EXHIBIT 7.II

MODEL WATER QUALITY MANAGEMENT PLAN (MODEL WQMP)

Submitted to Santa Ana Regional Water Quality Control Board

May 24, 2010

Contents

Appendices

MODEL WATER QUALITY MANAGEMENT PLAN (WQMP)

7.II - 1.0 Introduction

This Model Water Quality Management Plan (Model WQMP) has been developed to aid the County of Orange, the Orange County Flood Control District, and the Cities in Orange County (Permittees) and project proponents with addressing post-construction urban runoff and stormwater pollution from new development and significant redevelopment projects. The goal of the Model WQMP is to provide a framework for developing a Project WQMP that minimizes the effects of urbanization on site hydrology, urban runoff flow rates or velocities and pollutant loads. This goal may be achieved through practicable and enforceable site-specific project-based controls, or a combination of project-based and regional or watershed-based controls. For most projects the process will first involve preparing a Conceptual / Preliminary WQMP to incorporate Low Impact Development (LID) and where necessary hydromodification control BMPs at the earliest conceptual planning stages of a project for early review. The process for preparing Conceptual / Preliminary WQMPs and / or Project WQMPs is described in Section 4.

This Model WQMP identifies appropriate controls, referred to as Low Impact Development Practices (LID) best management practices (BMPs), as well as other alternative compliance programs, for new development and significant redevelopment projects that are subject to WQMP requirements pursuant to Section 7 of the Drainage Area Management Plan (DAMP).

LID BMP – a BMP that provides retention or biotreatment – these may include hydrologic source controls, retention, and biotreatment, and may be located either on-site or off-site. Examples include biorention systems (introduced runoff into planter areas for infiltration with no underdrains), filtration thru planter media with underdrains, harvest and use systems, and green roofs

New development and significant redevelopment projects are required to develop and implement a Conceptual/Preliminary, or Project WQMP that includes LID BMPs. Depending upon the project size and characteristics, these may include:

- Consideration of site design measures
- Implementing LID BMPs on-site
- Constructing or participating in sub-regional/regional LID BMPs
- Implementing hydromodification control BMPs
- Utilizing alternative programs or treatment control BMPs
- Employing applicable source control BMPs

Explanation, descriptions and examples of the above site design measures and BMP types are provided later within this document.

7.II - 1.1 Regulatory Basis

The development of this Model WQMP and preparation of Conceptual/Preliminary, and Project WQMPs based on this model is required by two municipal National Pollutant Discharge

Elimination System (NPDES) permits held jointly by the County of Orange, Orange County Flood Control District, and the cities within the county. As authorized by the Federal Clean Water Act, the NPDES permit program controls water pollution by regulating sources that discharge pollutants into waters of the United States.

Within the Santa Ana Regional Water Quality Control Board (Santa Ana Regional Board) jurisdiction, the Model WQMP will be reviewed and approved by the Santa Ana Regional Board in accordance with the relevant Fourth Term Permit (Order No. R8 -2009-0030) (North County Permit). Using the Model WQMP as a guide, North Orange County permit area local jurisdictions will review and approve Conceptual/Preliminary, and Final Project WQMPs as part of the development plan and entitlement approval process or the ministerial permit approval process for new development projects as defined in **DAMP Section 7.6 and Table 7.II-1.**

Within the San Diego Regional Water Quality Control Board (San Diego Regional Board) jurisdiction, the San Diego Regional Board will review the Model WQMP for compliance with the relevant Fourth Term Permit Order (R9-2009-0002)(South County Permit). South Orange County permit area local jurisdictions are required to adopt their own local Jurisdictional Runoff Management Program (JRMP) and Model Standard Storm Water Mitigation Plan (Model SSMP) with similar elements to this Model WQMP (see **DAMP, Appendix A-7**). Using the Model SSMP as a guide, each South Orange County jurisdiction will review and approve Project WQMPs as part of the development plan and entitlement approval process or the ministerial permit approval process for new development projects as defined in **DAMP Section 7.6** and **Table 7.II-1**.

