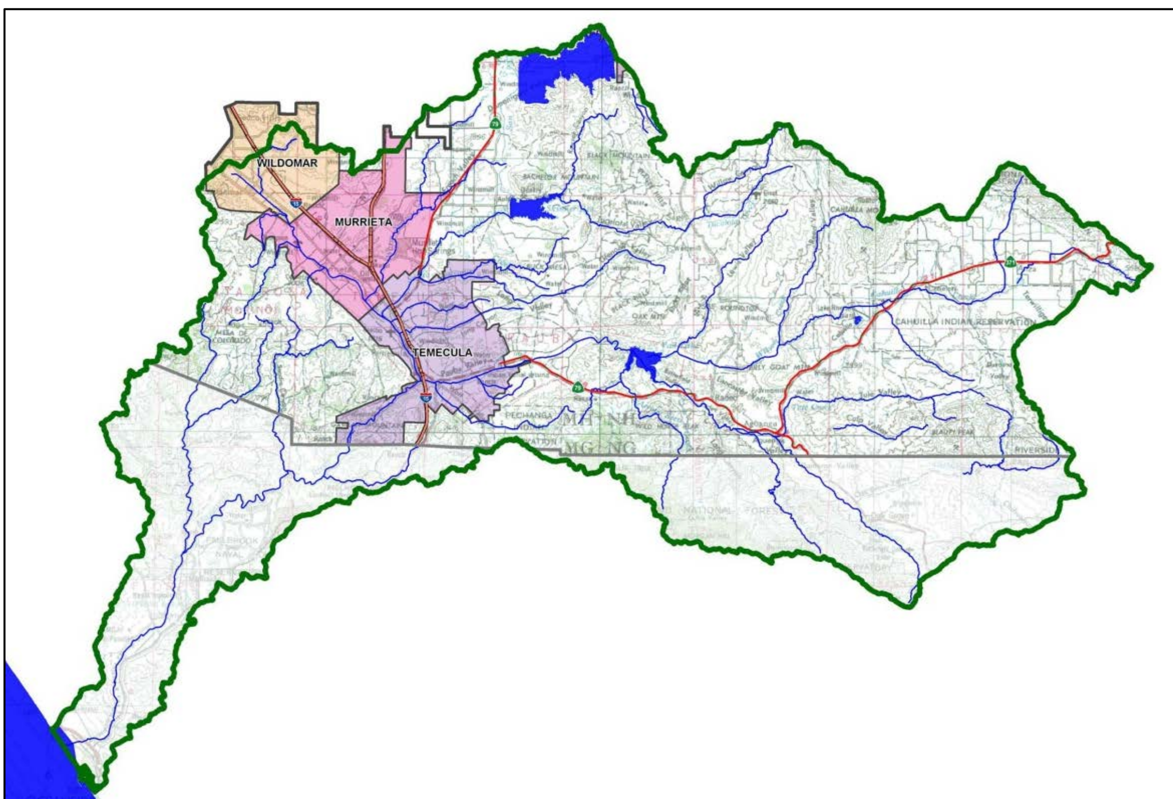
WATER QUALITY MANAGMEMENT PLAN FOR THE
SANTA MARGARITA REGION OF RIVERSIDE COUNTY



2014 WATER QUALITY MANAGEMENT PLAN

for the Santa Margarita Region of Riverside County



Water Quality Management Plan

for the Santa Margarita Region *of Riverside County*

In compliance with Order No. R9-2010-0016, this WQMP has been developed and will be implemented by the Copermittees in the Santa Margarita Region:

Copermittees:

County of Riverside
All Project applications:
www.countyofriverside.us/

For WQMP questions in unincorporated County areas:
www.rctlma.org
(951) 955-3185

Riverside County Flood Control and Water Conservation District
http://www.rcflood.org/

Murrieta
http://www.murrieta.org/

Temecula
http://www.cityoftemecula.org/

Wildomar
http://www.cityofwildomar.org/

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Start

INTRODUCTION

This Water Quality Management Plan (WQMP) is a guidance document to assist in the design of projects in compliance with San Diego Regional Water Quality Control Board (San Diego Regional Board) requirements for Priority Development Projects (PDPs). These requirements are specified in the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit issued to the Riverside County Flood Control and Water Conservation District (District), County of Riverside (County), and Cities of Murrieta, Temecula, and Wildomar (Copermittees) in November 2010 (2010 SMR MS4 Permit). The area covered by this MS4 Permit is referred to as the Santa Margarita Region (SMR).

This WQMP is only applicable to projects in the cities of:

- Murrieta
- Temecula
- Wildomar

and

- Portions of unincorporated County of Riverside that are within the SMR.

Because every project is unique, development of a Project-Specific WQMP should begin by scheduling a pre-application meeting with the applicable staff of the Copermittee with jurisdiction over the project site to understand the specific submittal requirements.

Be sure to use the most recent version of this WQMP for each and every project, including updates and errata. The most recent version is available at www.rcflood.org/NPDES/Developers.aspx. This WQMP may be updated periodically based on the Copermittees' experience with implementation of this document. Any non-substantive updates to the WQMP will be provided in the Copermittee's Jurisdictional Runoff Management Plan (JRMP) Annual Report to the San Diego Regional Board. Substantive updates will be submitted to San Diego Regional Board staff for review and approval prior to implementation. If reading the WQMP on a computer, hyperlinks within this document can be used to navigate from section to section Internet references can be accessed directly via the internet. The hyperlinks are throughout the text, as well as in "References and Resources" sections (marked by the 🕮 icon).

To use the *WQMP* to guide development of a Project-Specific WQMP, start by reviewing Chapter 1 to find out whether and how the requirements apply to your PDP. Chapter 1 also provides an overview of the entire process of planning, design, construction, operation, and maintenance leading to compliance.

Terms and issues used in the *WQMP* are defined in the Glossary or in Chapter 2. Chapter 2 provides background on key stormwater concepts and water quality regulations, including technical criteria for the design and selection of Best Management Practices (BMPs). Defined terms that are included in the glossary are also capitalized in the text.

Then proceed to Chapter 3 and follow the step-by-step guidance to prepare a Project-Specific WQMP for your site. Note that the steps in Chapter 3 reference additional detail in Chapters 4 and 5. A preliminary Project-Specific WQMP is commonly required to be submitted with applications for entitlements and development approvals and must be approved by the Copermittee with jurisdiction over the project site before any approvals or entitlements will be granted. A final Project-Specific WQMP will be required to be submitted and approved prior to issuance of grading and building permits.

> **Construction Phase Controls**
> Your Project-Specific WQMP is a separate document from the Stormwater Pollution Prevention Plan (SWPPP). A SWPPP provides for temporary measures to control discharges of sediment and other Pollutants during construction at sites that disturb one acre or more, whereas a WQMP is required to address discharges from the post-construction use of the site.

Chapter 4 describes key ways to coordinate development of the Project-Specific WQMP with other site plans such as landscaping, grading and erosion control plans, and overseeing construction of BMPs.

Chapter 5 provides a description of the process for ensuring operation and maintenance of BMPs over the life of the PDP. The chapter includes step-by-step instructions for preparing a Project-Specific WQMP Operation and Maintenance Plan.

Throughout each chapter, you will find references and resources to help you understand the regulations, complete the Project-Specific WQMP, and design the PDP to be protective of water quality to the Maximum Extent Practicable (MEP).

PLAN AHEAD TO AVOID THE THREE MOST COMMON MISTAKES

The most common (and costly) errors made by Users for development approvals with respect to stormwater compliance are:

1. Not planning for compliance early enough. The strategy for compliance with WQMP requirements should be developed before completing a conceptual site design or sketching a layout of subdivision lots. It is highly recommended that the project team (civil engineers, planners, architects, landscape architects, etc.) meet and confer at project inception, and then regularly throughout the design, to discuss design strategies that meet the WQMP requirements. Section 4.0 discusses some of the elements of the Project-Specific WQMP that will need to be coordinated among the site plans that these professionals may develop.

2. Assuming proprietary Stormwater BMPs or Conventional Treatment BMPs will be adequate for compliance. Low Impact Development (LID) BMPs that maximize infiltration, harvest and use, evapotranspiration and/or bio-treatment, are now required for nearly all projects. In addition, Hydrologic Control BMPs and Sediment Control BMPs are required for all projects that are not exempt from the requirements set forth in the SMR HMP. See Chapter 2 for criteria affecting what Stormwater BMPs can be used on a project.

3. Not planning for long-term maintenance of the PDP BMPs, and inspections/verifications by the Copermittee. Consider who will own and who will maintain the BMPs in perpetuity and how they will obtain access, and identify which arrangements are acceptable to the Copermittee with jurisdiction over the project site (Chapter 5).

COMPLIANCE PROCESS AT A GLANCE

Users should follow these general steps to comply with the requirements of the 2010 SMR MS4 Permit:

1. Discuss WQMP requirements during a pre-application meeting with Copermittee staff, if possible. This can help you to confirm any requirements specific to the Copermittee with jurisdiction over the project site. Note that the Copermittee will require the User to certify that the project does or does not qualify as a PDP. The Copermittee with jurisdiction over the project site will nevertheless have the ultimate discretion as to whether a Project-Specific WQMP will be required for any particular project.

2. If the project is required to prepare a Project-Specific WQMP, review the instructions in this WQMP BEFORE the tentative map, preliminary site plan, drainage plan, and improvement plans are prepared. The requirements in this WQMP will affect each of these items. Neglecting to appropriately consider and address the requirements of this WQMP at all stages of project planning and design, will likely result in costly re-design being required.

3. When required by the Copermittee with jurisdiction over the project site, prepare a preliminary Project-Specific WQMP and submit it with applications for Discretionary Approvals (entitlements).

4. Following receipt of any Discretionary Approvals, the final Project-Specific WQMP can be developed as part of the plan to complete the detailed project design, incorporating the BMPs committed to in the preliminary Project-Specific WQMP.

5. Prepare a draft Project-Specific WQMP Operation and Maintenance Plan and submit both, together with the grading and improvement plans as part of the application for grading and/or building permits. Execute legal documents assigning responsibility for operation and maintenance of BMPs. Protect proposed Post-Construction BMPs (and underlying infiltration soils) during construction, and maintain them following construction.

6. Following construction, submit 'as-built' plans and a final Project-Specific WQMP Operation and Maintenance Plan and formally transfer responsibility for maintenance to the owner or permanent occupant. Typically the Copermittees will require the final Project-Specific WQMP Operation and Maintenance Plan prior to issuance of Certificate of Occupancy.

7. Following occupancy, the occupant or owner (as defined in the Project-Specific WQMP Operation and Maintenance Plan) must maintain records that all necessary maintenance of Post-Construction BMP facilities has been performed and allow periodic inspections of Structural BMPs by the Copermittee with jurisdiction over the project site. Where Copermittees allow or require self-certifications of Structural BMPs, the occupant or owner must certify that the Structural BMPs are properly maintained and submit reports, prepared and certified by a Professional Engineer, to the Copermittee staff upon their request.

8. Preparation of a complete and detailed Project-Specific WQMP is the key to cost-effective compliance and expeditious review of your project. Instructions for preparing a Project-Specific WQMP are in Chapter 3.

Consistent with Section F of the 2010 SMR MS4 Permit, each Copermittee has implemented a JRMP that identifies an implementation process to verify compliance with the SMR WQMP requirements. In each JRMP, the implementation process identifies roles and responsibilities of the Copermittee departments in the method to track post-construction BMPs, to ensure that appropriate easements and ownerships are properly recorded in public records and that the information is conveyed to all applicable parties when there is a change in project or site ownership. Figure 1-1 identifies the typical implementation process for Project-Specific WQMP approval adopted by the Copermittees. The User may refer to the JRMP of the Copermittee with jurisdiction over the project site to determine specific roles and responsibilities.

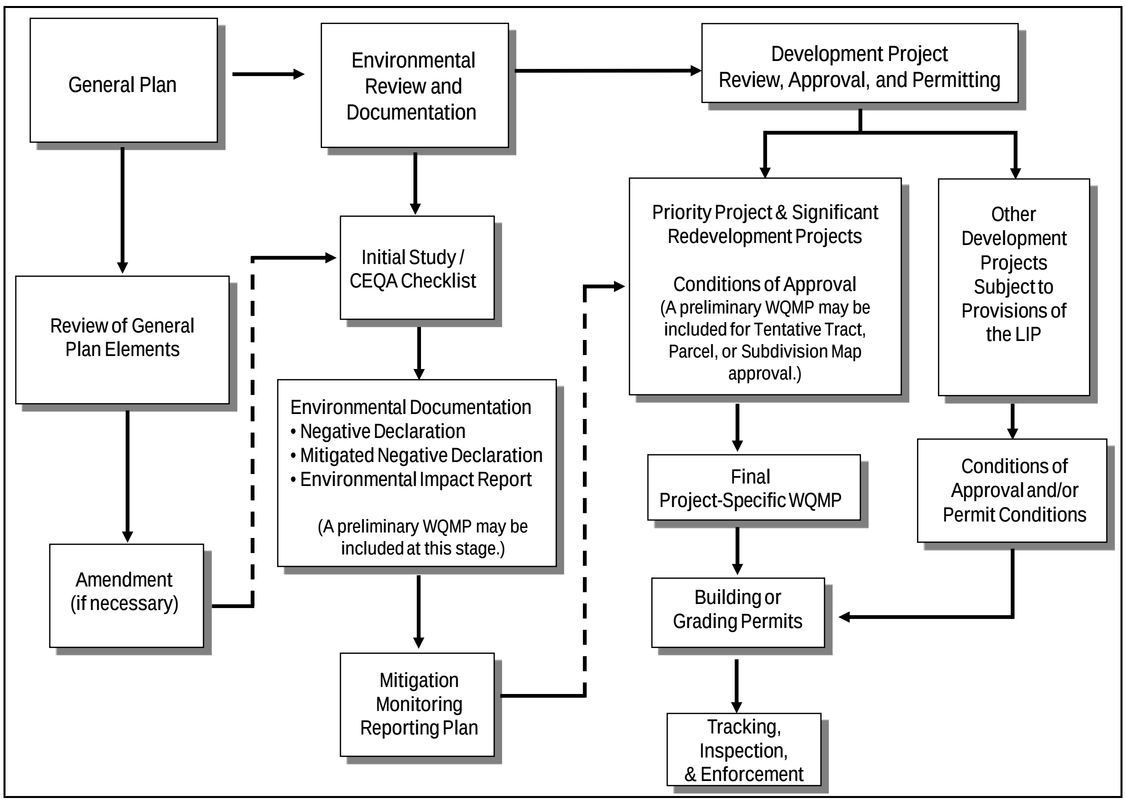

FIGURE 1-1: Development Process Flow Chart

Chapter 1

1.0 POLICIES AND PROCEDURES

Determine if your project requires a Project-Specific WQMP, and review the steps to compliance.

1.1. PROJECTS REQUIRING A PROJECT-SPECIFIC WQMP

This Document is specific to projects in the Santa Margarita Region of Riverside County.

> ☞*Before continuing use of this document, it is highly encouraged that the 'Locate your Watershed' tool available at www.rcflood.org/npdes, or SWCT2 (Stormwater & Water Conservation Tracking Tool - http://rivco.permitrack.com/)is used to verify that your project is within the Santa Margarita Region of Riverside County; which includes the incorporated Cities of Murrieta, Temecula and Wildomar, as well as the Unincorporated County of Riverside within the Santa Margarita Region.*

The 2010 SMR MS4 Permit (see Section 2.1.1) requires that a Project-Specific WQMP be prepared for all development projects within the SMR that meet the 'Priority Development Project' categories and thresholds listed in Table 1-1 (Section 1.1.1 below), and Redevelopment projects that meet the criteria in Section 1.1.2 below.

ICON KEY
☞ Helpful Tip
Submittal Requirement
Terms to Look Up
🕮 References & Resources

Additionally, the Project-Specific WQMP Applicability Checklist provided in Exhibit D, which is incorporated into each Copermittee's project application requirements, can be used as a means to document a conclusion that a project does or does not meet the criteria as a PDP. Note some thresholds are defined by square footage of impervious area; others by land area of development; others by total area disturbed. Exhibit E includes a Project-Specific WQMP Review Checklist that can be used to ensure that your Project-Specific WQMP submittal includes all required elements.

If the project is not a PDP, a Project-Specific WQMP is generally not required. Such projects, referred to as 'Other Development Projects' are still required to incorporate appropriate minimum Site Design, Source Control and LID BMPs which may or may not include Structural LID or Conventional Treatment Control BMPs. If your project is an Other Development Project, consult the Copermittee with jurisdiction over the project site to determine applicable requirements.

However, Copermittee staff may choose to require a Project-Specific WQMP for Other Development Projects, based on their assessment of the potential for the proposed project to impact stormwater quality.

When determining whether WQMP requirements apply, a "project" should be defined consistent with California Environmental Quality Act (CEQA) definitions of "project". That is, the "project" is the whole of an action which has the potential for adding or replacing or resulting in the addition or replacement of roofs, pavement, or other impervious surfaces. "Whole of an action" means the project may not be segmented or piecemealed into small parts if the effect is to reduce the quantity of impervious area for any part to below the applicable threshold.

1.1.1. New Priority Development Projects

New Development Projects are defined by the 2010 MS4 permit as a PDP if the project, or a component of the project, meets the categories and thresholds described in Table 1-1 below.

TABLE 1-1. Priority Development Project Categories

Category	Threshold	Development Project Description
New Development Projects	10,000 SF new Impervious surface	Development Projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site) including commercial, industrial, residential, mixed-use, and public development projects. This category includes Development Projects on public or private land which fall under the planning and building authority of the Copermittees.
Automotive Repair Shops	Dependent on SIC Code	Development Projects that include automotive repair shops that are categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.
Restaurants	5,000 SF	Development Projects that will sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet must meet all WQMP requirements except for the conventional treatment control BMP requirements of WQMP Section 3.5, and the Hydromodification requirements of WQMP Section 3.6.
Hillside Developments	5,000 SF	Hillside Development Projects greater than 5,000 square feet. This category is defined as any development project which creates 5,000 square feet of impervious surface and which is located in an area with known erosive soil conditions, where the development project will grade on any natural slope that is 25% or greater.

Category	Threshold	Development Project Description
Environmentally Sensitive Areas	2,500 SF Impervious surface	Development Projects located within, directly adjacent to or discharging directly to an Environmentally Sensitive Area (ESA) (where discharges from the Development Project site will enter Receiving Waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed Development Project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject Development Project site, and not commingled with flows from adjacent or upstream lands.
Parking Lots	5,000 SF Impervious surface	Development Projects with impervious parking lots 5,000 square feet or more and potentially exposed to runoff. Parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business or for commerce.
Streets, Roads, Highways and Freeways	5,000 SF Impervious surface	Private Development Projects that include any paved impervious surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles and other vehicles.
Retail Gasoline Outlets	5,000 SF or ADT >100	Retail Gasoline Outlets that meet either of the following criteria: (a) 5,000 square feet or more; or (b) a projected Average Daily Traffic of 100 or more vehicles per day.
Pollutant Generating projects disturbing over 1 acre	1 acre disturbed area	Development Projects that disturb over one acre of land, where the post-construction use of the site generate pollutants at levels greater than natural background levels.

1.1.1.a) Entire Project

Where a New Development Project feature, such as a parking lot, falls into a PDP Category as described in Table 1-1 above, the entire project footprint is subject to WQMP requirements.

1.1.2. Redevelopment Projects

Redevelopment projects are considered a PDP if:

- The project creates, adds, or replaces at least 5,000 square feet of impervious surfaces on an already developed site: AND
- The existing development AND/OR the proposed redevelopment project meets the criteria in Table 1-1 above.

1.1.2.a) The "50% Rule" for Redevelopment Projects

Redevelopment PDPs may not only be required to develop a Project-Specific WQMP for the new 'project' footprint, but may also be required to retrofit the existing portions of the site for compliance with this WQMP as well (including runoff from existing areas not otherwise being modified as part of the current project).

- Where a Redevelopment Project results in an increase of less than 50% of the impervious surfaces compared to the previously existing development, and the existing development was not subject to WQMP requirements, the Project-Specific WQMP applies only to the addition or replacement, and not to the entire development.

- Where a Redevelopment Project results in an increase of more than 50% of the impervious surfaces compared to the previously existing development, the Project-Specific WQMP applies to the entire development, including portions of the site not otherwise being modified or improved as part of the current project.

Copermittee staff will require submittal of sufficient information about the existing developed site and proposed additions/modifications, and to assess whether or not the proposed Redevelopment Project increases the collective impervious surfaces beyond the 50% threshold. Compliance with the Hydrologic Performance Standard (See Chapter 2.2.3) will be determined based on the naturally occurring condition, i.e. the native condition of the project site prior to any existing development.

1.2. WQMP Requirements for Projects in Progress

Requirements for preparing Project-Specific WQMPs have been in place for all applicable projects submitted to the Copermittee after July 13, 2005. The 2010 SMR MS4 Permit, however, includes new/additional requirements for Project-Specific WQMPs that are reflected in this revised WQMP. The following describes how these new requirements are to be applied to PDPs that have begun the process for securing approvals from the Copermittee.

The Project-Specific WQMP and HMP requirements described in this WQMP address the provisions of the 2010 SMR MS4 Permit and apply to all PDPs or phases of PDPs except those where:

- The project or phase has begun grading or construction activities at the time the updated WQMP and/or Hydromodification requirements go into effect*, or

- The Copermittee determines that lawful prior approval rights for a Development Project or project phase exist, whereby application of the updated requirements to the project is illegal.

If it appears that the project may meet either of these criteria, verify with the Copermittee with jurisdiction over the project site. Each Copermittee individually determines how and when a project will be allowed to be grandfathered.

1.3. Project-Specific WQMP Requirements for Phased Projects

Before occupancy will be granted for any phase of a multi-phase PDP, all requirements of the Project-Specific WQMP must be met for the current phase.

If any Structural BMPs necessary for the current phase of the PDP would be located in a future phase, occupancy for the current phase will not be granted until such 'offsite' BMPs have been constructed and are fully operational. In addition, the Operation and Maintenance requirements described in Section 5.0 must be fully met for all such 'offsite' BMPs.

1.4. Types of Project-Specific WQMPs

1.4.1. Preliminary Project-Specific WQMPs

If a Discretionary Approval would entitle construction of new or replaced improvements which, individually or in aggregate, would qualify as a PDP, then the User must prepare a preliminary Project-Specific WQMP. The level of detail in a preliminary Project-Specific WQMP will depend upon the level of detail known about the overall project design at the time project approval is sought.

> **Local Requirements**
> A Copermittee may have requirements that differ from, or are in addition to, this WQMP. Check with the Copermittee with jurisdiction over your project site.

For example, if approval of a tentative tract map application would entitle site improvements on individual lots that individually or in aggregate would exceed the thresholds for PDPs in Table 1-1, the User should prepare a preliminary Project-

* If your project site has been partially graded under an expired grading permit, consult the Copermittee with jurisdiction over your project site to determine whether the requirements in this document apply.

Specific WQMP. If particular plans for individual lots have not been identified, the preliminary Project-Specific WQMP may nevertheless be required to identify the type, size, location, and final ownership of Structural BMPs adequate to serve new roadways and any common areas, and to also manage runoff from an expected reasonable estimate of the square footage of future roofs, driveways, and other impervious surfaces on each individual lot. The Copermittee with jurisdiction over the project site will then condition approval of the map on implementation of a final Project-Specific WQMP that is in substantial conformance with the approved preliminary Project-Specific WQMP prior to issuance of grading / building permits.

If a Copermittee deems it necessary, the future improvements on one or more lots may be required to be limited by a deed restriction or dedication of an appropriate easement, to suitably restrict the future building of structures at each Structural BMP location.

In general, it is recommended Structural BMPs not be located on individual single-family residential lots to facilitate long-term maintenance, particularly when those BMPs manage runoff from streets or from common areas. However, local requirements may vary. Most often, it is better to locate Structural BMPs on one or more separate, jointly owned parcels such as a parcel owned by a homeowners association).

1.4.2. Final Project-Specific WQMPs

All PDPs are required to prepare a final Project-Specific WQMP, which the Copermittees require to be submitted together with associated grading and improvement plans, and approved prior to the issuance of any building or grading permits. The final Project-Specific WQMP must be in substantial conformance with any preliminary Project-Specific WQMP submitted and approved by the Copermittee with jurisdiction over the project site during the land use entitlement process.

2.0 CONCEPTS AND CRITERIA

Technical background and explanations of policies and general design requirements.

2.1. Regulatory Requirements

2.1.1. 2010 SMR MS4 Permit

The San Diego Regional Board first issued a MS4 Permit to the Copermittees in the Santa Margarita Region in 1990. That permit has been reissued four times since then, with the most recent permit being issued in 2010. These permits have required the Copermittees to develop and implement a comprehensive program to prevent Stormwater Pollution to the MEP.

The 2010 SMR MS4 Permit mandates the LID approach described in this WQMP for management of the discharge of storm water pollutants from PDPs to the MEP. The 2010 SMR MS4 Permit also requires implementation of the SMR HMP to manage runoff discharge rates and durations from PDPs to avoid increased erosion of stream beds and banks in receiving waters.

This section (Section 2) explains the technical background of the Copermittees' approach to implementing both LID requirements and the SMR HMP requirements; and Chapter 3 describes how to prepare a Project-Specific WQMP (referred to as a SSMP in the 2010 MS4 Permit) that is in compliance with these requirements.

2.1.2. Maximum Extent Practicable

The Clean Water Act (CWA) Section 402(p)(3)(iii) sets the standard for control of Stormwater Pollutants as MEP, but the CWA does not quantitatively define this term. As implemented, MEP is varies with conditions. In general, to achieve the MEP standard, Copermittees must require deployment of whatever BMPs are technically feasible (that is, are likely to be effective) and are not cost prohibitive.[1]

Many stormwater controls, including LID, have proven to be practicable in most Development Projects. To achieve fair and effective implementation, criteria and guidance for those controls must be detailed and specific—while also offering the right amount of flexibility or exceptions for special cases. The 2010 SMR MS4 Permit includes various standards, reflected in this WQMP, which the San Diego Regional Board has found to provide "MEP" control.

2.1.3. Best Management Practices

CWA Section 402(p) and United States Environmental Protection Agency (USEPA) regulations (40 CFR 122.26) require the Copermittees to implement a program of "management practices" to control Stormwater Pollutants to the MEP. BMPs are schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. This document defines several categories of BMPs. The glossary includes definitions for each category of BMP.

2.1.4. TMDL

A TMDL, or 'Total Maximum Daily Load', is the maximum amount of a Pollutant that the Regional Board has established can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.

At this time, there are no adopted TMDLs in the SMR. As TMDLs are developed and adopted in the SMR, this WQMP will be updated as necessary.

2.2. Potential Impacts of Development

This section describes the potential impacts that Development Projects can have on streams, rivers and other water bodies.

[1] "Definition of Maximum Extent Practicable", memo by Elizabeth Jennings, Senior Staff Counsel, State Water Resources Control Board, February 11, 1993.

2.2.1. Imperviousness

Schueler (1995) proposed imperviousness as a "unifying theme" for the efforts of planners, engineers, landscape architects, scientists, and local officials concerned with urban watershed protection. Schueler argued (1) that imperviousness is a useful indicator linking urban land development to the degradation of aquatic ecosystems, and (2) imperviousness can be quantified, managed, and controlled during land development.

Imperviousness has long been understood as the key variable in urban hydrology. Peak runoff flow and total runoff volume from small urban catchments are usually calculated as a function of the ratio of impervious area to total area. The ratio correlates to the composite runoff factor, usually designated "C". Increased flows resulting from urban development tend to increase the frequency of small-scale flooding downstream.

Imperviousness has three major components: rooftops, transportation (including streets, highways, and parking areas) and other hardscape. The transportation component is most likely to be directly connected to the MS4.

The effects of imperviousness can be managed by disconnecting impervious areas from the MS4 and by making drainage conveyances *less* efficient—that is, by encouraging retention and detention of runoff near the point where it is generated, more closely mimicking pre-development runoff flows and durations and time of concentration.

2.2.2. Potential Water Quality Impacts Associated with Developments

Runoff from a developed site has the potential to contribute Pollutants to the MS4 and Receiving Waters. These Pollutants may originate as airborne dust, be washed from the atmosphere during rains or may be generated locally by automobiles and activities present at the site. Pollutants can be grouped in nine general categories as follows:

- Sediments are soils or other surficial materials that are eroded and then transported or deposited by the action of wind, water, ice, or gravity. Excessive discharge of sediments to waterbodies and streams can potentially increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organism survival rates, smother bottom dwelling organisms, and/or suppress aquatic vegetation growth.

- Nutrients are inorganic substances, such as nitrogen and phosphorus. They commonly exist in the form of mineral salts that are either dissolved or suspended in water. Primary potential sources of nutrients in runoff are fertilizers and eroded soils. Excessive discharge of nutrients to waterbodies and streams may cause excessive aquatic algae and plant growth. Such excessive production, referred to as cultural eutrophication, may lead to excessive decay of organic matter in the waterbody, loss of oxygen in the water, release of toxins in bed sediment, and/or the eventual death of aquatic organisms and fish kills.

- Metals are raw material components in both metal and non-metal products. Primary potential sources of metal pollution in stormwater are typically commercially-available metals and non-metal products such as fuels, adhesives, paints, and other coatings. Metal Pollutants may include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. Metals that naturally occur in soil are typically not toxic at low concentrations. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications.

- Toxic Organic Compounds are natural or synthetic carbon-based molecules that may be found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can inadvertently be discharged to MS4 facilities. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life.

- Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) may impact the recreational value or other Beneficial Uses of a waterbody and/or aquatic habitat. Excess organic matter that may have been introduced as trash can create a high biochemical oxygen demand in a stream and thereby lower its water quality.

- Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids. Introduction of these Pollutants to the waterbodies can occur due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Elevated oil and grease content can decrease the aesthetic value of the waterbody, as well as the water quality.

- Bacteria and Viruses are environmentally-ubiquitous microorganisms that thrive under certain ecological conditions. Their proliferation is often from natural or uncontrollable sources but can also be caused by the transport of animal or human fecal wastes from a watershed. Water containing excessive bacteria and viruses, can alter the aquatic habitat and create a harmful environment for humans and aquatic life.

- Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Excessive or inappropriate application of a pesticide may result in runoff that may be toxic to aquatic life.

The 2010 MS4 Permit requires the Copermittees to require proposed PDPs to incorporate LID principles and LID BMPs, Conventional Treatment Control BMPs (where LID BMPs are technically infeasible), and Hydrologic Control BMPs that address potential water quality impacts.

2.2.3. Hydromodification Impacts

The 2010 SMR MS4 Permit defines Hydromodification as:

> *The change in the natural watershed hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow and groundwater flow) caused by urbanization or other land use changes that result in increased stream flows and sediment transport. In addition, alteration of stream and river channels, such as stream channelization, concrete lining, installation of dams and water impoundments, and excessive streambank and shoreline erosion are also considered Hydromodification, due to their disruption of natural watershed hydrologic processes.*

Once altered, natural streams and their ecosystems may have diminished beneficial uses. However, the stream may reach a new geomorphic equilibrium if proper management measures are implemented, and beneficial uses may be partially or fully recovered. Managing runoff from a single development site may seem inconsequential, but by changing the way most sites are developed (and redeveloped), it may be possible to protect existing stream ecosystems downstream of urban and urbanizing areas.

2.2.4. Priority Pollutants of Concern

'Priority Pollutants of Concern' are those Pollutants that the proposed PDP has the potential to generate, and are also known to be impairing the downstream Receiving Waters. Identifying Priority Pollutants of Concern involves the following steps:

1. Identify Receiving Waters – Use the most recent version of the Water Quality Control Plan for the in the San Diego Region Basin to determine the PDPs proximate Receiving Waters. This information can be accessed from the following site: (http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)

2. Identify Impairments in those Receiving Waters by Reviewing:

 the 303(d) listings for all downstream Receiving Waters:

 http://waterboards.ca.gov/santaana/water_issues/programs/tmdl/303d.shtml

 and any Pollutants being addressed by an adopted TMDL:

 http://waterboards.ca.gov/santaana/water_issues/programs/tmdl/

3. Identify Pollutants associated with your site/project - This includes legacy Pollutants that may be present on the project site, as well as Pollutants that are listed for the category of development on Table 2-1 below. That table may be updated by the Copermittees periodically based on updated studies and information. Updates will be reported in the JRMP Annual Report to the San Diego Regional Board submitted by the Copermittee with Jurisdiction over the project site, and reflected in an update to this WQMP.

Table 2-1: Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
Detached Residential Development	P	N	P	P	N	P	P	P
Attached Residential Development	P	N	P	P	N	P	P	P(2)
Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
Retail Gasoline Outlets	N	P	N	N	P	N	P	P

P = Potential
N = Not Potential
(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected.
(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected
(3) A potential Pollutant is land use involving animal waste
(4) Specifically petroleum hydrocarbons
(5) Specifically solvents
(6) Bacterial Indicators are routinely detected in pavement runoff

2.3. Low Impact Development (LID)

The 2010 SMR MS4 Permit defines LID as follows:

> A stormwater management and land development strategy that emphasizes conservation and the use of onsite natural features integrated with engineered, small-scale hydrologic controls to more closely reflect pre-development hydrologic functions.

The Low Impact Development Manual for Southern California (SMC, 2010) further describes that there are two types of LID:

- LID Principles which are site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime. LID Principles should be implemented to the MEP on all sites.

- LID BMPs which are Structural BMPs that help manage otherwise unavoidable post-construction impact; i.e., where implementation of LID Principles cannot fully address the Design Capture Volume for a particular portion of a site, LID

BMPs must be implemented. The User may also investigate the feasibility of using LID BMPs as Hydrologic Control BMPs to manage the increases in runoff discharge rates and durations that may cause Hydromodification impacts.

2.3.1. Benefits of LID

There are many potential benefits associated with the use of LID. Foremost, LID BMPs tend to retain runoff, thus reducing the amount of potentially Polluted runoff that can be transported to Receiving Waters. Additionally, LID BMPs have the advantage of supplementing the physical processes of interstitial settling and adsorption—common to all media filters—with additional complexation and adsorption to the biofilms that are developed, and for those that include vegetation, additional Pollutant removal through uptake through the plant roots. In addition, LID BMPs that integrate engineered/amended soils and/or vegetation benefit from the biological activity of bacteria, insects, and worms, which helps renew and maintain the media, increasing reliability and eliminating the need for frequent maintenance or re-setting of the filtration layers. LID BMPs also act as "sponges", absorbing the amount of Runoff from small storm events and some of the Runoff from larger events and retaining it so as to maximize infiltration and Evapotranspiration. This, in turn helps the post-development site's hydrologic regime mimic the pre-development hydrology and can be useful in achieving compliance with the HMP Performance Standards.

In addition to Stormwater management, LID implementation can result in environmental, economic, and community benefits:

Potential Environmental Benefits:

- Improved water quality
- Maintenance of predevelopment Runoff volume and discharge
- Groundwater recharge
- Terrestrial and aquatic habitat preservation
- Reduced potable water demand
- Recycling and beneficial reuse

- Reduction in urban heat island effect

Potential Economic Benefits:

- Reduced construction and maintenance costs
- Improved marketability
- Energy cost reduction and water conservation

Potential Community Benefits:

- Improved aesthetic value
- Provides "green job" opportunities
- Educational opportunities

LID BMPs have been shown in studies throughout the country to be effective and reliable at treating a wide range of Pollutants that can be found in Runoff, including those listed in Section 2.2.2 above. As such, the LID BMPs required in this WQMP are expected to treat discharges of urban-sourced Pollutants from PDPs with a high level of effectiveness, such that the runoff discharges from the PDP should not cause or contribute to an exceedance of Receiving Water Quality Objectives.

2.3.2. LID BMP Types and Prioritization

LID BMPs are a type of Structural BMP that provide many of the benefits described above. For the purposes of this WQMP, LID BMPs are categorized and prioritized as follows:

- Priority 1: LID Retention BMPs
    - LID Infiltration BMPs are designed to infiltrate captured runoff into the underlying native soils. As such, these LID Infiltration BMPs can be used only where soils are highly permeable. Review the assessment of constraints and opportunities in Step 2 to determine the applicability of LID Infiltration BMPs to the PDP. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
        - Pervious Pavements include pervious pavers, asphalt or concrete surfaces, or permeable modular block. Unlike traditional pavements that are impermeable, porous pavements reduce the volume and peak of Stormwater Runoff as well as manage

Pollutants from Stormwater Runoff by allowing precipitation to infiltrate into underlying soils. Permeable pavements can be designed as LID Infiltration BMPs, or as an LID Principle[1].

- Harvest and Use BMPs are used to facilitate capturing Stormwater Runoff for later use. Review the assessment of constraints and opportunities in Step 2 to determine the applicability of this LID BMP to the Development Project.
- Bioretention BMPs are engineered vegetated areas that are designed to receive runoff. These areas can be configured as free-form areas or planters to integrate with the landscape design. Bioretention BMPs are feasible on all soil types and distinguished from Biotreatment BMPs (below) by the fact that they capture and absorb the Design Capture Volume (DCV) entirely into a biologically active soil media. Water retained in this soil media is then evapotranspired by plants in the BMP, or slowly allowed to infiltrate into the underlying soils. This BMP inherently maximizes both infiltration and evapotranspiration of runoff based on the actual limitations of the soil and environment. In sufficiently drained soils, even when constructed with a subdrain, Bioretention BMPs will retain long term volumes of runoff. See the additional discussion of Retention vs. Bioretention in Section 2.3.3.

- Priority 2: Other LID BMPs
  - Bioretention BMPs while designed to be a LID Retention BMP, Bioretention BMPs can also be used in areas where infiltration characteristics of the soils will not allow full retention of the DCV. Bioretention BMPs may also be implemented to partially, if not fully, manage increases in runoff discharge rates and duration to meet the Hydrologic Performance Standard (Section 3.6.3). In this case, infiltration and evapotranspiration of Runoff will still be maximized based on the actual limitations of the soil and environment.

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[1] When pervious pavement is designed primarily as a site design feature (i.e., it doesn't receive Runoff from more than 2 parts tributary impervious area to 1 part pervious pavement), the pervious pavement is considered a self-retaining area as described in Section 3.3.3. If additional area is drained onto the pervious pavement beyond the 2:1 ratio, the pervious pavement will be required to be constructed in accordance with a Copermittee approved Stormwater BMP design that allows for greater ratios, (such as the LID BMP Design Handbook). In this case, pervious pavement is considered a LID Infiltration BMP.

- Biotreatment BMPs are naturally-based LID BMPs, which can be used where soils are relatively impermeable. These BMPs are distinguished from LID Bioretention BMPs in that they are not designed to retain the DCV in an engineered soil media, however, they still provide similar functions and benefits to LID Bioretention BMPs by incorporation of features that provide for natural biological processes while still maximizing opportunities for infiltration and evapotranspiration. Biotreatment BMPs may also be implemented to partially, if not fully, manage increases in runoff discharge rates and duration to meet the Hydrologic Performance Standard (Section 3.6.3). Examples of Biotreatment Control BMPs include extended detention basins, bioswales, and constructed wetlands. Consult with the Copermittee with jurisdiction over the project site to determine approved LID Biotreatment BMPs.

Descriptions, illustrations, designs, and design criteria for the LID BMPs described herein can be found in the LID BMP Design Handbook (Exhibit C). A Copermittee may have its own designs for these same BMPs, or may specify other LID BMPs that Users may use.

2.3.2.a) LID Prioritization

Consistent with Provision F.1.d.(4) of the 2010 SMR MS4 Permit, each PDP must implement LID Retention BMPs that capture and retain onsite the DCV for each of the project's Drainage Management Areas (DMAs). If it has been shown to be technically infeasible to implement such LID Retention BMPs for some or all of DMAs on the site, other LID BMPs can be used to address the runoff from those DMAs.

2.3.3. LID Retention vs Bioretention

The 2010 SMR MS4 Permit requires that the DCV be retained onsite unless it is technically infeasible. The intent behind these prioritization requirements is to reduce the volume of runoff and Pollutant loads entering Receiving Waters. In cases where such retention practices are feasible, they may provide a significant benefit to runoff quality, and help the project mimic the pre-development hydrologic regime. Of particular interest is the contribution of LID BMPs towards managing potential increases in runoff discharge rates and durations caused by PDPs.

BMPs solely reliant on retention practices (infiltration, harvesting and use, or evapotranspiration) however, require a high level of confidence in the long-term reliability of water demand, the infiltration characteristics of the underlying soils, and of evapotranspiration rates, to ensure timely drawdown of the storage volume.