7.II - 1.2 Use of the Model WQMP

The Model WQMP has been prepared to explain the requirements and types of analyses that go into producing a Conceptual/Preliminary, or Project WQMP.

- **Section 7.II – 1.0** provides an introduction to the overall regulatory basis and goals of the Model WQMP, information on the use of the Model WQMP, an overview of applicable priority development projects, and the general process steps for developing a Conceptual/Preliminary, or Project WQMP.
- **Section 7.II – 2.0** describes the requirements for assessing a site and determining and selecting an appropriate compliance plan for Priority Projects.
- **Section 7.II – 3.0** contains BMP funding and maintenance requirements.
- **Section 7.II – 4.0** describes the process for WQMP preparation, submittal, and approval.
- **Section 7.II – 5.0** provides additional WQMP related resources and the references used for producing this Model WQMP.

A Technical Guidance Document has been prepared as a companion to this Model WQMP as DAMP Section 7.II-3. The Technical Guidance Document contains more detailed information and explains how to complete the requirements and the technical analysis necessary for preparing a Conceptual/Preliminary, or Project WQMP.

7.II - 1.3 Priority Projects

This model provides requirements for new Priority Projects and significant redevelopment Priority Projects. The Priority Project categories are explained in Table 7.II-1. Unless otherwise indicated, listed requirements apply equally to both regions. Region specific requirements listed in a box are supplemental to other non-region specific requirements listed in a box. A project is a Priority Project if it meets any of the following criteria.

Table 7.II-1 Priority Projects Categories
1. *Both Permit Areas* - New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees. *South County Permit Area only* – All pollutant generating development or redevelopment projects that result in the disturbance of one acre or more of land will be considered Priority Project starting December 16, 2012.
2. Automotive repair shops. This applies to facilities that are categorized in any one of the following Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, and 7536-7539.
3. *Both Permit Areas* - Restaurants where the land area of development is 5,000 square feet or more including parking area. This category is defined as facilities that 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. *South County Permit Area only* – Restaurants where land development is less than 5,000 square feet shall meet all WQMP requirements except for LID BMP, treatment control BMP, and hydro-modification/HCOC requirements.
4. Hillside development greater than 5,000 square feet. Hillside development is defined as any development which is located in an area with known erosive soil conditions or where the natural slope is twenty-five percent or greater.
5. *Both Permit Areas* - Impervious surface of 2,500 square feet or more located within, directly adjacent to (within 200 feet), or discharging directly into receiving waters within Environmentally Sensitive Areas. *South County Permit Area only* – or a project with an increase in impervious area by10% or more of its naturally occurring condition located within, directly adjacent to (within 200 feet), or discharging directly to receiving waters within Environmentally Sensitive Areas.
6. *Both Permit Areas* - Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban stormwater runoff. A 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. *South County Permit Area only* – or parking lots with 15 parking spaces or more.
7. Streets, roads, highways, and freeways. This category includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles. (see discussion under (Section 7.II –1.6).
8. *North County Permit Area only* – All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purposed of the facility, or emergency redevelopment activity required to protect public health and safety. *South County Permit Area only* – All significant redevelopment projects, where significant redevelopment is defined as the addition of 5,000 or more square feet of impervious surface on an already developed site, and the existing development or redevelopment project falls under another Priority Project Category. *Both Permit Areas* – If the redevelopment results in the addition or replacement of less than 50% of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discuss below only applies to the addition or replacement area. If the addition or replacement accounts for 50% or more of the impervious area, the WQMP requirements apply to the entire development.
9. Retail Gasoline Outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more, or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

7.II - 1.4 Non-Priority Projects

New development or significant redevelopment projects that are not Priority Projects are considered Non-Priority Projects. Requirements for Non-Priority Projects are contained in a separate Non-Priority Project checklist that is available from the applicable Permittee.