LID Bioretention BMPs, when properly designed such as shown in the LID BMP Design Handbook, also inherently meet the goal of capturing the required volume of runoff, and infiltrating and evapotranspiring that volume to the extent feasible given site soils and other conditions. In highly permeable soils, infiltration will meet or exceed the required DCV; in less permeable soils the proportion infiltrated will be smaller and the remaining proportion will either be evapotranspired or receive full biotreatment. Such LID Biotreatment BMPs will achieve the *maximum* feasible level of infiltration and evapotranspiration and achieve the *minimum* feasible (but highly biotreated) discharge.

> LID Bioretention BMPs provide the benefits of LID Retention BMPs, while providing a higher level of confidence that the captured volume will be drained within an acceptable timeframe to avoid nuisance conditions and ensure that subsequent storms will not bypass the BMP untreated.

A recent analysis of the monitored inflow and outflow data contained in the International Stormwater BMP Database showed an average long-term volume reduction on the order of 40% for biofilters, 30% for extended detention basins, and 60% for Bioretention BMPs. These performance figures are for installations on a variety of underlying soil types. The higher the infiltrative capacity of the underlying soils, the higher percentage of long term captured volume will be retained.

This means that a designer could substitute a LID Bioretention BMP designed to capture 100% of the DCV, instead of an identically sized LID Harvest and Use BMP that has insufficient demand - without impairing the long term retention of stormwater runoff of the PDP's system of BMPs. This is because, if the Harvest and Use BMP would, based on the demands present on the site, retain less than 40% of the *long term volume of runoff*, the LID Biotreatment BMP would end up retaining more than the Harvest and Use BMP.

☞ *To further validate the volume reduction resulting from LID BMPs in the semi-arid environment of western Riverside County, the District has constructed several categories of LID BMPs, including Bioretention BMPs, at their headquarters in Riverside, CA and is directly measuring the actual long term volume reductions.*

2.3.4. LID Infiltration Feasibility Criteria

In many areas of Riverside County, soils will support LID Infiltration BMPs. However, there are several factors that affect their feasibility that must be considered before utilizing such BMPs. Some of the factors will require a licensed Geotechnical Engineer to verify, as identified in the sub-sections below.

2.3.4.a) Downstream Impacts

If it is demonstrated that infiltrating the DCV would negatively impact downstream water rights or other Beneficial Uses, LID Infiltration BMPs are not required. Such a condition must be substantiated by sufficient modeling to demonstrate such an impact. Such an exemption would have to be approved by the Copermittee with jurisdiction over the project site and the San Diego Regional Board.

2.3.4.b) Groundwater Protection

The following restrictions on the use of centralized Infiltration BMPs are identified to ensure that the BMP does not cause or contribute to an exceedance of groundwater quality objectives. These restrictions do not apply to small infiltration systems dispersed throughout a PDP.

- LID Infiltration BMPs must not be used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities as designated by each Copermittee unless first treated or filtered to remove Pollutants prior to infiltration.

- The seasonal high groundwater mark must be at least 10 feet below the invert of the LID Infiltration BMP.

- Infiltration BMPs must be located a minimum of 100 feet horizontally from any water supply wells.

- No part of a LID Infiltration BMP should be within a 2:1 (horizontal: vertical) influence line extending from any septic leach line.

- LID Infiltration BMPs must not be located in soils that, according to a licensed Geotechnical Engineer, do not have adequate physical and chemical characteristics (such as appropriate cation exchange capacity, organic content, clay content and infiltration rate) for the protection of groundwater.

2.3.4.c) Public Safety and Offsite Impacts:

LID Infiltration BMPs must not be used in locations or in soils that may create a public safety or structural concern, such as but not limited to slope or structural instability, landslides, mudslides, liquefaction, seeps, adjacent to building foundations, or other geotechnical concerns. Such a determination must be in accordance with the recommendations of a licensed Geotechnical Engineer.

2.3.4.d) Infiltration Characteristics

BMPs entirely reliant on infiltration (such as infiltration basins or infiltration trenches) require a high level of confidence in the long-term reliability of the infiltration characteristics of the underlying soils. Adequate long-term infiltration capacity is the determining factor as to whether a LID Infiltration BMP will be effective for the protection of Receiving Water quality.

'In-Situ' tested infiltration rates (i.e., the Saturated Hydraulic Conductivity) can vary widely both spatially and temporally within a project site. It is not uncommon to find that the tested infiltration rates at one location can be an order of magnitude different from another test conducted a matter of feet away – even within the same BMP footprint. Additionally it is known that the infiltration rate is typically reduced after construction of the project (compared to exploratory/feasibility testing performed before construction) due to grading, cut and fill conditions; and that the infiltration rate continues to further degrade over time due to unavoidable/inadvertent clogging of the native soils.

If the actual long-term infiltration rates within the BMP are too low, excessive ponding may occur, which may result in two negative effects:

1) Mosquitoes and other vectors may begin breeding; and
2) Runoff from subsequent rainfall events may bypass the BMP, resulting in untreated runoff being discharged from the site and potential impacts to receiving waterbodies.

To avoid creation of these conditions, a maximum Drawdown Time of 72 hours has been established. To ensure that over the life of the BMP the actual Drawdown Time does not exceed 72 hours, and based on the typical infiltration basin depth of five (5) feet, the minimum long-term post-development infiltration rate must be at least 0.83 inch per hour (5ft * 12/72 hours = 0.83 inch/hour).

As discussed above, however, the long-term post-development infiltration rates can be much lower than the initial (pre development) infiltration rates that are measured for feasibility testing. As such, infiltration testing requirements have incorporated a minimum factor of safety of two for Infiltration BMPs. Incorporating the established minimum factor of safety, the tested pre-development infiltration rates must be greater than 1.6 inches per hour to be assured that over the life of the BMP, the actual infiltration rate will not degrade to a level that nuisance or vector conditions could be created. This will also ensure that the BMP will be adequately drained for back-to-back storms.[1]

Accordingly, the following feasibility criteria have been developed to ensure that the most effective and reliable BMPs are deployed:

- If the 'in-situ' tested infiltration rate for the site is less than 1.6 inches per hour, due to the uncertainty in infiltration rates as discussed above LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) must not be used. Infiltration testing must be performed using methodologies such as identified in the LID BMP Design Handbook, or Copermittee-approved alternative methods. If Harvest and Use is also not feasible, Bioretention BMPs can instead be used. Bioretention BMPs provide infiltration and evapotranspiration to the MEP as described in Section 2.3.3, while ensuring that the BMP drains appropriately and capacity is restored for subsequent storms.

While soil amendment practices can affect evapotranspiration rates, they do not have a substantial effect on infiltration rates to the surrounding native soils or overall retention in a LID Infiltration BMP, and as such are not appropriate to prevent vector concerns or ensure adequate drainage for subsequent storms. Amended soils may be appropriate for self-retaining areas (micro-infiltration areas) described in section 3.3.2, when sited on Group C or D soils.

If the project meets the following criteria:

Table 2-2: Small Project Criteria

Residential	Commercial, Institutional	Industrial
Less than 10 acres and less than 30 DU	Less than 5 acres and less than 50,000 SF Impervious	Less than 2 acres and less than 20,000 SF Impervious

Then the project is considered a small project. If the small project is underlain with Hydrologic Soils Group (HSG) "D" soils according to available regional soils maps, and

[1] The analysis used to determine the threshold infiltration rates was based on factors of safety used in the adopted Orange County WQMP/Technical Guidance Document (Appendix VII), standard engineering practices, experience with BMPs that rely solely upon infiltration in Contra Costa County, and best professional judgment.

no available data for the site is conflicting with such a designation, 'in-situ' testing of infiltration rates may not be required, at the discretion of the Copermittee. In this case, LID Infiltration BMPs cannot be used.

2.3.4.e) Cut / Fill Conditions

The soil beneath LID Infiltration BMPs must be thoroughly evaluated in a geotechnical report since such BMPs are reliant solely on the infiltration rates of the underlying soils for their long term performance. Because of this, the project proponent must be able to perform tests on the actual soils that will exist at the infiltration surface. It is impossible to test the infiltration rate of an engineered fill that does not yet exist. As such, LID Infiltration BMPs would be prohibited if the planned fill was so deep that the bottom of the BMP could not extend down through the fill and into the native soils. A similar situation exists for those areas that will be significantly excavated as part of the site grading process, and the testing cannot be performed at the future cut elevation. If there is no practicable way to verify infiltration rates at the final BMP infiltration surface, LID Infiltration BMPs may not be used. LID Infiltration BMPs may still be applicable for DMAs in other parts of a project site in which infiltration testing is feasible. Each DMA on a project site will be assessed accordingly.

2.3.4.f) Other Site Specific Factors

If the geotechnical investigation performed by a licensed engineer discovers other site-specific factors that would preclude effective and/or safe infiltration, such as, but not limited to, clay lenses, restrictive layers, or soils prone to liquefaction, LID Infiltration BMPs are not required in those areas.

2.3.5. LID Harvest and Use Feasibility Criteria

LID Harvest and Use BMPs may be employed on any site where it can be shown there is sufficient reliable and timely demand for non-potable water, subject to the following criteria:

2.3.5.a) Downstream Impacts

If harvesting and using Stormwater Runoff would demonstrably negatively impact downstream water rights or other Beneficial Uses, LID Harvest and Use BMPs are not required. Such a condition must be substantiated by sufficient modeling to demonstrate such an impact. Such an exemption would have to be approved by the Copermittee with jurisdiction over the project site and the San Diego Regional Board.

2.3.5.b) Reclaimed Water Use

Utilizing reclaimed water where available inherently reduces the amount of treated municipal effluent discharged to waterbodies. Further, utilizing the capacity of the reclaimed water system, where available, has a significantly larger benefit for offsetting potable water supply than LID Harvest and Use BMPs. If reclaimed water is available to the site, the use of reclaimed water will take precedence over the harvest and use of Stormwater Runoff.

If reclaimed water will be used on the project, there is no need to further evaluate the feasibility of LID Harvest and Use BMPs. Use of reclaimed water should be documented in the Project-Specific WQMP.[1]

2.3.5.c) Code Compliance

If a particular use of captured stormwater, and/or available methods for storage of captured stormwater would be contrary to building codes in effect at the time of approval of the preliminary Project-Specific WQMP, then an evaluation of harvesting and use for that use would not be required.

2.3.5.d) Minimum Demands

The evaluation of the feasibility of LID Harvest and Use BMPs is performed for three potential categories of use: toilet flushing, irrigation and other onsite non-potable uses as described in the following tables. Data presented in the tables were generated based upon a continuous simulation analysis and demand factors consistent with similar analyses prepared for the 2011 Orange County WQMP and Technical Guidance Document. Riverside County specific rainfall and evapotranspiration data was used to generate the analysis.

For evaluation of toilet flushing, flush volumes and use rates from the literature have been combined with a long-term continuous simulation to develop a minimum unit demand, referred to as the Toilet Users to Impervious Area ratio that would be required to achieve the minimum 40% long-term retention of Runoff. See Table 2-3 below, as well as the discussion of Retention vs. Bioretention BMPs above. If the proposed project does not meet or exceed this minimum demand, implementing this LID Harvest and Use BMP would be less

[1] Non-agricultural irrigation using recycled water must comply with the statewide permit for Landscape Irrigation Using Recycled Water and the State Department Health guidelines.

effective than a Bioretention BMP, and as such, this LID Harvest and Use BMP would not be required for the project.

Table 2-3: Harvest and Use Data for Toilet Use

Project type	**Residential**	**Retail / Office Commercial**	**Industrial**	**Schools**
Basis of Use Type	*Resident*	*Employee (non-visitor)*	*Employee (non-visitor)*	*Employee (non-student)*
Design Capture Storm depth, in	**Minimum Demand (toilet users per tributary impervious acre)**			
0.50	87	116	160	26
0.55	94	125	170	28
0.60	102	133	179	30
0.65	109	142	189	31
0.70	116	150	198	33
0.75	123	159	208	35
0.80	130	167	217	36
0.85	137	176	227	38
0.90	145	184	236	40
0.95	152	193	246	41
1.00	159	201	255	43
1.05	166	210	265	45
1.10	173	218	274	46
1.15	180	227	284	48
1.20	188	235	293	50

[A] Unit demands used in analysis: *Residential = 9.3 gal/resident/day*
Retail/office = 7 gal/employee/day
Industrial = 5.5 gal/employee/day
Schools = 33 gal/employee/day

[B] Design storm capture = 0.7 in. with Lake Elsinore rainfall; 1.0 in. with Temecula rainfall. Other values were linearly interpolated/extrapolated

For evaluation of irrigation, typical evapotranspiration and water demands have been combined with a long-term continuous simulation to develop a minimum ratio of Effective Impervious Area to Irrigated Area that would be required to achieve the minimum 40% long-term retention of Runoff. See Table 2-4 below, as well as the discussion of Retention vs. Bioretention BMPs above. If the proposed project cannot meet or exceed this ratio, implementing this LID Harvest and Use

BMP would be less effective than a LID Bioretention BMP, and as such this LID Harvest and Use BMP would not be required for the project.

Table 2-4: Harvest and Use Data for Irrigation Use[A]

General landscape type	Conservation Design: $K_L{}^B$=0.35	Active Turf Areas: $K_L{}^B$=0.70
Design Capture Storm Depth[C], in	**Minimum required irrigated area per tributary impervious acre for partial capture (ac/ac)**	
0.50	0.36	0.22
0.55	0.72	0.35
0.60	1.08	0.47
0.65	1.45	0.60
0.70	1.81	0.91
0.75	2.17	1.16
0.80	2.53	1.41
0.85	2.90	1.66
0.90	3.26	1.91
0.95	3.62	2.16
1.00	3.98	2.41
1.05	4.35	2.66
1.10	4.71	2.91
1.15	5.07	3.16
1.20	5.43	3.41

[A]ET data from the CIMIS station at Temecula used for this analysis

[B] (KL) incorporates plant species, microclimate and water management/irrigation practices, as described in the 2011 Orange County WQMP and Technical Guidance Document.

[C]Design storm capture = 0.7 in. was calculated using Lake Elsinore rainfall; 1.0 in. with Temecula rainfall. Other values were linearly interpolated/extrapolated

For evaluation of other non-potable uses such as industrial uses, a long-term continuous simulation of precipitation intensity and frequency has been performed to develop a table of minimum demands that would be required to achieve the minimum 40% long-term retention of runoff. See Table 2-5 below, as well as the discussion of Retention vs. Biotreatment above. If the proposed project cannot meet or exceed these minimum demands, implementing this LID Harvest and Use BMP would be less effective than a LID Bioretention BMP, and as such this LID Harvest and Use BMP would not be required for the PDP.

Table 2-5: Harvest and Use Data for other non-potable uses*

Design Capture Storm depth, in	Wet season demand required for minimum partial capture, gpd per impervious acre
0.50	880
0.55	932
0.60	985
0.65	1,037
0.70	1,089
0.75	1,141
0.80	1,194
0.85	1,246
0.90	1,298
0.95	1,350
1.00	1,403
1.05	1,455
1.10	1,507
1.15	1,559
1.20	1,612

**Design storm capture = 0.7 in. was calculated using Lake Elsinore rainfall; 1.0 in. with Temecula rainfall. Other values were linearly interpolated/extrapolated*

2.3.6. Feasibility of Other LID BMPs

Experience has shown implementation of other types of LID BMPs, such as Bioretention and/or Biotreatment is feasible on nearly all PDP sites with sufficient advance planning. Projects where LID Bioretention and/or Biotreatment BMPs may not always be feasible generally fall into one of the following two categories:

- Portions of sites which are not being developed or redeveloped, but which must be retrofitted in accordance with the "50% rule". For example if site-specific conditions preclude draining existing impervious surfaces on the newly developed portion of the site – and if the existing impervious surfaces cannot be otherwise retrofitted with other LID BMPs.

- Sites smaller than one acre approved for lot-line to lot-line development or redevelopment as part of a Copermittee's effort to preserve or enhance a pedestrian-oriented "smart-growth" type of urban design. For many scenarios, LID Biotreatment BMP options such as planters will be feasible.

If you believe specific conditions on your site preclude the use of LID BMPs, you must submit, in the Project-Specific WQMP, a detailed site-specific examination and demonstration that implementation of other LID BMPs is technically infeasible.

2.3.7. BMP Area Considerations

Most LID BMPs can be fit within planned landscaped areas of a project with proper planning and site and grading/drainage optimization.

Table 2-6 provides the recommended percentage of a PDP site that is required to be made available for LID BMPs. The PDP may provide more area for LID BMPs if desired. Table 2-6 is intended to be used as follows:

- If the percentage of the PDP site that would have to be made available for BMPs to meet the requirements in this WQMP exceeds the project-type specific minimum criteria shown in Table 2-6 below, then the remaining volume (beyond that which fits within the shown minimum criteria) must be addressed with other Conventional Treatment Control BMPs, Credits, Runoff Fund contributions, or waivers.
- If the percentage of the site provided for BMPs is lower than the value shown in Table 2-6 and the BMP requirements have not fully been met, a reviewer can request that additional area be made available for BMPs until either the percentage of the site in Table 2-6 is provided or the BMP requirements are met, whichever is less.

Table 2-6: Recommended Effective Area[1] Required to be made Available for LID BMPs (% of site)[2]

Priority Development Project Type	New Development	Redevelopment
SF/MF Residential < 7 du/ac	10%	5%
SF/MF Residential 7 – 18 du/ac	7%	3.5%
SF/MF Residential > 18 du/ac	5%	2.5%
Mixed Use, Commercial/Industrial w/ FAR < 1.0	10%	5%
Mixed Use, Commercial/Industrial w/ FAR 1.0 – 2.0	7%	3.5%
Mixed Use, Commercial/Industrial w/ FAR > 2.0	5%	2.5%
Podium (parking under > 75% of project)	3%	1.5%
Zoning allowing development to property lines	2%	1%
Transit Oriented Development[3]	5%	2.5%
Parking	5%	2.5%

[1] "Effective area" is defined as area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.

[2] Adapted from the San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans.

[3]Transit oriented development is defined as a development with development center within one half mile of a mass transit center.

Key: du/ac = dwelling units per acre, FAR = Floor Area Ratio = ratio of gross floor area of building to gross lot area, MF = Multi Family, SF = Single Family

2.4. HYDROMODIFICATION

As land converts from natural land covers to developed land covers, runoff discharge rates and durations, and the delivery of Bed Sediment Supply from PDPs to the Receiving Waters may be altered. The alteration of both hydrology and sediment transport regimes may cause erosion or aggradation to channels. Where this occurs, this phenomenon is referred to as Hydromodification.

The 2010 SMR MS4 Permit specifies additional BMP requirements to help prevent Hydromodification impacts. Formerly referred to as 'Hydrologic Conditions of Concern', Hydromodification management approaches have evolved over time, with efforts first focused on managing peak flow rates, and have now shifted to matching or reducing the flow duration curves from post-development to pre-development, in some cases naturally occurring, conditions using continuous simulation approaches, and preserving the delivery of Bed Sediment Supply to the Receiving Waters. This can be accomplished through the use of Structural BMPs, or Hydrologic Control BMPs, and Site Design Principles, or Sediment Supply BMPs. Hydrologic Control BMPs are designed to control the post-construction Runoff hydrograph from the PDP site. Sediment Supply BMPs are implemented to preserve the delivery of Bed Sediment Load to the Receiving Waters.

Hydromodification requirements are separate from, but overlap, the LID requirements of the 2010 SMR MS4 Permit. The LID Design process described in this document will help to avoid potential Hydromodification impacts from a PDP, however may not lead to full compliance with the HMP Performance Standards.

2.5. Hydrology for NPDES Compliance

2.5.1. Water Quality Hydrology

Most runoff, and therefore, most of the potential for conveyance of Pollutants, is produced by frequent storms of small or moderate intensity and duration. Accordingly, Structural BMPs are designed to treat smaller storms and the first flush of larger storms.

2.5.1.a) Design Storm

Methods that have historically been used to determine an MEP-based and cost effective volume of treatment involve continuous simulation of long term rainfall and corresponding runoff from a hypothetical one-acre area entering a basin designed to draw down in a specified amount of time. The simulation is iterated with varying unit basin sizes, and the results are graphed to find the point of diminishing returns (i.e., the 'knee' of the curve) where incrementally larger BMPs result in incrementally smaller benefits to treatment of runoff.

It has been found that the knee of the curve typically occurs with a basin designed for the 85th percentile 24-hour storm event. It has also been found that a basin of this size ends up treating about 80% of the total long-term volume of runoff that occurs during the simulation period.

To simplify design calculations (that is, to avoid the need to perform continuous simulation for design of all BMPs), 2010 SMR MS4 Permit has established the 85^{th} percentile, 24-hour storm event as the "Design Storm", which is the standard used in this WQMP.

An updated Isohyetal map showing the 85^{th} percentile 24-hour storm depth at different locations throughout western Riverside County, based on long-term rainfall data, is provided in Exhibit A.

2.5.1.b) Composite Runoff Factor

The sizing of both Volume-Based BMPs and Flow-Based BMPs is based on determination of a composite runoff factor, which varies depending on the land use covers tributary to the BMP. This composite runoff factor, C, is determined using the following equation

$$C = 0.858 \cdot {I_f}^3 - 0.78 \cdot {I_f}^2 + 0.774 * I_f + 0.04$$

where the Impervious Fraction, I_f is obtained from Table 2-7 below.

Table 2-7: Impervious Fraction Based on Various Land Use Covers

Surface Type	Effective Impervious Fraction, I_f
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40

Where multiple surface types are present, a Composite Impervious Fraction, and therefore a Composite Runoff Factor can be calculated using the following equation:

$$I_{f\,composite} = \frac{\left[(I_f)_1 \cdot A_1\right] + \left[(I_f)_2 \cdot A_2\right] + [\ldots]}{A_T}$$

2.5.1.c) Design Capture Volume (DCV or V_{BMP})

The 2010 SMR MS4 Permit requires that all LID Retention BMPs, Other LID BMPs and Volume-Based Conventional Treatment BMPs be sized to address the volume of runoff from the Design Storm, referred to as

> NOTE
> The LID BMP Design Handbook (Exhibit C) includes calculation sheets that can be used to calculate and document the '**Design Capture Volume**,' and the **Design Flow Rate**. These should be documented as described in Section 3 herein.

the 'Design Capture Volume', or V_{BMP}. Use the LID BMP Design Handbook to calculate the DCV. For reference, the following equations are used by the LID BMP Design Handbook:

$$DCV = D_{85} \cdot C \cdot A_{TRIB}$$

Where:

DCV = Design Capture Volume (ft^3)

D_{85} = Design Storm depth (from Exhibit A)

C = Composite Runoff Factor (unitless, per 2.5.1.b)

A_{TRIB} = Area tributary to the BMP (acres, see Section 3.3)

2.5.1.d) Design Flow Rate (Q_{BMP})

For flow-based Conventional Treatment Control BMPs, use the LID BMP Design Handbook to calculate the design flow rate. For reference, the LID BMP Design Handbook is based on the rational method and uses the following equation:

$$Q_{BMP} = C \cdot i \cdot A_{TRIB}$$

Where:

Q_{BMP} = Design Flow Rate (cfs)

i = rainfall intensity (0.2 inches/hour)

C = Composite Runoff Factor (unitless, per 2.5.1.b))

A_{TRIB} = area tributary to the BMP (acres, see Section 3.3)

2.5.2. Hydromodification Hydrology

In addition to incorporating applicable LID BMPs to ensure water quality treatment of runoff, Users may be required to provide additional LID Principles, LID BMPs, or other Structural BMPs to manage Hydromodification.

2.5.2.a) Santa Margarita Region Hydrology Model

The 2010 SMR MS4 Permit states:

All PDPs must use continuous simulation to ensure that post-project runoff flow rates and durations for the PDP shall not exceed pre-development, naturally occurring, runoff flow rates and durations by more than 10% over more than 10% the length of the flow duration curve, from 10% of the 2-year runoff event up to the 10-year runoff event.

To comply with this provision, the Copermittees require Users to use the Santa Margarita Region Hydrology Model (SMRHM) to demonstrate compliance with the Hydrologic Performance Standard of the SMR HMP. The SMRHM is an integrated flow control sizing tool that performs continuous hydrologic simulations over the entire available rainfall record. The tool allows the User to size LID BMPs and match or reduce the flow duration curve of post-development to that of pre-existing, naturally occurring, conditions. Geomorphically significant flows that are embedded in SMRHM range from 10% of the 2-year runoff event up to the 10-year runoff event. The SMRHM is made available to Users at no cost.

Alternatively, the User may opt to develop its own model using publicly-available software, which performs continuous hydrologic simulation over the available period of rainfall record, consistent with the conditions set forth in Section 2.2.i of the SMR HMP. The use of a different model than SMRHM must receive prior approval from the Copermittee having jurisdiction over the PDP. User may also put forth other low-flow thresholds for individual PDPs, which will require site-specific justification, at the User’s expense. General guidelines on how to develop a site-specific low-flow threshold are provided in Appendix I of the SMR HMP.

Compliance with the Hydrologic Performance Standard of the SMR HMP does not constitute full compliance with the HMP Performance Standards. The Copermittees also require Users to demonstrate compliance with the Sediment Supply Performance Standard defined in Section 3.6 to fulfill the requirements.

2.6. REFERENCES AND RESOURCES

- *The Importance of Imperviousness* (Tom Scheuler, 1995)
  Site Planning for Urban Stream Protection, available from the Center for Watershed Protection)
- California Stormwater BMP Handbooks
  - Southern California LID Manual
  - *Urban Runoff Quality Management,* Water Environment Federation and American Society of Civil Engineers, 1998. ISBN 1-57278-039-8 ISBN 0-7844-0174-8.
  - *Stormwater Infiltration,* Bruce K. Ferguson, 1994. ISBN 0-87371-987-5

- Clean Water Act Section 402(p)
- 40 CFR 122.26(d)(2)(iv)(A)(2) – Stormwater Regulations for New Development
- *Restoring Streams in Cities* (Riley, 1998)
- *Stream Restoration: Principles, Processes, and Practices*
  (Federal Interagency Stream Restoration Working Group, 1998, revised 2001)
- *Municipal Handbook, Rainwater Harvesting Policies* (USEPA, 2008)
- *Green Roofs for Stormwater Runoff Control* (USEPA, 2009a)
- *Porous Pavements* (Ferguson, 2005)
- *Orange County WQMP and TGD, with errata, 2011*
- *CASQA LID Guidance Manual for Southern California*
- *RWQCB Water Quality Control Plan for the San Diego Basin (Basin Plan)*
- *Design Hansbook for Low Impact Development Best Management Practices,* Riverside County Flood Control and Water Conservation District, 2011.

Chapter 3

3.0 PREPARING PROJECT-SPECIFIC WQMPS

Step-by-step assistance to document compliance.

A Project-Specific WQMP is a document to demonstrate that a PDP complies with applicable requirements of the 2010 SMR MS4 Permit — to implement LID Principles and BMPs, manage Hydromodification, incorporate required Source Control BMPs, and provide for operation and maintenance of Structural BMPs.

ICON KEY

- ☞ Helpful Tip
- ✍ Submittal Requirement
- 1. Terms to Look Up
- 🕮 References & Resources

The Copermittees require a 'Project-Specific' WQMP for every PDP as described in Section 1.1. The Project-Specific WQMP must be submitted with the application for Discretionary Approvals (entitlements) and must have sufficient detail to ensure the stormwater design, site plan, and landscaping plan are congruent and will comply with the applicable LID and HCOC standards in the 2010 SMR MS4 Permit. Submitting a complete and thorough Project-Specific WQMP will facilitate quicker review and fewer cycles of review.

The procedure in this section is intended to facilitate, not substitute for, creative interplay among site design, landscape design, and drainage design. Several iterations may be needed to optimize your drainage design as well as aesthetics, circulation, and use of available area for the PDP site.

Structural BMPs should be planned and designed integrally with the site planning and landscaping for the PDP. It's best to start with general project requirements and preliminary site design concepts; then prepare the detailed site design, landscape design, and Project-Specific WQMP simultaneously. This will facilitate the development of a congruent site plan, landscape plan, grading plan and Project-Specific WQMP.

3.1. Assemble Project and Site Information

To perform the LID design, the designer needs to identify pertinent site and PDP characteristics, including information such as (but not limited to):

- Existing natural hydrologic features and natural resources, including any contiguous natural areas, wetlands, watercourses, seeps, or springs.
- Existing site topography, including contours of any slopes of 4% or steeper, general direction of surface drainage, local high or low points or depressions, and any outcrops or other significant geologic features.
- Zoning, including requirements for setbacks and open space.

- Soil types (including Hydrologic Soil Groups) and depth to groundwater, which may determine whether infiltration is a feasible option for managing site Runoff. Depending on site location and characteristics, and on the selection of Structural BMPs, site-specific information (e.g., from boring logs or geotechnical studies) may be required.
- Existing site drainage. For undeveloped sites, this should be obtained by inspecting the site and examining topographic maps and survey data. For previously developed sites, site drainage and connection to the MS4 can be located from site inspection, MS4 maps, and plans for previous development.
- Onsite Significant Sources of Bed Sediment and first order, or higher, channels, as defined in Section 2.3.i of the SMR HMP.
- Existing vegetative cover and impervious areas, if any.
- Project Design Features, including impervious surfaces, landscaped surfaces, parking lots, land uses, etc.

3.2. Optimize Site utilization (LID Principles)

Review the information collected in Section 3.1. Identify the principal constraints on site design as well as opportunities to reduce imperviousness and incorporate LID Principles into the PDP site and landscape design. For example, constraints might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations, or safety concerns. Opportunities might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which may be able to double as locations for LID Bioretention BMPs), and differences in elevation (which may provide hydraulic head).

Apply the following LID Principles to the layout of the PDP. Putting thought upfront about how best to organize the various elements of PDP site can help to significantly reduce the PDP's potential impact on the environment and reduce the number of Structural LID and/or Conventional Treatment BMPs that must be implemented. Analyze the preliminary PDP site layout concepts, and look for opportunities to accommodate the following LID Principles within the PDP site layout. Performing this analysis and optimizing the layout for LID will come in handy during the remaining steps.

3.2.1. Preserve Existing Drainage Patterns

Integrating existing drainage patterns into the site plan may facilitate maintaining the PDPs predevelopment hydrologic function. Preserving existing drainage paths and depressions will not only help maintain the time of concentration and infiltration rates of Runoff, decreasing peak flows, but may also help preserve the contribution of Bed Sediment Supply from the PDP to the Receiving Water. The best way to define existing drainage patterns may be to visit the site of the PDP during a rain event and to directly observe runoff flowing over the site. If this is not possible, drainage patterns may be inferred from topographic data, though it should be noted that depression micro-storage features are often not accurately mapped in topographic surveys. Analysis of the existing site drainage patterns during the site assessment phase of the PDP can help to identify the best locations for buildings, roadways, and Structural BMPs.

Minimize unnecessary site grading that eliminates small depressions, which may provide storage of small volumes of runoff. Where appropriate, add additional depression "micro" storage throughout the site's landscaping. This is referred to in Section 3.3 as 'self-retaining areas'. Mild gradients may be used to extend the time of concentration, which reduces peak flows and increases the potential for additional infiltration. While risk of serious flooding must be limited, the persistence of temporary "puddles" during storms may be beneficial to infiltration.

- Where possible, conform the PDP site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, and preserve or replicate the site's natural drainage features and patterns.
- Set back PDP improvements from creeks, wetlands, and riparian habitats.

- Use both existing and proposed site drainage patterns as a natural design element, rather than using expensive impervious conveyance systems. Use depressed landscape areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

3.2.2. Protect Existing Vegetation and Sensitive Areas

Identify any areas of the PDP containing dense native vegetation or well-established trees, and try to avoid disturbing these areas. Soils with thick, undisturbed vegetation have a much higher capacity to store and infiltrate Runoff than do disturbed soils. Reestablishment of a mature vegetative community may take decades. Sensitive areas, such as streams and floodplains should also be avoided.

- Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed.
- Establish setbacks and buffer zones surrounding sensitive areas.
- Preserve significant trees and other natural vegetation where possible.

3.2.3. Preserve Natural Infiltration Capacity

A key component of LID is taking advantage of a site's natural infiltration and storage capacity. A site survey and geotechnical investigation can help define areas with high potential for infiltration and surface storage. Identify opportunities to locate LID Principles and Structural BMPs in highly pervious areas. Doing so will maximize infiltration and limit the amount of runoff generated. Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.

3.2.4. Minimize Impervious Area

As discussed in Chapter 2, creation of impervious cover can be tied to potential environmental impacts due to runoff. Look for opportunities to limit impervious cover through identification of the smallest possible land area that can be practically impacted or disturbed during site development.

- Limit overall coverage of paving and roofs. This can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, clustering buildings and sharing driveways, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking.

- Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement, such as for overflow parking.

- Inventory planned impervious areas on your preliminary site plan. Identify where permeable pavements, such as crushed aggregate, turf block, permeable modular blocks, pervious concrete or pervious asphalt could be substituted for impervious concrete or asphalt paving. This will help reduce the amount of Runoff that may need to be addressed through Structural BMPs.

- Consider green roofs. Green roofs are roofing systems that provide a layer of soil/vegetative cover over a waterproofing membrane. A green roof mimics pre-development conditions by filtering, absorbing, and evapotranspiring precipitation to help manage the effects of an otherwise impervious rooftop. Green roofs with growing media four inches or deeper are considered 'self-retaining areas' as defined in Step 3, and do not produce increased Runoff or Runoff Pollutants (i.e., any Runoff from a green roof requires no further LID or Hydrologic Control BMPs).

3.2.5. Disperse Runoff to Adjacent Pervious Areas

Look for opportunities to direct Runoff from impervious areas to adjacent landscaping or other pervious areas. This is sometimes referred to as reducing Directly Connected Impervious Areas.

- Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. This is referred to as 'areas draining to self-retaining areas' in Section 3.3.

- Detain and retain Runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving.

- On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots.
- Reduce curb maintenance and provide for allowances for curb cuts.

3.3. Delineate Drainage Management Areas

The delineation of DMAs is key to successfully implementing your LID design. The procedure begins with:

1. Careful delineation of pervious areas and impervious areas (including roofs) throughout the site, and then;
2. Dividing the entire PDP site into individual, discrete DMAs.

Typically, lines delineating DMAs follow grade breaks and roof ridge lines. The exhibits, tables, text, and calculations in the Project-Specific WQMP will illustrate, describe, and account for runoff from each of the areas of the PDP.

Where possible, establish separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Assign each DMA a unique code and determine its size in *square feet*. The total area of your site should total the sum of all of your DMAs.

Next, determine how drainage from each DMA will be handled. Each DMA will be classified as one of the following four types:

A. Self-treating areas.

B. Self-retaining areas (also called "zero-discharge" areas).

C. Areas that drain to self-retaining areas.

D. Areas that drain to BMPs.

The first three types of DMAs: Self-Treating, Self-Retaining, and draining to Self-Retaining, are ways to account for successful implementation of the LID Principles discussed in Step 1. Areas addressed by LID Principles are self-managing and do not require any further management measures. Further, these areas will not require specialized Operation and Maintenance procedures, and can typically be maintained with normal landscape and site maintenance.

The fourth type of DMA is a way to document the specific areas within the site layout that require additional mitigation measures through LID BMPs.

As more LID Principles are implemented, more of the site will mimic natural processes and become self-managing, resulting in less area that must be managed through structural LID BMPs.

3.3.1. Type 'A': Self-Treating areas

Self-Treating Areas are those that meet the following criteria:

- Are either undisturbed from their natural condition, or restored with Native and/or California Friendly vegetative covers, AND
- Are irrigated, if at all, with appropriate low water use irrigation systems to prevent irrigation runoff.

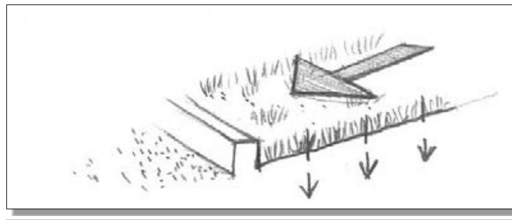


Figure 3-1: Self-Treating Areas

- Runoff from the area will not comingle with runoff from the developed portion of the site, or across other landscaped areas that do not meet the above criteria.

Examples include up-sloped undeveloped areas which are ditched and drained around a development, and landscaped areas (as described above) that drain offsite. Areas that do not meet the above criteria do not qualify as a Self-Treating Area. In general, Self-Treating Areas include no impervious areas, unless the impervious area is very small (e.g., 5% or less of the Self-Treating Area) and slopes are gentle enough to ensure Runoff from impervious areas will be absorbed into the vegetation and soil.

Table 3-1: Table for Documenting Self-Treating Areas (Type 'A' DMA)

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
A/1	*4,460*	*Undisturbed Natural*	*None*
A/2	*1,026*	*Native Low Water Use*	*Drip Irrigation*

Note: Example Data shown

3.3.2. Type 'B': Self-retaining Areas

Self-Retaining Areas are shallowly depressed 'micro infiltration' areas designed to retain the Design Storm rainfall that reaches the area, without producing any Runoff. The technique works best on flat, landscaped sites. It may be used on mild slopes if there is a reasonable expectation that design of the area will result in the Design Storm rainfall event producing no Runoff.

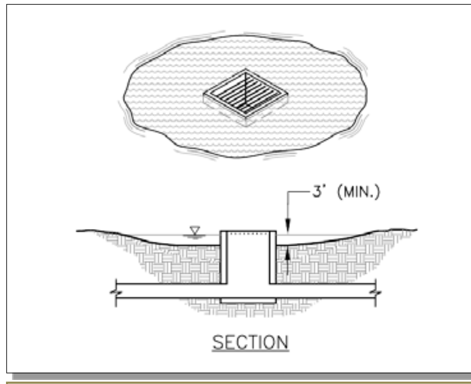


Figure 3-2 Self-Retaining Areas

To create Self-Retaining Areas in flat areas or on terraced slopes, either berm the area or depress the grade into a concave cross section so that there is a reasonable expectation that these areas will retain the Design Storm rainfall. Grade slopes, if any, toward the center of the pervious area.

Soils: Self-Retaining Areas are not recommended for soils that are not expected to be freely draining, so as not to create vector or nuisance conditions. Self-retaining areas within C or D soils must be constructed with appropriately amended soils to increase the shallow storage capacity of the soils such that surficial ponded water will not occur due to the design storm rainfall. All Self-Retaining Areas (regardless of soil type) should be protected during construction such that compaction is minimized or avoided entirely where possible. If compaction within a Self-Retaining area nevertheless occurs, the compacted surface must be re-tilled to a depth of at least six inches and amended as necessary to restore the infiltrative and storage capacity of the soil.

Inlet elevations of area/overflow drains, if any, should be clearly specified to be three inches or more above the low point to promote ponding. In setting elevations, account for mulch or other landscaping cover that could reduce available ponding depth. Construction documents must clearly specify the required elevation(s) of any overflow drain inlets.

Pervious pavements (e.g., crushed stone, porous asphalt, pervious concrete, or permeable pavers) can be self-retaining when constructed with a gravel base course four or more inches deep. This will ensure an adequate proportion of rainfall is infiltrated into native soils (including clay soils) rather than producing Runoff. Consult with a qualified (geotechnical) engineer regarding infiltration rates, pavement stability, and suitability for the intended traffic.

Drainage from green roofs is considered to be self-retained, however, an emergency overflow should be provided for extreme events. Drainage from green roofs should be routed to landscaping rather than being tied directly into MS4 facilities.

Table 3-2: Table for Documenting Self-Retaining Areas (Type 'B' DMAs)

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from table 3-3 = [C]	Required Retention Depth (inches) [D]
B/1	*Planter*	*604*	*0.8*	*C/1, C/2*	*1100+80 =1180*	*2.4*
B/2	*Pervious patio*	*2,149*	*0.8*	*C/3*	*1946*	*1.5*
B/3	*Planter*	*1677*	*0.8*	*N/A*	*N/A*	*0.8*

Note: Example Data shown

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

3.3.3. Type 'C': Areas Draining to Self-Retaining Areas

Runoff from impervious or partially pervious areas can be managed by routing it to Self-Retaining Areas consistent with the LID Principle discussed in Section 3.2.5 for 'Dispersing Runoff to Adjacent Pervious Areas'. For example, roof downspouts can be directed to lawns, and parking areas can be drained to landscaped areas.