7.II - 1.5 WQMP Development Process

Several steps are involved in completing an approvable Conceptual/Preliminary, or Project WQMP for new development or significant redevelopment projects. **Figure 7.II-1** displays an overview WQMP flowchart and the major implementation and decision steps that must be followed to successfully complete a Project WQMP. Each of the steps identified in the flow chart are described in later sections of the Model WQMP and referenced in the overall WQMP flow chart. **Figure 7.II–2** for the North County permit area and **Figure 7.II-3** for the South County permit area provide a more detailed overview of the steps in the process. Each of these steps is described in more detail in Section 7.II-2.

7.II – 1.6 Public Agency Projects

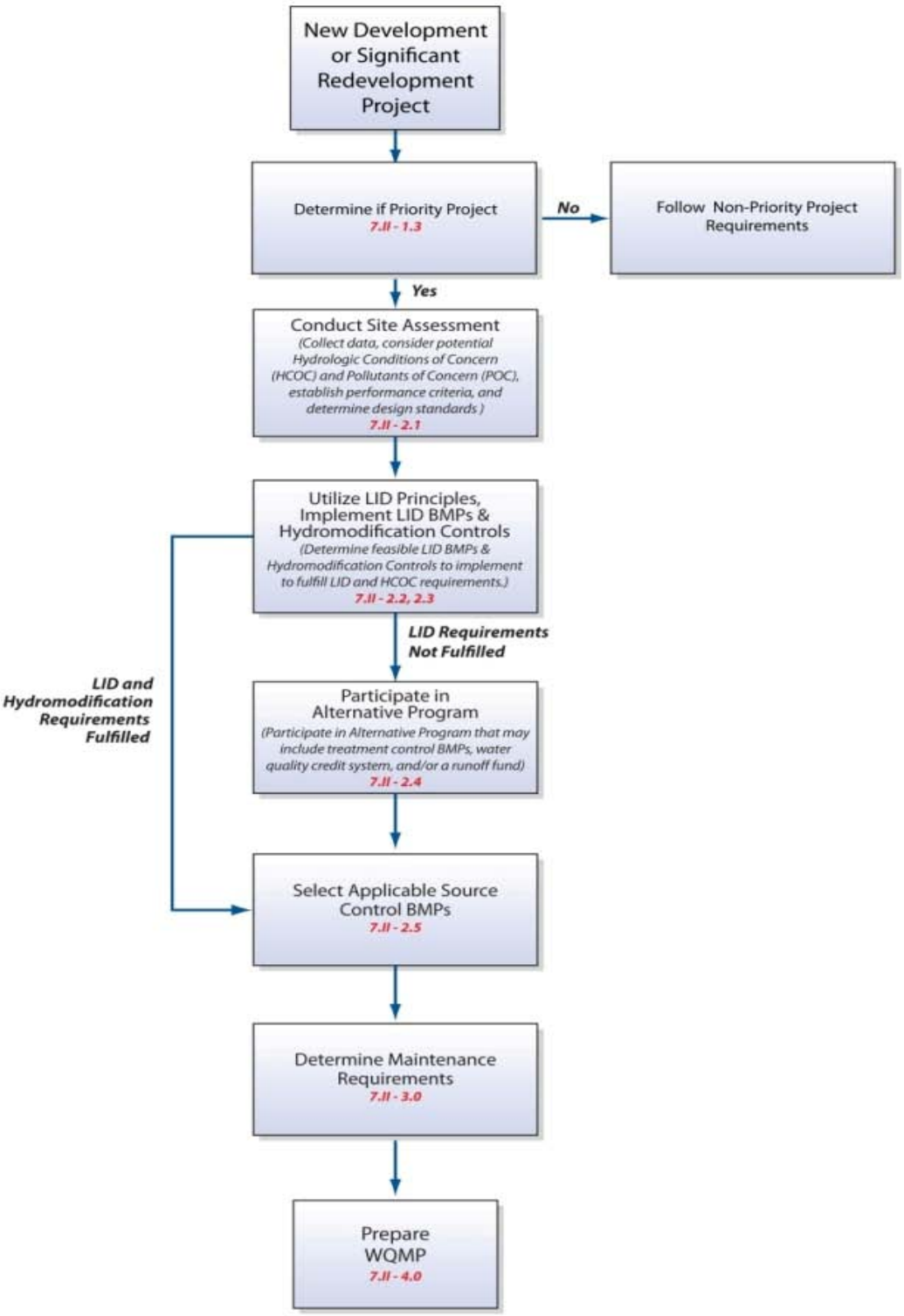
Under both permits, New Development/Significant Redevelopment requirements apply to Public Agency projects that meet the definitions in the Priority Project Categories described above. In general, the same Project WQMP overall development steps described herein apply to public agency projects as well as private development projects. However, there are unique issues associated with certain Public Agency Projects that are either specifically recognized in the Permits, or for which particular approaches can be considered.