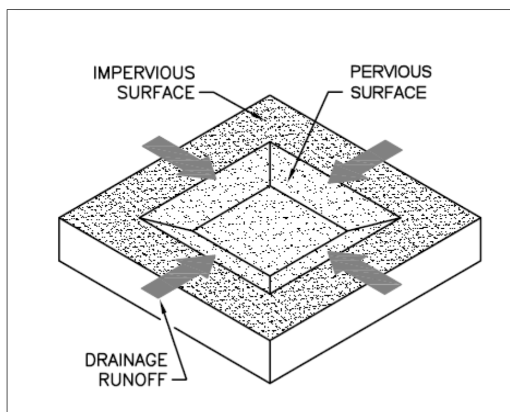


Figure 3-3: Areas draining to Self-Retaining Areas

For *impervious* areas such as pavements that drain to a nearby Self-Retaining Area, the maximum ratio, based upon past modeling efforts in California, is 2 parts impervious area for every 1 part pervious area.

For *partially* pervious areas draining to a Self-Retaining area the maximum ratio is:

$$\left(\frac{\mathbf{2}}{\boldsymbol{Impervious\ Fraction}}\right)\mathbf{:1}$$

(Tributary Area **:** Self-Retaining Area)

> **Special Case**
>
> If your self-retaining area is a **Permeable Pavement**, higher ratios than 2:1 can be used **IF** the pervious pavement is designed in accordance with the LID BMP Design Handbook or other standard approved by the Copermittee with jurisdiction over the project site. In this case, the area draining to the pavement will be considered a **Type D DMA** (area draining to a BMP).

Where the Impervious Fraction is obtained from Section 2.5.1.b).

The drainage from the tributary area must be directed to and dispersed within the Self-Retaining Area, and the area must be designed to retain the entire Design Storm runoff without flowing offsite. For example, if the ratio of 2 parts impervious area into 1 part pervious area is used, and the Design Storm is one inch, then the pervious area must absorb three inches of water over its surface before overflowing to an offsite drain (one inch of rainfall for the Self-Retaining Area itself, plus one inch for each of the 2 parts of tributary impervious area).

Prolonged ponding is a potential problem at higher impervious/pervious ratios. In your design, ensure that the pervious area soils can handle the additional run-on and are sufficiently well-drained, and/or amended as described in Section 3.3.2.

Table 3-3: Table for Documenting Areas Draining to Self-Retaining Areas (Type 'C' DMAs)

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
C/1	*1100*	*Roof*	*1*	*1100*			
C/2	*800*	*Pervious Walkway*	*0.1*	*80*			
				1180	*B/1*	*604*	*1.95 < 2*
C/3	*1946*	*Driveway*	*1*	*1946*	*B/2*	*2,149*	*0.91 < 2*

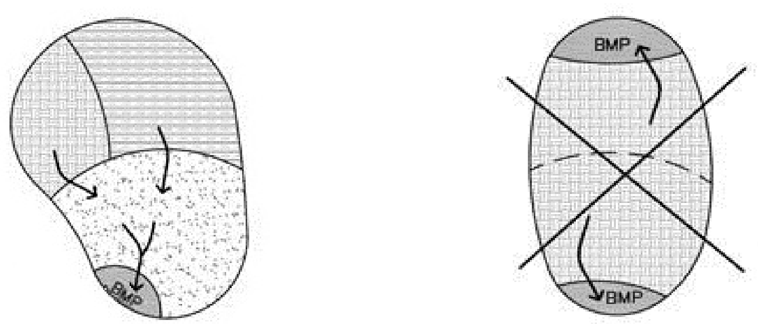
Note: Example Data shown

3.3.4. Type 'D': Areas Draining to BMPs

Areas draining to BMPs are those that could not be fully managed through LID Principles (DMA Types A through C) and will instead drain to a LID BMP and/or a Conventional Treatment BMP designed to manage water quality impacts from that area, and Hydromodification where necessary.

More than one DMA can drain to a single LID BMP, however, one DMA may not drain to more than one LID BMP. See Figures 3-4.

Where possible, design site drainage so only impervious roofs and pavement drain to LID BMPs. This yields a simpler, more efficient design, with minimized LID BMP requirements, and also helps protect LID BMPs from becoming clogged by sediment.



More than one DMA can drain to a single BMP.

One DMA cannot drain to multiple BMPs

Figure 3-4: Drainage from Multiple DMAs

Table 3-5, Example Format for Determining the Required DCV for BMPs, is discussed in Section 3.4.3.

3.4. Implement LID BMPs

Type 'D' DMAs draining to BMPs, as defined in Section 2.3.4, must be addressed using LID BMPs according to the prioritization discussed in Section 2.3.2.

> **Special Note**
> The User may distinguish the four types of DMAs ('A', 'B', 'C', and 'D'), which identifies the type and magnitude of LID principles incorporated into the site drainage, from the Hydrologic Soil Group Types (A,B,C, and D), which designate the minimum rate of infiltration obtained for bare soil after prolonged wetting.

3.4.1. LID BMP Selection

3.4.1.a) LID Infiltration BMP Assessment

An assessment of the feasibility of utilizing LID Infiltration BMPs is required for all Development Projects, except *w*here it can be shown that Harvest and Use BMPs can and will be implemented to address the DCV (see the Harvest and Use assessment below).

A site-specific evaluation of the feasibility of LID Infiltration BMPs must at minimum incorporate consideration of the criteria identified in Section 2.3.4. If one or more of the infiltration criteria indicate that LID Infiltration BMPs are not feasible for the PDP site, the other remaining infiltration criteria do not need to be assessed.

3.4.1.b) LID Harvest and Use BMP Assessment

An assessment of the feasibility of implementing harvesting and use BMPs is required for all PDPs, *except:*

- Where reclaimed water will be used for the non-potable water demands for the PDP, or where downstream water rights may be impacted by Harvest and Use (see Harvest and Use discussion in Chapter 2).

- Where it can be shown that the LID design can reliably provide for infiltration or evapotranspiration of the DCV (see the infiltration assessment below). In such a case, Harvest and Use BMPs can still be implemented for the DCV if desired, but it would not be required if the DCV will be infiltrated or evapotranspired.

If neither of the above criteria applies, follow the steps below to assess the feasibility of:

- Irrigation use
- Toilet use
- Other non-potable uses (i.e., industrial use)

☞ NOTE: It is important to note that harvested water demand calculations differ in purpose and methods from water demand calculations done for water supply planning. When designing harvest and use systems for stormwater management, a reliable method of quickly regenerating storage capacity (i.e., using water) must exist to provide storage capacity for subsequent storms. Therefore, demand calculations for LID Harvest and Use BMPs should attempt to estimate the actual demand that is reliably present to drain stormwater cisterns during the wet season, additionally considering that during a short time frame (a week to a couple of weeks) a series of storms may occur. This objective is fundamentally different from the objectives of water demand forecasting calculations done for water supply planning, which may err toward higher estimates of demand to provide conservatism to account for uncertainty. Harvested water demand calculations used to determine the feasibility of LID Harvest and Use BMPs must be based on estimates of actual expected demand that are reliably present to drain the cistern/vault during the wet season.

To assess the feasibility of implementing Harvest and Use BMPs, complete the following steps:

1. Document the following potential demands for the site, as applicable:

   a. ***The total area of irrigated landscape.*** It will be necessary to determine the type of landscaping that will be implemented on the site. For the purposes of this assessment, landscaping will either be a 'Conservation Design' (low water use, native species, etc.), or 'Active Turf areas' (higher water use, ornamental species such as conventional sod). Determine the irrigated landscape area in acres.

   b. ***The expected number of toilet users.*** This should be based on the average number of daily toilet users (building occupants) during the Wet Season and should account for any periodic shut downs/lapses in occupancy (e.g., for vacations, maintenance, or other reasons). This requires close coordination with the project architect to accurately reflect the number of daily users.

c. ***Other non-potable water demands.*** Identify any other onsite non-potable demand (in gallons per day) that is anticipated on an *average daily basis* during the Wet Season. Sources of demand should only be included if they are reliably and consistently present during the Wet Season.

2. Identify the planned ***total of all impervious areas*** on the proposed Development Project from which Runoff might be feasibly captured and stored. Depending on the configuration of buildings and other impervious areas on the PDP site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing Runoff and directing the stored Runoff from the potential use(s) identified in Step 1 above. Identify the total impervious area in acres.

3. Enter the Design Storm depth for the PDP site (see Exhibit A) into the left column of Tables 2-1 through 2-3 in Section 2.3.5 to determine, respectively: a) the minimum number of toilet users per tributary impervious acre, b) the minimum square footage of effective irrigated area per tributary impervious acre, and c) the minimum demand for other non-potable uses per tributary impervious acre.

4. Multiply the unit values obtained from Step 3 by the total of impervious areas from Step 2, to develop the minimum demand that would be required for the various forms of LID Harvest and Use BMPs to be feasible on the PDP. Then compare minimum demand values to the anticipated demands identified in Step 1.

   ☞ If any of the anticipated demands exceed the applicable minimum values, LID Harvest and Use BMPs are feasible for that demand type.

   ☞ If all of the anticipated demands are less than the applicable minimum values, LID Harvest and Use BMPs are not required, however, other LID Retention BMPs, such as infiltration must be assessed and where applicable used – before LID Biotreatment BMPs can be used.

3.4.1.c) LID BMP Selection Matrix

Once the above assessments for LID Infiltration and Harvest and Use BMPs have been completed, the following table can be used to determine the applicable LID BMPs for the PDP site. Refer to Table 3-4 below for determining LID BMPs that may be applicable to the PDP.

Table 3-4: LID BMP Selection Matrix

LID BMP Type	Are LID Retention BMPs Feasible?		
	Yes	**No**, but 'Other LID BMPs' are feasible, and	
		0.3"/hr. < K_{SAT} < 1.6"/hr.	K_{SAT} < 0.3"/hr.
Harvest and Use	✓(A)		
Infiltration	✓(B)		
Permeable Pavement	✓(C)		
Bioretention	✓(D)	✓(E)	✓
Biotreatment			✓

Notes for Table 4-5:

(A): LID Harvest and Use BMPs may be used where it can be shown that there is sufficient demand for harvested water. See Sections **LID Harvest and Use Feasibility Criteria** and **LID Harvest and Use BMP Assessment 3.4.1.b)**..

(B): LID Infiltration BMPs may be used in locations where the tested infiltration rate of underlying soils is at least 1.6 in. per hour and no restrictions on infiltration apply to these locations. See Sections **LID Infiltration Feasibility Criteria and LID Infiltration BMP Assessment 3.4.1.a)**.

(C) Permeable Pavement is a form of LID Infiltration BMP. However, when designed with a 2:1 ratio of impervious area to pervious pavement areas, or less, permeable pavement is considered a self-retaining area, and is not considered a LID BMP for the purposes of this table. This table focuses on the 'special case' included in the Section **3.3.3**, where a project proponent can choose to design the pervious pavement as a LID BMP in accordance with an approved design, such as the LID BMP Design Handbook, and perform any necessary infiltration testing; and in return drain additional impervious area onto the pervious pavement beyond the 2:1 ratio.

(D) As discussed in Section 2.3.3., in well drained soils, water captured in LID Bioretention BMPs can be fully retained via infiltration and evapotranspiration.

(E) In this range of infiltration rates, LID Bioretention BMPs will be more reliable than LID Infiltration BMPs, but will still infiltrate and evapotranspire captured runoff to the maximum extent feasible based on in-situ actual characteristics.

3.4.2. Laying out LID BMPs on the PDP site

Finding the right location for LID BMPs on the PDP site involves a careful and creative integration of several factors:

- To make the most efficient use of the site and to maximize aesthetic value, integrate LID BMPs with site landscaping. Many local zoning codes may require landscape setbacks or buffers, or may specify that a minimum portion of the site be landscaped. It may be possible to locate some or all LID BMPs within this same area, or within utility easements or other non-buildable areas.

- Use permeable pavements wherever possible. These pavement systems are not only aesthetically pleasing but they also minimize the amount of runoff that needs to be treated.

- LID Bioretention BMPs must be level or nearly level all the way around. When configured in a linear fashion (similar to swales) LID Bioretention BMPs may be gently sloped end to end, but opposite sides must be at the same elevation. BMPs on steeper slopes must be terraced or provided with check dams.

- For effective, low-maintenance operation, locate LID BMPs so drainage into and out of the device is by gravity flow. Many LID BMPs require three feet or more of hydraulic head.

- LID BMPs require excavations three or more feet deep, which can conflict with underground utilities.

- If the property is being subdivided now or in the future, the BMP should be in a common, accessible area. In particular, avoid locating LID BMPs on private residential lots. Even if the LID BMP will serve only one site owner or operator, make sure the BMP is located for ready access for inspection by the Copermittee with jurisdiction over the project site and the local mosquito and vector control agency. The goal is to ensure that LID BMPs are maintained and functional, to assure a properly functioning maintenance mechanism since the ability of individual homeowners to provide maintenance is variable, and to avoid residential property rights issues for inspections and verifications. While the specific maintenance mechanism will be provided on a project by project basis, many Copermittees are pursuing methods to allow residential LID BMPs to be maintained by a public entity. Maintenance via a public maintenance mechanism will require BMPs to be located in common areas and not in individual lots.

- The LID BMP must be accessible to equipment needed for its maintenance. Access requirements for maintenance will vary with the type of BMP selected. LID Bioretention BMPs will typically need access for the same types of equipment used for landscape maintenance.

Document site layout and site design decisions in the Project-Specific WQMP. This will provide background and context for how the design meets the quantitative LID

BMP design criteria. Once the LID BMPs have been laid out, calculate the square footage set aside on the site plan for each BMP.

3.4.3. Calculate Minimum LID BMP Sizes

LID BMPs must at minimum be sized to address the DCV. LID BMPs can be additionally sized and configured to meet Hydromodification Criteria described in Section 3.6, if applicable.

3.4.3.a) Design Capture Volume

Appendix F of the LID BMP Design Handbook contains worksheets that can be used for calculating the required DCV (aka V_{BMP}) for LID BMPs. The User may also compute V_{BMP} and Q_{BMP} using the LID BMP interface of SMRHM. Refer to the SMRHM Guidance Document (Appendix G of SMR HMP) for complementary information).

If neither the worksheet nor the LID BMP interface of SMRHM are used, your calculations should be in tables using the following format:

Table 3-5: Example Format for Determining the Required DCV for BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$[A]				Σ= [D]	[E]	[F] $= \frac{[D]x[E]}{12}$	[G]

[B], [C] are obtained as described in Section 2.5.1.b)
[E] is obtained from Exhibit A
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook. Maintain a completed design procedure sheet for each LID BMP.

3.4.3.b) Hydromodification

The User should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in Section 3.6. The User may consider the following in identifying the Hydrologic Control BMPs for incorporation in the design of the PDP:

- LID principles as defined in Section 3.2;
- Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV;
- Structural Hydrologic Control BMPs are distinct from the LID BMPs. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID and Hydromodification requirements. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

LID principles, structural LID BMPs, and structural Hydrologic Control BMPs can each be modeled in the SMRHM.

Refer to Section 3.6 to determine if the PDP is subject to the HMP Performance Standards, and Section 2.5.2 for acceptable methodologies to demonstrate compliance with the Hydrologic Performance Standard.

3.4.4. Specify Design Details

Preliminary design details sufficient to demonstrate that the area, volume, and other criteria of each can be met within the constraints of the PDP site are required in the preliminary Project-Specific WQMP.

The final Project-Specific WQMP and the construction and grading plans will need to include final design details consistent with your approved preliminary Project-Specific WQMP. These final details must demonstrate that the required DCV, potential HMP Performance Standards, and any other requirements specified by the Copermittee with jurisdiction over the project site, have been met. Ensure these details are consistent with preliminary site plans, landscaping plans, and architectural plans submitted with your application for planning and zoning approvals.

The User may elect to use SMRHM to select and design LID BMPs and Hydrologic Control BMPs, where required, selection and design of Hydrologic Control BMPs is an iterative process that can be facilitated using the SMRHM. The SMRHM has a comprehensive menu of site design LID BMPs and Hydrologic Control BMPs that can be selected for PDPs. The design standards for these Hydrologic Control BMPs have been pre-incorporated into SMRHM and can be modified to an extent based on site constraints. The User must verify that the design details of LID BMPs and Hydrologic Control BMPs defined in SMRHM are consistent with the BMP standards set forth in the LID BMP Design Handbook.

The LID BMP Design Handbook includes standard configurations, details and sizing calculator worksheets that are available for the LID BMPs referenced in this WQMP. Check with the Copermittee with jurisdiction over the project site to determine if this or alternative standards should be used for your PDP. The information in the LID BMP Design Handbook is designed to address the DCV and includes alternative designs and sizes for managing Hydromodification.

The planning, building, and public works officials of the Copermittee with jurisdiction over the project site have final review and approval authority over the project design.

3.4.5. Determine if BMP Area and Volume are Adequate

Sizing and configuring BMPs is typically an iterative process. After specifying the preliminary design details as described in Section 3.4.4, review the site plan to determine if the reserved BMP locations are sufficient for each of the LID BMPs.

If so, the planned BMPs will meet the WQMP sizing requirements for water quality.

If not, revise the plan accordingly. Revisions may include:

- Reducing the overall imperviousness of the PDP site. For example, consider incorporating additional permeable pavements to reduce the imperviousness of the site.
- Changing the grading and drainage to redirect some Runoff toward other BMPs which may have excess capacity.

- Making tributary landscaped DMAs self-treating or self-retaining (may require changes to grading).
- Expanding BMP surface area.
- Revision to the square footage of a BMP typically requires a corresponding revision to the square footage of the surrounding or adjacent DMA.
- The Hydromodification Performance Standards described in Section 3.6 are separate and additional standards that must be met by applicable PDPs. Even if the PDP has demonstrated compliance with the DCV standard, such Development Projects may need to implement additional and/or larger BMPs to meet the Hydromodification Performance Standards.

Section 3.5 describes alternative compliance measures that can be implemented if it has been demonstrated that it is technically infeasible to address all required Type 'D' DMAs with LID BMPs.

3.4.6. Unpaved Roads

If the PDP includes unpaved roads, ensure that appropriate erosion and sediment control BMPs are incorporated to manage runoff and erosion during the post-construction life of the unpaved roads. At a minimum, the BMPs must include the following or alternative BMPs that are equally effective:

- Practices to minimize road related erosion and sediment transport;
- Grading of unpaved roads to slope outward where consistent with road engineering safety standards;
- Installation of water bars as appropriate; and
- Unpaved roads and culvert designs that do not impact creek functions and where applicable, that maintain migratory fish passage.

3.5. Document any Alternative Compliance Measures (LID Waiver Program)

As discussed in Section 2.3.6, LID BMPs are expected to be feasible on virtually all PDPs. Where LID BMPs have been demonstrated to be infeasible, a LID waiver must be granted by the Copermittee with jurisdiction over the project site, and the minimum alternative compliance measures described in this section must be implemented for the remaining Type D DMAs not addressed with LID BMPs.

3.5.1. LID Waiver

If you believe specific conditions on your site preclude the use of LID, you must submit, in the Project-Specific WQMP, a detailed site-specific examination and demonstration that implementation of other LID BMPs (as discussed in Sections 2.3.2 and 2.3.6) is infeasible. A site-specific determinations must be approved by the Copermittee with jurisdiction over the PDP site. Some Copermittees may require that the determination be performed by a Professional Civil Engineer registered in the State of California

- If a site-specific infeasibility determination for Other LID BMPs will be submitted, it is highly recommended to discuss this with the Copermittee with jurisdiction over the project site early on, as such site-specific determinations are expected to be highly scrutinized and LID Waivers are only granted in truly extenuating circumstances.
- If a Copermittee grants a LID Waiver from implementation of LID BMPs for particular DMAs:
    - LID BMPs are required to be used for all other DMAs where LID is feasible.
    - Other Conventional Treatment Control BMPs approved by the Copermittee with jurisdiction over the project site must be implemented, and the pollutant loads expected to be discharged due to not implementing LID Retention BMPs must be fully managed, as described in Sections 3.5.2 through 3.5.5.

3.5.2. Identify Priority Pollutants of Concern

The first step to identifying adequate alternative compliance measures is to identify the specific pollutants generated by the PDP that are also impairing the downstream receiving waters, referred to as 'Priority Pollutants of Concern'. Follow the process identified in Section 2.2.4 to identify the Priority Pollutants of Concern for your project.

3.5.3. Required Pollutant Load Mitigation

All projects participating in the Alternative Compliance Program must fully manage the Pollutant loads for the Priority Pollutants of Concern that are expected to be discharged due to not implementing LID Retention BMPs. Table 3-6 below provides estimated Pollutant concentrations that may be associated with various land use types, and has been compiled based on a study performed by the Southern California Coastal Water Research Project (SCCWRP) in the Los Angeles area watersheds (SCCWRP, TR510), assessments performed by the County of Los Angeles, and the National Stormwater Quality Database. However, there is currently insufficient data to accurately model land use wash-off rates for all potential Priority Pollutants of Concern that may potentially be discharged from development land uses in Southern California. Accordingly, Total Suspended Solids (TSS) should be used as a surrogate for any Priority Pollutants of Concern that are not identified in Table 3-6.

Table 3-6: Potential Untreated Median Concentration of Stormwater Runoff from Various Land Use Categories

Constituent	Residential	Commercial	Industrial	Transportation	Open Space
Sediments					
TSS (mg/L)	100	18	74	50	134
Pathogens					
Fecal Coliform (mpn/100 mL)	55426	22291	39595	2500	25565
Nutrients					
NH3 (mg/L)	0.25	0.25	0.26	0.14	0.05
N02+NO3 (mg/L)	0.51	0.50	0.58	0.45	0.99
Phos., total (mg/L)	0.32	0.28	0.30	0.32	0.05
Metals					
Cadmium, total (µg/L)	Non-detect	0.50	Non-detect	0.50	Non-detect
Chromium, total (µg/L)	Non-detect	2.5	2.5	2.5	Non-detect
Copper, total (µg/L)	18	17	33	39	8.0
Iron, total (µg/L)	546	587	600	512	233
Lead, total (µg/L)	8.0	4.0	19	2.5	1.0
Manganese, total (µg/L)	Non-detect	Non-detect	Non-detect	Non-detect	50
Zinc, total (µg/L)	103	156	550	218	23

Notes: TSS, fecal coliform, copper, lead, zinc data from Stein et al (2007), except for Transportation category data. Other data from County of L.A. monitoring data (http://dpw.lacounty.gov/wmd/NPDES/IntTC.cfm), except for Transportation fecal coliform which is from the National Stormwater Quality Database (Pitt and Maestre, 2005).

As discussed in Section 2.3.3, LID Retention BMPs sized to capture the runoff from the 85th percentile 24-hour storm, retain, on average, 80% of the long term runoff volume.

Therefore, to provide equivalent Pollutant load reduction as LID Retention BMPs, management measures must reduce 80% of the Pollutant loads identified in Table 3-6 above for TSS (at minimum), and additionally any other Pollutant that is identified as a Priority Pollutant of Concern for which data is available.

3.5.4. Stormwater Credits

Certain types of development practices may provide broad scale environmental benefits to communities, which will reduce overall Pollutant loadings into Receiving Waters. For example, a PDP that will redevelop a brownfield site could reduce discharges of legacy Pollutants into Receiving Waters and/or groundwater. Section 101 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601) defines "brownfield site" as real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Alternatively, a transit-oriented development would reduce car trips, which also reduces Pollutant loadings.

3.5.4.a) Applying Water Quality Credits

The following water quality credits have been established for particular smart growth project categories. To determine the amount of credit a project would qualify for, the first step is to calculate the Pollutant loads that would need to be managed as described in Section 3.5.3. Any credits shown in Table 3-7 below would then be taken as a reduction to this required mitigation.

Table 3-7: Water Quality Credits for Applicable PDP Categories

PDP Category	Water Quality Credit
Redevelopment Projects that reduce the overall impervious footprint of the existing project site	*Percentage of site imperviousness reduced*
Historic district, historic preservation area, or similar areas	*10%*
Brownfield redevelopment	*25%*
Higher density development, 7 units/acre or more	*5%*
Higher density development, vertical density	*20%*
Mixed use development, transit oriented development or live-work development	*20%*
In-fill development	*10%*
[1] *Maximum total of water quality credits for a project is 50%*	

If more than one category applies to a particular PDP, the credit percentages would be additive. Applicable performance criteria depend on the number of LID water quality credits claimed by the proposed PDP. Water quality credits can be additive up to a 50% reduction (50% reduction maximum) from a proposed PDP's obligation for sizing Conventional Treatment Control BMPs, contributing to an urban runoff/mitigation fund, or offsite mitigation projects. The volume credit would be calculated as the DCV of the proposed condition multiplied by the sum of the percentages claimed above.

3.5.5. Conventional Treatment Control BMPs

Conventional Treatment Control BMPs are typically proprietary devices that provide treatment mechanisms for Pollutants in runoff, but do not reduce the volume of runoff.

3.5.5.a) Selection and Sizing of Conventional Treatment Control BMPs

Conventional Treatment Control BMPs must be implemented and sized to meet the following criteria:

- At minimum, all Conventional Treatment Control BMPs must be sized to address the DCV or the Design Flow Rate, as applicable to the BMP type, as described in Section 2.5.1. Document minimum size of the Conventional Treatment Control BMPs in the Project-Specific WQMP using the table below.

Table 3-8: Example Format for Conventional Treatment Control BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*DCV or Design Flow Rate (cubic feet or cfs)*	*Minimum DCV, adjusted for any Water Quality Credits (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[H]

[B], [C] are obtained as described in Section 2.5.1.b)
[E] is obtained from Exhibit A
[G] for Flow-Based Treatment BMPs [G] = 43,560, for Volume-Based Treatment BMPs, [G] = 12.
[H] = [F], reduced by the project's total water quality credit percentage.

- Additionally, the onsite or offsite BMPs must fully manage the required pollutant loads as calculated from Sections 3.5.3 and 3.5.4. Meeting this standard may require additional or larger Conventional Treatment Control BMPs to be incorporated into the design, or the construction of / participation in an offsite mitigation project, if available.

- Pollutant load removal efficiencies of any selected Conventional Treatment Control BMP must be substantiated by independent third-party 'in-situ' testing of the specific Conventional Treatment Control BMPs being considered, such as provided on the references included in the BMP Performance Report Library, located at:

  http://rcflood.org/NPDES/BMPPerformance.aspx

Document that all Type D DMAs that have not been addressed using LID BMPs have been fully managed with Conventional Treatment Control BMPs and any additional onsite or offsite mitigation in the Project-Specific WQMP as described above.

3.6. Address Hydromodification

Section 3.6 identifies the critical questions and steps that the User must fulfill to meet the HMP requirements, defined as HMP Performance Standards in the SMR HMP. The SMR HMP serves as the supporting document to the outlined methodology; the User may refer to the SMR HMP for complementary information to that described in this section. The major steps to be fulfilled include:

- Identify if the project is subject to the HMP Performance Standards;
- Understand the HMP Performance Standards;
- Incorporate Hydrologic Control BMPs and Sediment Supply BMPs, where required

3.6.1. Projects Subject to HMP Performance Standards

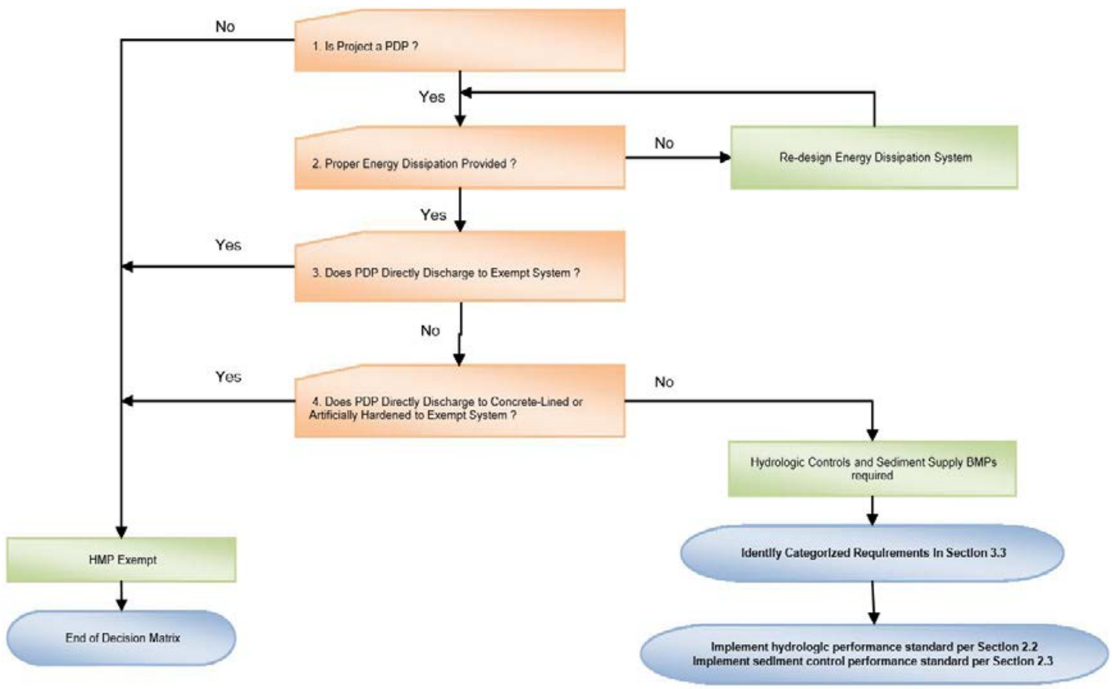
If the User determines that a Project-Specific WQMP based on the conditions described in Section 1.1, the User may use the Decision Matrix (Figure 3-5) to determine if the PDP is subject to HMP Performance Standards. Non-Priority Projects, as identified in Section 1.1, are exempt from HMP requirements. Other exemptions may be granted under each of the following conditions:

- If the project is not classified as PDP per Section 1.1;
- If the PDP discharges runoff directly to an exempt river reach, or an exempt reservoir (Vail Lake, Skinner Lake). Or if the PDP discharges to a concrete-lined or artificially hardened channel that exetends to an exempt river reach or reservoir, as defined in Section 3.2.i of the SMR HMP;
- If the PDP discharges to a large river large river as defined in Section 3.2.ii of the SMR HMP.

It should be noted that all PDPs are subject to the 2010 SMR MS4 Permit's LID and water quality treatment requirements even if Hydrologic Control BMPs and Sediment Supply BMPs are not required.

In addition, the User should note that properly designed energy dissipation systems are required for all project outfalls to unlined channels (See Section 3.6.6). The User should refer to the HMP Decision Matrix in Figure 3-6 to identify if the project is subject to the requirements of the HMP.

Figure 3-5: HMP Decision Matrix



3.6.2. HMP Performance Standards

PDPs that are subject to HMP requirements must demonstrate compliance with the HMP Performance Standards, consisting of the Hydrologic Performance Standard and the Sediment Supply Performance Standard.

The Hydrologic Performance Standard consists of matching or reducing the flow duration curve of post-development conditions to that of pre-existing, naturally occurring conditions, for the range of geomorphically significant flows (10% of the 2-year runoff event up to the 10-year runoff event). The Sediment Supply Performance Standard consists of maintaining the pre-project Bed Sediment supply to the channel receiving runoff from the project site (Receiving Channel).

HMP Performance Standards are also applicable to those PDPs that are unable to implement flow duration controls onsite or via a regional or sub-regional BMP that accepts discharges from the project, but is located outside of the project boundaries, but seek compliance through offsite Hydrologic Control BMP projects. The offsite Hydrologic Control BMP project must be capable of matching or reducing the equivalent flow duration curves from the PDP.

In addition, the HMP offers an alternate Hydrologic Performance Standard to those PDPs that are unable to implement flow duration matching onsite and offsite, only if the infeasibility is demonstrated and documented to the Copermittee with jurisdiction over the project site. The alternative Hydrologic Performance Standard consists of implementing projects to restore or rehabilitate channels with historic Hydromodification that are tributary to documented low or very low Index of Biotic Integrity scores. The performance equivalency of a restoration project must be demonstrated to the Copermittee.

To obtain approval from the Copermittee with jurisdiction over the project site, PDPs must either meet both the Hydrologic Performance Standard and the Sediment Supply Performance Standard OR qualify for the alternate performance standard.

3.6.3. Hydrologic Performance Standard Compliance *F.1.h.(1)*

The User must design and implement onsite Hydrologic Control BMPs to meet the Hydrologic Performance Standard. Hydrologic Control BMPs must be sized to mitigate flow rates and durations from the post-development condition to the Permit standards. As identified in Section 2.5.2, the User is required to use the SMRHM tool, which is an HSPF model overlaid with an interactive and user-friendly interface, to demonstrate compliance with the Hydrologic Performance Standard. A manual to this tool, the SMRHM Guidance Document (Appendix G of the SMR HMP), describes the specifics and functionality of the SMRHM and is available to all Users at no cost.

The User should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in this section. The intent of this WQMP is not to specify the types of Hydrologic Control BMPs that can be used but rather identify the criteria that must be met, allowing flexibility for PDPs to use the full suite of BMPs to meet the Hydrologic Performance Standard. The User may consider the following in identifying the Hydrologic Control BMPs for incorporation in the design of the PDP:

- LID principles as defined in Section 3.2;

- Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV;

- Structural Hydrologic Control BMPs are distinct from the LID BMPs. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID requirement and Hydrologic Performance Standard. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

LID principles, structural LID BMPs, and structural Hydrologic Control BMPs can be modeled in the SMRHM. SMRHM can be employed by the User not only to meet the Hydrologic Performance Standard, but also to meet the LID requirements. SMRHM incorporates additional BMPs that may be investigated by the User. For example, buffer zones for those PDPs adjacent to channels can be modeled and sized the meet the Hydrologic Performance Standard.

3.6.3.a) HMP Waiver Program F.1.h.(3)

For some PDPs, the implementation of onsite Hydrologic Control BMPs may not be feasible due to site constraints. A technical feasibility study is required to provide technical justification as to why onsite Hydrologic Control BMPs cannot be incorporated into the PDP. The technical feasibility study will be submitted to the Copermittee with jurisdiction over the project site for review as part of the Preliminary Project-Specific WQMP. The feasibility analysis for both Hydrologic Control BMPs and LID BMPs will be integrated into one technical feasibility study for the PDP and submitted with the Preliminary Project-Specific WQMP.

The technical feasibility study should:

- Provide a narrative regarding the applicability of LID principles onsite as described in Section 3.2;

- Evaluate the feasibility of infiltration to capture partially or in its entirety the DCV based on the presence of either low infiltrating soils or high groundwater level, proximity to a water well or a contaminated plume, or a geotechnical report precluding effective and safe infiltration, consistent with the conditions set forth in Section 2.2.3;

- Evaluate the feasibility of harvest-and-use BMPs based on local water demands, consistent with the conditions set forth in Section 2.2.4;

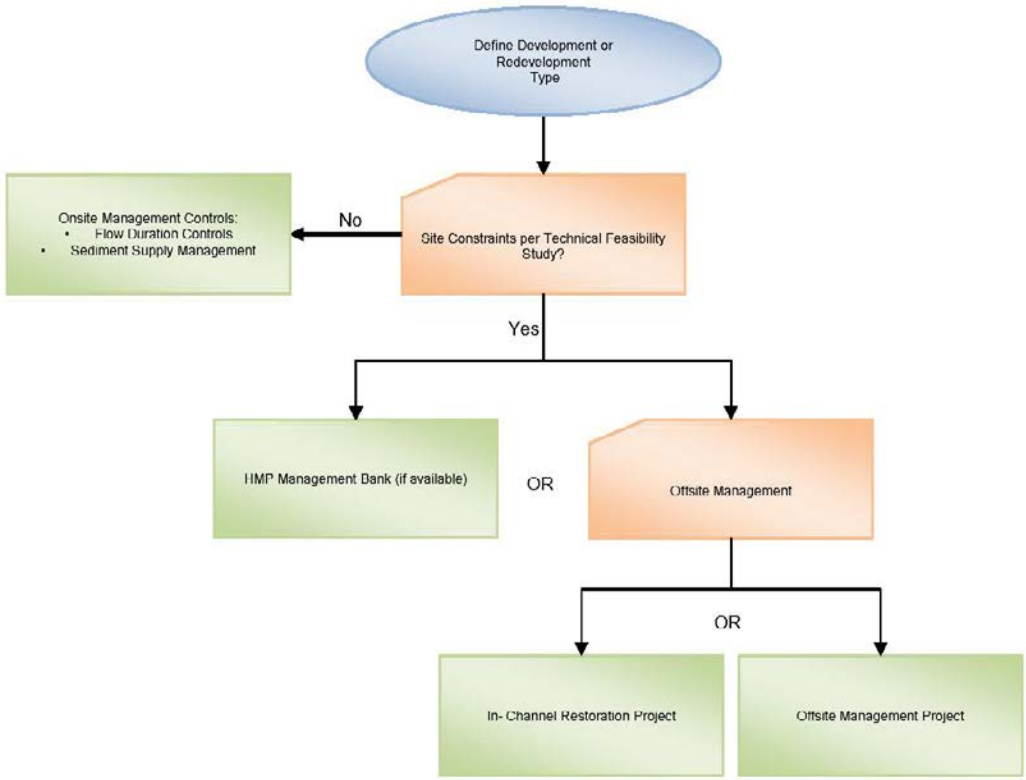
- Evaluate the feasibility of implementing detention or retention BMPs onsite based on critical geotechnical considerations such as collapsible soil, expansive soil, slopes, liquefaction and other factors identified by a registered Geotechnical Engineer that may prohibit the detention of large volumes of runoff. The feasibility to implement Hydrologic Control BMPs and meet the Hydrologic Performance Standard onsite may be principally dictated by the geotechnical considerations.

There are two alternative compliance options for PDPs that cannot implement onsite Hydromodification Control BMPs. The User may identify and construct off-site Hydrologic Control BMPs within the same channel system as the PDP; or implement an in-channel restoration project for the Receiving Channel.

The SMR HMP includes the additional option of participating into a HMP Management Bank that will develop regional HMP BMP projects where PDPs can buy HMP management credits. The User may only pursue this option if an HMP Management Bank is available to the PDP. The User should consult with the Copermittee with jurisdiction over the project site to determine an HMP Management Bank is available.

The decision matrix that Users should follow to meet the Hydrologic Performance Standard is presented in Figure 3-7.

Figure 3-6: Hydrologic Performance Standard – Decision Matrix



3.6.3.b) *Off-Site Mitigation*

For those PDPs where the technical feasibility study demonstrating the infeasibility of onsite Hydrologic Control BMPs has been approved by the Copermittee with jurisdiction over the project site, Users have the option to either (a) implement an offsite Hydrologic Control BMP project within the Receiving Channel, or (b) implement an in-channel restoration project for the Receiving Channel. The process for these two options is detailed hereafter.

Option a(1) - Implement offsite Hydrologic Control BMP projects within the Receiving Channel

In choosing this option, the PDP must investigate potential locations for implementation of an offsite Hydrologic Control BMP project within the Receiving Channel. If the User demonstrates that an offsite Hydrologic Control BMP project is not feasible in the Receiving Channel, then an offsite Hydrologic Control project in the same Hydrologic Unit as the PDP may be approved. The offsite Hydrologic Control BMP project must manage the incremental impact from not achieving the pre-development (naturally occurring) runoff flow rates and durations for the project site. Sizing of offsite Hydrologic Control BMP projects may be accomplished using the SMRHM. The User will evaluate and identify potential sites in the Receiving Channel, and if not feasible, then evaluate projects in the same Hydrologic Unit for implementation of an offsite Hydrologic

Control BMP project that has the supplemental capacity to manage the PDPs Hydrologic Performance Standard. If an adequate site is identified in the Receiving Channel, the User will submit a report detailing:

- That the offsite Hydrologic Control BMP project manages the incremental impact from the pre-development (naturally occurring) runoff flow rates and durations for the project site;
- Conceptual plans for the offsite Hydrologic Control BMP project as part of an amended Project-Specific WQMP for review and approval;
- If the PDP is a redevelopment project, that the post-project runoff flow rates and durations do not exceed pre-project runoff flow rates and durations; and
- If no potential offsite Hydrologic Control BMP project sites are identified in the Receiving Channel, that there is an offsite Hydrologic Control BMP project in the same Hydrologic Unit.

If no potential offsite Hydrologic Control BMP project sites are identified in the same Hydrologic Unit as the PDP, the PDP must implement Option a(2), a restoration or rehabilitation project in the Receiving Channel with historic Hydromodification.

Option a(2) – Implement In-Channel Restoration or Rehabilitation of the Receiving Channel

In choosing this option, the PDP investigates the potential for implementation of an in-channel restoration or rehabilitation project for the Receiving Channel. It must be determined that the Receiving Channel has experienced historic Hydromodification. The in-channel restoration or rehabilitation project must be located in the Receiving Channel. The PDP must submit a report detailing the historic Hydromodification, as well as conceptual plans for the in-channel restoration or rehabilitation project to the Copermittee with jurisdiction over the project site for review. The Copermittee is responsible for verifying that the level of restoration or rehabilitation is adequate given the potential Hydromodification impacts of the PDP. Copermittees maintain individual processes consistent with their approval procedures to ensure that the User's obligations under the HMP alternative compliance process are completed prior to approval of the PDP.