Streets, roads, highways and freeways of 5,000 square feet or more of paved surface shall incorporate United States Environmental Protection Agency (USEPA) guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the maximum extent practicable standard and alternative criteria as discussed further in Section 7.II – 2.1.

Other public agency projects, such as above ground linear lined drainage projects that may result in the "creation" of more than 10,000 square feet of impervious surface, or below ground linear drainage and utility construction projects that may result in the "replacement" of more than 5,000 square feet of impervious surface on a developed site (i.e., an existing street) do not have categorical conditions specified in either permit. In the case of the below ground utility projects, such as storm drains, sewers, and water lines, it is assumed that these projects would be in a similar category as projects which maintain original line and grade at the surface and therefore would not qualify as a Priority Project. In the case of above ground linear drainage infrastructure, the constraints for BMP implementation for these projects are similar to streets, roads, highways and freeways and therefore such projects must implement similar practices, as discussed further in Section 7.II – 2.1.

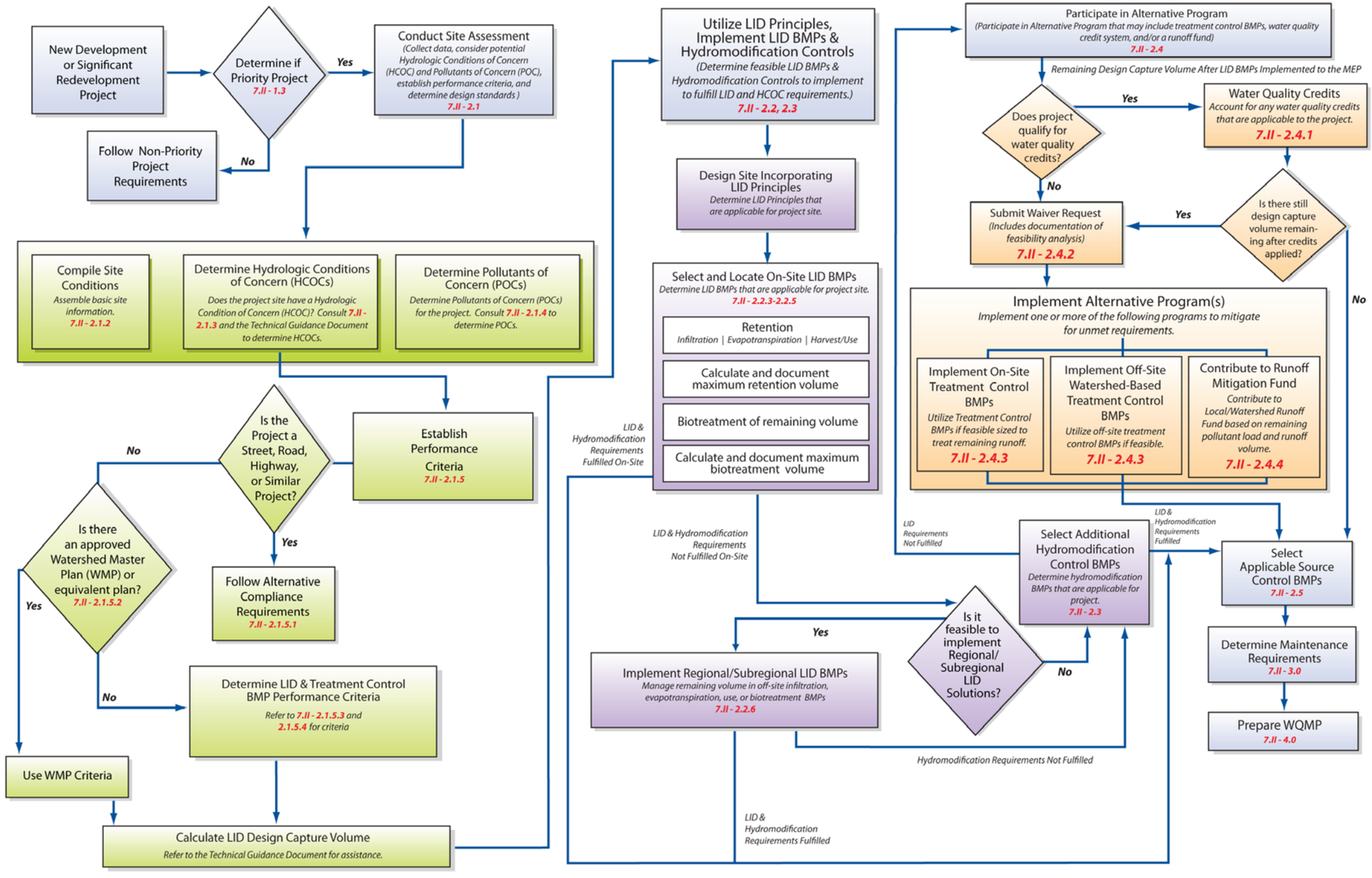
Individual Permittees may elect to develop a separate "Master Project WQMP" for streets, roads and highways projects based upon the requirements outlined in this document. A Master Project WQMP document would need to list all of the qualifying streets, roads and highways projects anticipated to occur within the Permittee's jurisdiction over a given time period and the proposed methods of compliance with this Model WQMP.