Once the project conceptual plans have been approved by the Copermittee with jurisdiction over the project site, it is the responsibility of the User to obtain required permits from the appropriate regulatory agencies (e.g., SDRWQCB, California Department of Fish and Wildlife, USACE). If the PDP identifies no opportunities for in-channel restoration or rehabilitation in the Receiving Channel, then the PDP must implement Option a(1), an offsite Hydrologic Control BMP project within the same Hydrologic Unit as the PDP.

3.6.4. Meet the Sediment Supply Performance Standard

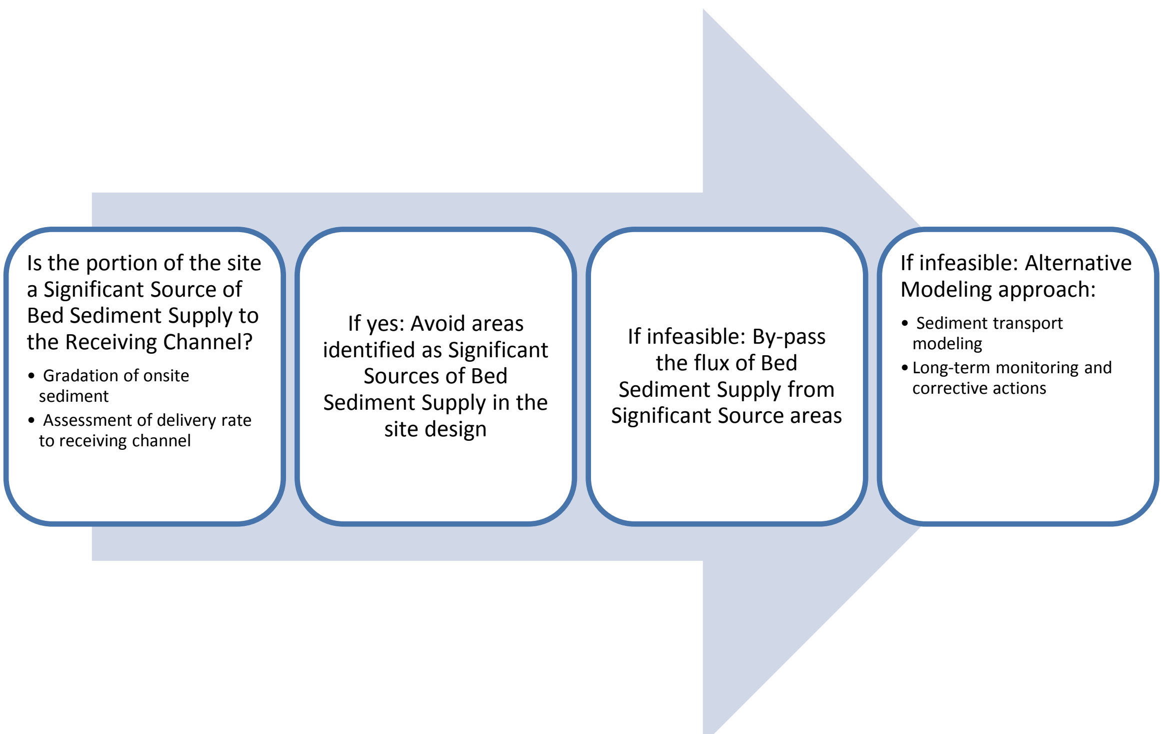
Bed Sediment Supply to a Receiving Channel during construction may increase as land surface is cleared and the potential for erosion is increased. Once the land surface is urbanized, the potential for Bed Sediment Supply may be reduced as compared to the pre-development condition. The purpose of the Sediment Supply Performance Standard is to maintain the pre-development supply of Bed Sediment to the Receiving Channel following urban development.

The User must perform a stepwise assessment to ensure the maintenance of the pre-project Bed Sediment Supply:

- Determine whether the site or a portion of the site is a Significant Source of Bed Sediment Load to the Receiving Channel;
- Avoid areas identified as Significant Sources of Bed Sediment Supply in the PDP design;
- Site specific alternative compliance measures.

The stepwise assessment that Users should follow to meet the Sediment Supply Performance Standard is conceptualized in Figure 3-7.

Figure 3-7: Sediment Supply Performance Standard - Stepwise Approach



The User must determine the location of the downstream alluvial Receiving Channel that may be impacted by the PDP. The first downstream conveyance that is unlined (invert, side slopes or both) will serve as the Receiving" Channel for the PDP. The stepwise assessment will be used to ensure that the PDP does not adversely impact the delivery of Bed Sediment Supply to the Receiving Channel. The User may refer to Section 2.3.i of the SMR HMP for additional information on the stepwise assessment.

The analyses from the stepwise assessment must be documented and submitted to the Copermittee with jurisdiction over the project site along with the Preliminary Project-Specific WQMP for approval.

STEP 1:

A triad approach must be completed to determine whether the site is a Significant Source of Bed Sediment Supply to the Receiving Channel and include the following components:

A. Site soil assessment, including an analysis and comparison of Bed Sediment in the Receiving Channel and the onsite channel, if any;
B. Determination of the capability of the channels, if any, on the project site to deliver the site Bed Sediment (if present) to the receiving channel;
C. Present and potential future condition of the Receiving Channel.

STEP 2:
If the analysis in Step 1 indicates that some or all of the channels on the project site must be preserved as a source of Bed Sediment Supply to the Receiving Channel, the site plan must be developed to avoid impacting the identified channels. The User will designate channels on the project site that should be avoided to preserve the discharge of Bed Sediment Supply from the site.

STEP 3:
If it is infeasible to avoid channels on the project site that are Significant Sources of Bed Sediment Supply in the design of the site plan, the drainage(s) may be by-passed to maintain the Bed Sediment Supply to the Receiving Channel. The Engineer will need to prepare specific designs to achieve this objective.

ALTERNATIVE STEP:
The alternative compliance program can only be pursued if the replacement of Bed Sediment Supply to the Receiving Channel is deemed infeasible by the Copermittee with jurisdiction over the project site, or if the project site design requires significant alteration of onsite channels. The infeasibility of the different Sediment Supply BMPs stated in the general approach can only be demonstrated and documented by the User in the preliminary Project-Specific WQMP for approval. The User must also demonstrate the expected feasibility of the alternative compliance methodology.

The alternative compliance option allows the User to model numerically the site conditions and the Receiving Channel and provide additional mitigation in site runoff to compensate for the estimated reduction (or addition) of Bed Sediment Load in the Receiving Channel. The alternative compliance option will generally trigger the necessity to implement a long-term monitoring program, with potential corrective measures to be identified and implemented as needed in response to findings from the monitoring program. The User may refer to Section 2.3.ii of the SMR HMP for additional guidelines on the alternative compliance approach.

Fulfilling the objectives of the stepwise assessment constitutes compliance with the Sediment Supply Performance Standard.

3.6.5. Specific Requirements for PDPs Smaller Than One Acre and Copermittee Roadway Projects *Permit Reference?*

PDPs that are smaller than one acre and Copermittee Roadway Projects are typically completed within a limited right-of-way, making it unlikely for the User to implement onsite Hydrologic Control BMPs. Those projects are allowed to submit, if necessary, a simplified Technical Feasibility Study to the Copermittee having jurisdiction over the PDP. The simplified Technical Feasibility Study must be developed to explain why the HMP Performance Standards cannot be met onsite and must include:

- The soil conditions of the PDP site;
- A demonstration of the lack of available space for onsite controls; and
- An explanation of prohibitive costs to implement onsite controls.
- A written opinion from a California Registered Geotechnical Engineer, who will identify the infeasibility due to geotechnical concerns.

Once the simplified technical feasibility study is accepted by the jurisdiction of the PDP, the User may pursue either an off-site mitigation project or an in-stream restoration project as detailed in Section 3.6.3.a) and Section 3.6.3.b). The off-site mitigation project or in-stream restoration project must meet the HMP Performance Standards.

3.7. Specify Source Control BMPs

Some everyday activities–such as trash recycling/disposal and washing vehicles and equipment–may generate Pollutants that tend to find their way into the MS4. These Pollutants can be minimized by applying Source Control BMPs.

Source Control BMPs include Permanent, structural features (Source Control BMPs) that may be required in your Development Project plans—such as roofs over and berms around trash and recycling areas—and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Source Control BMP.

Use the following procedure to specify Source Control BMPs for the PDP site:

1. Identify Pollutant Sources. Review the PDP site plan to identify potential Pollutant sources such as, but not limited to:

   - Storm Drain Inlets
   - Floor Drains

- Sump Pumps
- Pets Control/Herbicide Application
- Pools, Spas, Fountains and other water features
- Food Service Areas
- Trash Storage Areas
- Industrial Processes
- Outdoor storage areas
- Vehicle and Equipment Cleaning and Maintenance/Repair Areas
- Fueling areas
- Loading Docks
- Fire Sprinkler Test/Maintenance water
- Plazas, Sidewalks and Parking Lots

2. Identify in the Project-Specific WQMP the permanent Source Control BMPs, as applicable, for each identified source.

3. Using Table 3-9 as a model, identify in the Project-Specific WQMP the Operational Source Control BMPs, for each source, which should be implemented as long as the anticipated activities continue at the site. Copermittee Stormwater Ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table 3-9: Format for Table of Structural and Operational Source Control BMPs

Potential source of Runoff Pollutants	*Structural Source Control BMPs*	*Operational Source Control BMPs*

3.8. Coordinate your Project-Specific WQMP Design with Other Site Plans

Follow the guidance in Section 4.0 to verify that the Project-Specific WQMP, including all LID Principles, LID BMPs, Alternative Compliance measures, Hydrologic Control BMPs, and Source Control BMPs are properly identified on and coordinated with all other site plans, such as Architectural Plans, Improvement Plans, Construction Plans, and Landscaping Plans.

3.9. Develop an Operation and Maintenance Plan

All Structural Control BMPs must be maintained and functional throughout the life of the project to ensure their ongoing effectiveness for protecting runoff quality and quantity. As required by the 2010 SMR MS4 Permit, the Copermittee with jurisdiction over the project site will periodically verify that Structural Control BMPs on your site are maintained and continue to operate as designed.

To make this possible, the Copermittee with jurisdiction over the project site will also require preparation and submittal of a Project-Specific WQMP Operation and Maintenance Plan.

Details of these requirements, and instructions for preparing a Project-Specific WQMP Operation and Maintenance Plan are provided in Section 5.0.

Chapter 4

4.0 COORDINATION WITH OTHER SITE PLANS

Guidance for coordinating the Project-Specific WQMP with other site plans, including Architectural Plans, Grading Plans, Construction SWPPPs, and Landscaping Plans.

The Project-Specific WQMP must contain enough detail to demonstrate the planned LID Principles, LID BMPs, Alternative Compliance measures, Hydrologic Control BMPs, and Source Control BMPs are feasible and are coordinated with the project construction plan, architectural renderings, grading plan, landscape design, and other information submitted with your application for development approvals.

4.1. PREPARE A PROJECT-SPECIFIC WQMP SITE PLAN

To help ensure that the PDP design has fully met the WQMP requirements and is coordinated with your other project plans, Users are required to prepare and submit a Project-Specific WQMP Site Plan with the Project-Specific WQMP. At a minimum, the Project-Specific WQMP Site Plan should include the following:

- Vicinity and location maps
- Drainage Management Areas
- Proposed Structural BMPs
- Drainage paths
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Buildings, roof lines, downspouts
- Impervious surfaces
- Standard labeling

Use discretion on whether or not you may need to show additional information and/or to create multiple sheets to appropriately accommodate these features. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project-Specific WQMP and Site plan, and compare those to your other plans and maps as described below.

4.2. Coordination with Architectural Plans

If the User is required by the Copermittee(s) having jurisdiction over the project site to submit information and presentations to design review committees, planning commissions, and other decision-making bodies, the User may be required to incorporate relevant aspects of the BMP design. In particular:

- The visual impact of Structural BMPs adjacent to building foundations and any terracing or retaining walls required for the BMP design should be shown in renderings and other architectural drawings.
- Renderings and representation of street views should incorporate Structural Control BMPs located in street-side buffers and setbacks.
- Potential conflicts with local development standards should be identified and resolved.
- Verify that the selected BMPs do not create conflicts with pedestrian access between parking and building entrances.
- Verify that potential conflicts with local development standards have been identified and resolved.

4.3. Coordination with Improvement Plans

Details of how the project BMPs are constructed can be critical to proper operation. A misplaced inlet, an overflow at the wrong elevation, or the wrong soil mix used in an LID BMP may delay project approvals and incur additional expenses.

Additional details identified in this section must be shown on plans submitted with applications for building and grading permits. During construction and at completion, Copermittee inspectors will verify the installation of BMPs against the approved plans.

LID principles and LID BMPs have been routinely incorporated into PDPs for only a few years. Land development professionals and Copermittee staff continue to compile and analyze "lessons learned" from their experiences. The following guidance is based on those lessons.

4.3.1. What to Show on Improvement Plans

With few exceptions, the plan set should include separate sheets specifically incorporating the BMPs described in the Project-Specific WQMP. The information on these sheets should be carefully coordinated and made consistent with grading plans, utility plans, landscaping plans, and (in many cases) architectural plans. Consider including the grading plan (screened) as background for the BMP sheets. It may also be appropriate to show portions of the roofing plan wherever roof ridges define DMAs. Additionally, utilizing different colors with associated legends will help the Copermittee reviewers differentiate the details shown on the construction plans with respect to grading and runoff management.

In particular, verify that relevant aspects of the BMP design are properly incorporated into your construction documents, including:

4.3.1.a) BMP Reference Table

The Copermittee plan checker will compare the Building and Grading plans with the Project-Specific WQMP. To facilitate the plan checker's comparison and speed review of your project, a WQMP Checklist should be prepared for your PDP.

Table 4-1: Format for BMP Reference Table

Project-Specific WQMP Page #	*BMP Identifier and Description*	*See Plan Sheet #s*

Here's how:

1) Create a table similar to Table 4-1. Number and list each measure or BMP specified in the Project-Specific WQMP in Columns 1 and 2 of the table. Leave Column 3 blank. <u>Incorporate the table into the Project-Specific WQMP.</u>

2) When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 3, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. Submit the updated table with your construction plans so that the plan checker can quickly locate the Structural Control BMPs that were committed to in the Project-Specific WQMP.

Note that the updated table—or Construction Plan WQMP Checklist—is only a reference tool to facilitate comparison of the construction plans to the Project-Specific WQMP. The Copermittee plan checker can advise regarding the process required to propose changes, if any, to the approved Project-Specific WQMP.

4.3.1.b) Grading is Key

Copermittee plan checkers typically require grading plans to show each BMP in addition to the delineation of DMAs. Elevations, including the following, should be called out:

- Curbs, inlets, grade breaks and other features of the drainage design consistent with the delineation of the DMAs.
- Top of paving at curb cut inlets, top of curb and top of the bioretention soil layer.
- Grate elevation at overflow grates and the adjacent top of soil elevation.
- Piped inlets.

Show how DMAs follow grade breaks, consistent with the grading plan and the Project-Specific WQMP.

4.3.1.c) Show How Runoff Moves

As needed for clarity, show the direction of Runoff flow across roofs and pavement and into BMPs. For runoff conveyed via pipes or channels, show locations, slopes, and elevations at the beginning and end of each run.

For roof drainage, show the routing of roof downspouts, use drawings or notes to make clear how drainage from leaders is routed under walkways, across pavement, through drainage pipes, or by other means to reach the BMP.

Show pipes or channels connecting the BMP underdrain and overflow to the site drainage system, MS4, or other approved discharge point. Call out slopes and key elevations.

4.3.1.d) Landscaping and Utility Plans

- The 2010 SMR MS4 Permit *(Order No. R9-2010-0016 NPDES No. CAS0108766)* requires the Copermittees to prohibit irrigation runoff. Any instance of irrigation water reaching the MS4 or Receiving Water is a violation of the Copermittees' ordinances. Ensure that irrigation systems are designed to avoid the potential for irrigation runoff. For example, drip irrigation may be an appropriate technology to meet this objective.

- Vaults and utility boxes should be accommodated outside BMPs and not placed within Structural BMPs in a manner that may interfere with their performance and/or operation and maintenance.

- Landscaping plans, including planting plans, should identify locations of Structural BMPs and the plant requirements must be consistent with the engineered soils and conditions in the BMPs. For more information on plant species appropriate for LID Bioretention BMPs, see Appendix A of the LID Manual for Southern California:

https://www.casqa.org/resources/lid/socal-lid-manual

4.3.1.e) Show LID Principles and Structural BMPs in Cross-Section

Use one or more cross section drawings to illustrate details and key BMP elevations, including bottom of excavation, top of gravel layer, top of soil layer, edge treatments, inlet elevations, overflow grate elevations, rim elevations, locations of rock for energy dissipation, moisture barriers, and other information. If structural BMPs include gravel and soil mix, call out specifications or refer to specifications elsewhere for gravel and soil mix.

- Any area drains within Type B Self-Retaining areas should be identified with elevations of the inlet into the drain, such that the required retention depth will be provided.

- The top edge (overflow) of each BMP provides for the required ponding depth.

4.4. Coordination with Construction Activities

Successful construction of BMPs requires attention to detail during every stage of the construction process, from initial layout to rough grading, installation of utilities, construction of buildings, paving, landscaping, and final clean-up and inspection.

Construction project managers need to understand the purpose and function of BMPs and know how to avoid common missteps that can occur during construction. For LID BMPs, the following operating principles should be noted at a pre-construction meeting.

- Runoff flow from the intended tributary DMA must flow into the BMP.
- The surface reservoir must fill to its intended volume during high inflows.
- Runoff must filter rapidly through the filtration/soil layer.
- Filtered Runoff must infiltrate into the native soil to the extent feasible (or allowable).
- Remaining Runoff must be captured and drained to a storm drain or other approved location.

4.4.1. Coordination with Erosion and Sediment Control Plan/SWPPP

BMPs may not perform as designed if the BMP and the BMP location are not protected during site construction. It is important to specify that appropriate measures be taken by construction staff to protect these areas and BMPs. Be sure that all construction site staff is aware of these requirements, because historical construction habits may take time to change.

- Avoid intentional or unintentional compaction of planned landscaped areas, particularly areas that have been designated for infiltration such as Self-Retaining Areas, LID Infiltration and LID Bioretention BMPs. If these areas are compacted, or even just used as an access path for heavy equipment during site grading, then the soil structure and infiltration characteristics will be destroyed, and the BMP will not perform as designed. If this occurs, require re-tilling and/or soil amendments as necessary to restore the infiltrative capacity of the underlying soils.
- Once any BMP is constructed, surround the BMP with Sediment Control BMPs, and maintain them until site occupancy is granted. Even small amounts of construction sediment can significantly affect the performance of the Sediment Control BMPs.

- Construct pervious pavements as the last order of work, if possible, to minimize the risk of clogging the constructed pervious pavement by sediment and debris generated from additional construction activities.

4.4.2. Items to Be Inspected During Construction

Verify that the project contract documents are sufficiently detailed to provide for the proper construction of the elements of the BMPs specified in the Project-Specific WQMP. See the example construction checklist on the following pages for ideas of items that may need to be verified in the contract documents and during construction.

EXAMPLE BMP CONSTRUCTION CHECKLIST

Staking

- ❒ Square footage of BMPs meets or exceeds minimum shown in Project-Specific WQMP
- ❒ Site grading and grade breaks are staked consistent with and sufficient to define the boundaries of the tributary Drainage Management Area(s) (DMAs) shown in the Project-Specific WQMP
- ❒ Inlet elevation of the BMP is low enough to receive drainage from the entire tributary DMA
- ❒ Locations and elevations of overland flow or piping, including roof leaders, from impervious areas to the BMP have been laid out and any conflicts resolved
- ❒ Rim elevation of the BMP is staked consistent with plans
- ❒ Locations for vaults, utility boxes, and light standards have been identified so that they will not conflict with BMPs

EXCAVATION (to be confirmed prior to backfilling or pipe installation)

- ❒ Excavation conducted with materials and techniques to minimize compaction of soils within the BMP area
- ❒ Excavation is to accurate area and depth
- ❒ Slopes or side walls protected from sloughing of native soils into the BMP
- ❒ Moisture barrier, if specified, has been added to protect adjacent pavement or structures
- ❒ Native soils at bottom of excavation are ripped or loosened to promote infiltration

OVERFLOW OR SURFACE CONNECTION TO MS4
(to be confirmed prior to backfilling with any materials)

- ❒ Overflow is at specified elevation (typically no lower than two inches below BMP rim)
- ❒ No knockouts or side inlets are in overflow riser
- ❒ Overflow location selected to minimize surface flow velocity (near, but offset from, inlet recommended)
- ❒ Grating excludes mulch and litter (beehive or atrium-style grates with ¼" openings recommended)
- ❒ Overflow structures are located away from inlets to the BMP
- ❒ Overflow is connected to storm drain or other specified outlet via appropriately sized piping

UNDERGROUND CONNECTION TO MS4 /OUTLET ORIFICE
(to be confirmed prior to backfilling BMP with any materials)

- ❒ Perforated pipe underdrain is installed with holes facing down
- ❒ Perforated pipe is connected to the specified discharge point
- ❒ Underdrain pipe is at elevation shown on plans. In facilities allowing infiltration, preferred elevation is above native soil but low enough to still be covered by the underdrain rock; in bioretention facilities that are sealed or with liners, preferred elevation is as near bottom as possible
- ❒ Cleanouts are in accessible locations and connected via sweeps
- ❒ Structures (arches or large diameter pipes) for additional surface storage are installed as shown in plans and specifications and have the specified volume

(continued)

Figure 4-1: Example BMP Construction Checklist

EXAMPLE BMP CONSTRUCTION CHECKLIST (CONTINUED)

DRAIN ROCK/SUBDRAIN (to be confirmed prior to installation of soil mix)

- ❐ Rock is installed as specified.
- ❐ Rock is smoothed to a consistent top elevation. Depth and top elevation are as shown in plans
- ❐ Slopes or side walls protected from sloughing of native soils into the BMP
- ❐ No filter fabric is placed between the subdrain and soil mix layers

SOIL MIX (FOR BIORETENTION)

- ❐ Soil mix is as specified. Quality of mix is confirmed by delivery ticket or onsite testing as appropriate to the size and complexity of the BMP
- ❐ Mix is not compacted during installation but may be thoroughly wetted to encourage consolidation
- ❐ Mix is smoothed to a consistent top elevation. Depth of mix and top elevation are as shown in plans, accounting for depth of mulch to follow and required reservoir depth

IRRIGATION

- ❐ Irrigation system is installed so it can be controlled separately from other landscaped areas. Smart irrigation controllers and drip emitters are recommended
- ❐ Spray heads, if any, are positioned to avoid direct spray into outlet structures

PLANTING

- ❐ Plants are installed consistent with approved planting plan
- ❐ Any trees and large shrubs are staked securely
- ❐ No clayey material, including inappropriate native soils are used in the BMP
- ❐ 1"-2" mulch may be applied following planting; mulch selected to avoid floating
- ❐ Final elevation of soil mix, including mulch, is maintained following planting
- ❐ Curb openings are free of obstructions

FINAL ENGINEERING INSPECTION

- ❐ Drainage Management Area(s) are free of construction sediment and landscaped areas are stabilized
- ❐ Inlets are installed to provide smooth entry of Runoff from adjoining pavement, have sufficient reveal (drop from the adjoining pavement to the top of the mulch or soil mix, and are not blocked
- ❐ Inflows from roof leaders and pipes are connected and operable
- ❐ Temporary flow diversions are removed
- ❐ Rock or other energy dissipation at piped or surface inlets is adequate
- ❐ Overflow outlets are configured to allow the BMP to flood and fill to near rim before overflow
- ❐ Plantings are healthy and becoming established
- ❐ Irrigation is operable
- ❐ If rains have occurred: BMP drains rapidly; no surface ponding is evident
- ❐ Any accumulated construction debris, trash, or sediment is removed from BMP
- ❐ Certification Statement from design professional that all BMPs have been constructed and/or installed in accordance with the approved plans and specs.

Chapter
5

5.0 PROJECT-SPECIFIC WQMP OPERATION & MAINTENANCE

How to prepare a customized Project-Specific WQMP Operation & Maintenance Plan for the BMPs on your PDP site.

Provision F.1.f(2)(b) of the 2010 SMR MS4 Permit requires that each Copermittee must verify that Structural BMPs are adequately maintained. Copermittees must report the results of these verifications to the San Diego Regional Board annually.

Structural BMPs installed as part of the PDP will be incorporated into the Copermittee's verification program. This is a five-stage process:

1) Determine who will own the Structural BMPs and be responsible for its maintenance in perpetuity and document this in the Project-Specific WQMP. The Project-Specific WQMP must also identify the means by which ongoing maintenance will be assured (for example, a maintenance agreement that runs with the land).

2) Identify project-specific maintenance requirements, allow for these requirements in your project planning and preliminary design, and document the typical maintenance requirements in the Project-Specific WQMP.

3) Prepare a Project-Specific WQMP Operation and Maintenance Plan (WQMP O&M Plan) for the site incorporating detailed requirements for each LID, Conventional Treatment and Hydrologic Control BMP. Other types of LID Principles, such as self-retaining areas may also require operation and maintenance to ensure that they continue to function as designed. Typically, a draft Project-Specific WQMP Operation and Maintenance Plan must be submitted with the Final Project-Specific WQMP, and a final Project-Specific WQMP Operation and Maintenance Plan must be submitted to and approved by the Copermittee with jurisdiction over the project site prior to issuance of a

certificate of occupancy. Local requirements vary as to schedule. Check with Copermittee staff.

4) Maintain the Structural BMPs from the time they are constructed until ownership and maintenance responsibility is formally transferred to the site owner/operator.

5) **Maintain** the BMPs in perpetuity and comply with the Copermittee's self-inspection, reporting, and verification requirements.

Table 5-1: Schedule for Planning the Project-Specific WQMP Operation and Maintenance Plan

Stage	*Description*	*Where documented*	*Schedule*
1	Determine BMP ownership and maintenance responsibility	Preliminary Project-Specific WQMP	Discuss with project owner at initial project planning phase
2	Identify Project-Specific maintenance requirements	Preliminary Project-Specific WQMP	Submit with planning & zoning application
3	Develop detailed operation and maintenance plan	Final Project-Specific WQMP	Submit draft with Building Permit application; final due before building permit final and applying for a Certificate of Occupancy
4	Interim operation and maintenance of BMPs	As required by Copermittee O&M verification program	During and following construction including warranty period
5	Ongoing maintenance and compliance with inspection & reporting requirements	As required by Copermittee O&M verification program	In perpetuity

5.1. STAGE 1: OWNERSHIP AND MAINTENANCE RESPONSIBILITY

Ownership & maintenance responsibility for Structural BMPs should be discussed as early as due diligence and definitely at the beginning of project planning. Experience has shown that provisions to implement and finance maintenance of Structural BMPs can be a major stumbling block to project approval, particularly for small residential subdivisions.

Your Project-Specific WQMP must specify:

1) Who will be responsible for maintaining the site in conformance with the WQMP Operation & Maintenance Plan.

2) The means for financing the maintenance of Structural BMPs in perpetuity once the BMP is implemented and the Development Project is complete. This should include the mechanisms for the eventual replacement of the BMP or elements of the BMP.

3) How the maintenance obligations will carry over to subsequent owners, as further described in Sections 5.1.1 through 5.1.3 below.

5.1.1. Private Ownership and Maintenance

The Copermittee may require—as a condition of project approval—that a maintenance agreement be executed and recorded against the title of the property. Consult with the Copermittee with jurisdiction over the project site for a copy of any required maintenance agreement.

The agreement will thereby "run with the land", so the maintenance agreement executed by a developer is binding on the owners of the subdivided lots and subsequent owners. The agreement must be recorded prior to conveyance of the subdivided property.

5.1.2. Transfer to Public Ownership

Some Copermittees may have developed a process by which a Structural BMP can be deeded to the public in fee or as an easement, for public maintenance. The Copermittee may recoup the costs of maintenance through a special tax, assessment district, or similar mechanism.

☞ Check with the Copermittee with jurisdiction over the project site to determine if any such 'public maintenance' mechanisms are in place, and for any associated requirements.

Transferring a LID BMP to Public Ownership may create additional design constraints, however, it removes the burden from the site owner/operator from having to maintain the BMP in perpetuity. Because PDP sites typically drain to the street, it may be possible to locate a BMP parallel to the street and within road right of way, or on a common, publically accessible lot.

Even if the Structural BMP is to be deeded or transferred to the Copermittee after construction is complete, it is still the responsibility of the User, to maintain the BMP in accordance with the Project-Specific WQMP O&M Plan until that responsibility is formally transferred to the subsequent owner.

5.1.3. Copermittee Projects

Public projects (such as Public Works/Capital Improvement Projects) implemented by a Copermittee will be maintained by the Copermittee in accordance with a Facility Pollution Prevention Plan as described in the Copermittees' JRMP.

5.2. STAGE 2: IDENTIFY MAINTENANCE REQUIREMENTS

Include in the Project-Specific WQMP a description of the maintenance requirements for each Structural BMP, including for any self-retaining and/or landscaped self-treating areas. This will help ensure that:

- Ongoing costs of Structural BMP maintenance have been considered in BMP selection and design.
- Site and landscaping plans provide for access for inspections and by maintenance equipment.
- Landscaping plans incorporate irrigation requirements for Structural BMP plantings as appropriate.
- Initial maintenance and replacement of Structural BMP plantings is incorporated into landscaping contracts and guarantees.

Fact sheets in the LID BMP Design Handbook describe typical maintenance requirements for many of the Structural BMPs described in this WQMP. Use this information, or other requirements specified by the Copermittee to specify the maintenance requirements for each of the Structural BMPs, including LID BMPs, Conventional Treatment Control BMPs, Hydrologic Control BMPs, and Source Control BMPs identified in the Project-Specific WQMP. In addition, identify any necessary maintenance requirements for any other LID Principles that were incorporated into the project, such as buffer areas, etc.

5.3. STAGE 3: DEVELOP PROJECT-SPECIFIC WQMP OPERATIONS &MAINTENANCE PLAN

Submit a draft Project-Specific WQMP O&M Plan with your final Project-Specific WQMP included with the application for permits to begin grading or construction on the site. A final Project-Specific WQMP O&M Plan (updated as necessary) will be required to be submitted with the 'as-built' plans and approved before occupancy is granted.

The final Project-Specific WQMP O&M Plan should incorporate solutions to any problems noted or changes that occurred during construction.

The Final Project-Specific WQMP O&M Plan and 'as-built' plans must be submitted to and approved by the Copermittee with jurisdiction over the project site before a building permit can be made final and a certificate of occupancy issued.

The Project-Specific WQMP and WQMP O&M Plan must be kept onsite for use by maintenance personnel and during site inspections.

The following step-by-step guidance will help you prepare each required section of your WQMP O&M Plan. Preparation of the Plan will require familiarity with the Structural BMPs as they have been designed/constructed and a fair amount of "thinking through" plans for their operation and maintenance. The text and forms provided here will assist you, but are no substitute for thoughtful planning.

5.3.1. Step 1: Designate Responsible Individuals

To begin creating the Project-Specific WQMP O&M Plan, the User must designate and identify:

- The individual who will have direct responsibility for the maintenance of the BMPs identified in the Project-Specific WQMP O&M Plan. This individual should be the designated contact with Copermittee inspectors and should sign self-inspection reports and any correspondence with the Copermittee regarding verification inspections. The Copermittee may accept self-certification or third-party certification by a California licensed Professional Engineer.
- Employees or contractors who will report to the designated contact and are responsible for conducting all required operation and maintenance.
- The corporate officer authorized to negotiate and execute contracts that might be necessary for future changes to operation and maintenance of the BMPs identified in the Project-Specific WQMP O&M Plan or to implement remedial measures if problems occur.
- The designated respondent to problems with the BMPs, such as clogged drains or broken irrigation mains, that would require immediate response should they occur during off-hours.

Include an organization chart to show the relationships of authority and responsibility between the individuals responsible for Project-Specific WQMP operation and maintenance. This need not be elaborate, particularly for smaller organizations.

Describe how funding for operation and maintenance will be assured, including sources of funds, budget category for expenditures, process for establishing the annual maintenance budget, and process for obtaining authority should unexpected expenditures for major corrective maintenance be required.

Describe how training of staff or contractors regarding the purpose, mode of operation, and maintenance requirements for the BMPs Identified in the Project-Specific WQMP O&M Plan will be provided. Also, describe how ongoing training will be provided as needed and in response to staff changes.

5.3.2. Step 2: Summarize Drainage and BMPs

Incorporate the following information from the Project-Specific WQMP into the Project-Specific WQMP O&M Plan:

- Figures delineating and designating DMAs
- Figures showing locations of BMPs on the site
- Tables of the DMAs served by each Structural BMP

Verify that these figures incorporate changes that may have occurred during planning and zoning review, building permit review, or construction.

5.3.3. Step 3: Document BMPs 'As-Built'

Once each Structural BMP is constructed, plans for the BMP must be 'as-built' by a licensed civil/geotechnical engineer registered in the State of California and submitted to the Copermittee, and also included as part of the Project-Specific WQMP O&M Plan. The information contained on the 'as-built' plans must be consistent with standard engineering practice. Following is a list of types of information that should be documented on 'as-built' plans as applicable and appropriate:

- Plans, elevations, and details of all Structural BMPs. Annotate if necessary with designations used in the Project-Specific WQMP.
- Design information or calculations submitted in the detailed design phase (i.e., not included in the Project-Specific WQMP).
- Specifications of construction of the Structural BMPs, including sand or soil, compaction, pipe materials, and bedding.

In the final Project-Specific WQMP O&M Plan, incorporate field changes to design drawings, including changes to any of the following:

- Location and layouts of inflow piping, flow splitter boxes, and piping to offsite discharge.

- Depths and layering of soil, sand, or gravel.
- Placement of filter fabric or geotextiles.
- Changes or substitutions in soil or other materials.
- Natural soils encountered (e.g., sand or clay lenses).
- Vegetation type within or around the BMP.
- Changes in tree types.
- Fencing around the BMP.
- Etc.

5.3.4. Step 4: Prepare Customized Maintenance Plans

Prepare a maintenance plan, schedule, and inspection checklists (e.g. routine, annual, and after major storms) for each Structural BMP including for any self-retaining and/or landscaped self-treating areas. Plans and schedules for two or more similar BMPs on the same site may be combined.

Use the following resources to prepare the customized maintenance plan, schedule, and checklists.

- Specific information noted in Steps 2 and 3, above.
- Other input from the Structural BMP designer, Copermittee staff, or other sources.
- BMP Fact Sheets in the LID BMP Design Handbook, as applicable.

Note any particular characteristics or circumstances that may require attention in the future, and include any troubleshooting advice.

Also include in an appendix any manufacturer's data, operating manuals, and maintenance requirements for any:

- Pumps or other mechanical equipment.
- Proprietary devices used as or in conjunction with BMPs.

Manufacturers' publications should be referenced in the text (including models and serial numbers where available). Copies of the manufacturers' publications should be included as an attachment in the back of the Project-Specific WQMP O&M Plan or as a separate document.

5.3.5. Step 5: Compile O&M Plan

The Project-Specific WQMP O&M Plan should follow the general outline below.

> **Note** that for Copermittee Projects, the WQMP O&M Plan requirements will be incorporated into a new or existing, Facility Pollution Prevention Plans (FPPP).

I. Inspection and Maintenance Log

II. Updates, Revisions and Errata

III. Introduction

Narrative overview describing the site; drainage areas, routing, and discharge points; and Structural BMPs

IV. Responsibility for Maintenance

A. General

1) Name and contact information for responsible individual(s).

2) Organization chart or charts of the maintenance function and location within the overall organization.

3) Reference to Operation and Maintenance Agreement (if any). A copy of the agreement should be attached.

4) Maintenance Funding

a. Sources of funds for maintenance

b. Budget category or line item

c. Description of procedure and process for ensuring adequate funding for maintenance

B. Staff Training Program

C. Records

D. Safety

V. Summary of DMAs and BMPs

A. DMAs

1) Drawings showing pervious and impervious areas (copied or adapted from Project-Specific WQMP)

2) Designation and description of each DMA and how flow is routed to the corresponding BMP

B. Structural BMPs

1) Drawings showing location and type of each Structural Post-Construction BMP

2) General description of each BMP (consider a table if more than two BMPs)

(b) DMA and routing of discharge

(c) BMP type and size

VI. BMP Design Documentation

A. 'As-built' drawings of each Structural BMP (design drawings in the draft Plan).

B. Manufacturer's data (as applicable) including manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a "placeholder" in the draft Project-Specific WQMP Operations and Maintenance Plan for information not yet available at the draft phase).

C. Specific operation and maintenance concerns and troubleshooting.

VII. Maintenance Schedule or Matrix

A. Maintenance Schedule for each Structural BMP with specific requirements for:

(1) Routine inspection and maintenance

(2) Annual inspection and maintenance

(3) Inspection and maintenance after major storms

B. Service Agreement Information

Assemble and make copies of the Project-Specific WQMP O&M Plan. One or more copies must be submitted to the Copermittee, including one electronic copy. At least one copy must be kept onsite. Following are some suggestions for formatting the Project-Specific WQMP O&M Plan:

- Format plans to 8½" x 11" to facilitate duplication, filing, and handling
- Include the revision date in the footer on each page
    - Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed up so that copies of the Project-Specific WQMP O&M Plan can be made if the hard copy is lost or damaged.

5.3.6. Step 6: Updates

The Stormwater Control Operation and Maintenance Plan (or Facility Pollution Prevention Plan for Copermittee projects) will be a living document and, thus, will require periodic updates by the Facility/Activity Manager at least annually. There are two types of updates, each with their own implications as noted below. Note that these are examples of minimum thresholds that should be verified with the Copermittee with jurisdiction over the PDP site for specific direction and advisement.

- Minor Updates – Turnover of named maintenance personnel, mechanical equipment, addition of maintenance procedures, etc.
- Major Updates – Relocation of BMPs, modification of maintenance schedule(s) of BMPs, change in legal ownership and/or party responsible for maintaining the BMPs in perpetuity, major site re-grading or re-paving that can affect DMAs, changing one BMP for an alternative BMP, etc.

Updates may be transmitted to the Copermittee with jurisdiction over the project site at any time. However, at a minimum, updates to the O&M Plan must be maintained, implemented, and available to Copermittee inspectors. These updates should reference the sections of the O&M Plan being changed. In addition, major updates may necessitate a revision to the Project-Specific WQMP and as such may cause the need for the document to be re-recorded. Consult with the Copermittee with jurisdiction over the project site before performing any major updates to the approved and implemented Project-Specific WQMP. Conversely, updates may not require re-recordation if they are consistent with the original, executed agreement.

Failure to maintain an up-to-date copy of the O&M Plan may be a violation of Copermittee requirements subject to fines and/or other penalties.

5.4. STAGE 4: INTERIM OPERATION & MAINTENANCE

The User is responsible for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent property owner. Users may be required to warranty Stormwater BMPs against lack of performance due to flaws in design or construction for a minimum of two rainy seasons following completion of construction. The warranty may need to be secured by a bond or other financial instrument if required by the Copermittee.

5.5. STAGE 5: OPERATION & MAINTENANCE VERIFICATION

Each Copermittee implements a program to ensure that the Structural BMPs are operating and are maintained properly and all BMPs are working effectively to remove Pollutants in Runoff from the site. This may include periodic site inspections, or requirements for self-certifications by a licensed professional engineer. This program will be described by each Copermittee in their respective JRMP.

5.6. REFERENCES AND RESOURCES

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- *Urban Runoff Quality Management* (WEF/ASCE, 1998). pp 186-189.
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- *California Stormwater Best Management Practice Handbooks* (CASQA, 2003).
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- Operation, Maintenance, and Management of Stormwater Management Systems (Watershed Management Institute, 1997)

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EXHIBIT A:

Isohyetal Map for the 85th Percentile 24-hour Storm Event

EXHIBIT B:

Project-Specific WQMP Template

EXHIBIT C:

LID BMP Design Handbook

Please Visit

www.rcflood.org/npdes/developers

to access the current Handbook.

EXHIBIT D:

WQMP Applicability Checklist

EXHIBIT E:

WQMP Review Checklist

EXHIBIT F:

Santa Margarita Region Hydromodification Management Plan

EXHIBIT G:

Glossary