Figure 7.II-1
Overall WQMP Development Process Flow Chart



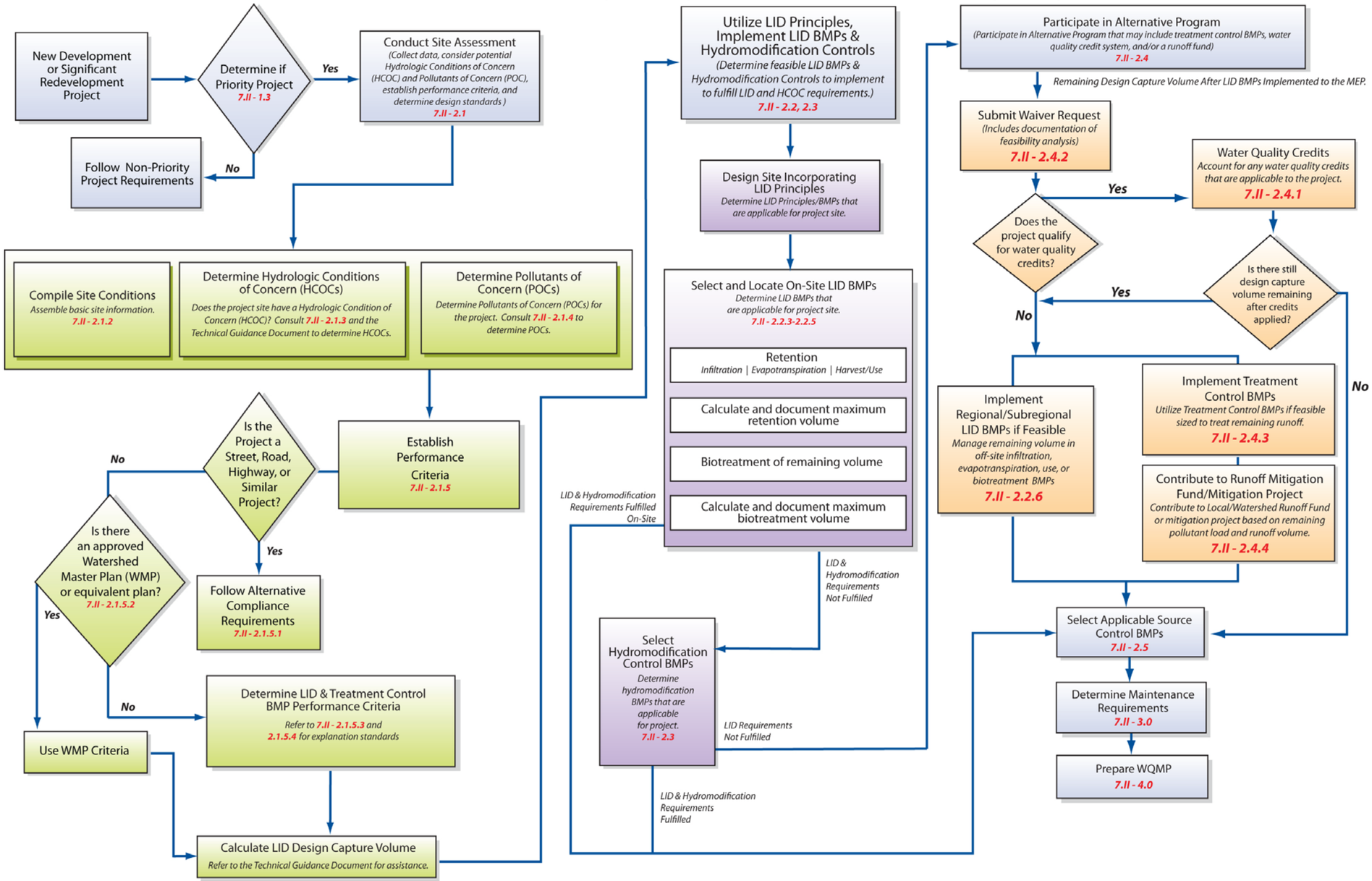
Note: Model WQMP sections shown in red.

Figure 7.II-2
WQMP Development Process Flow Chart for North Orange County



Note: Model WQMP sections shown in red

Figure 7.II-3
WQMP Development Process Flow Chart for South Orange County



Note: Model WQMP sections shown in red

7.II - 2.0 Priority Project Requirements

Proponents proposing new development and significant redevelopment Priority Projects will perform the following steps:

1. Perform site assessment and establish performance criteria
2. Develop and select site design practices and LID BMPs
3. Develop and select hydromodification control BMPs (if necessary)
4. Develop alternative compliance plans (if necessary)
5. Select applicable source control BMPs
6. Determine BMP maintenance requirements
7. Prepare a Conceptual/Preliminary, and/or Project WQMP and submit for approval

Steps 1-5 are described in the following subsections. Step 6 is described in Section 7.II-3.0, and Step 7 is described in Section 7.II-4.0.

7.II - 2.1 Perform Site Assessment and Establish Performance Criteria

7.II – 2.1.1 Introduction

Site assessment involves the following steps:

1. Compile site conditions;
2. Determine if hydrologic conditions of concern are applicable;
3. Determine pollutants of concern;
4. Establish performance criteria; and
5. Determine design standards

Using this information, the applicable performance criteria that apply to the remaining steps in the overall process can be determined.

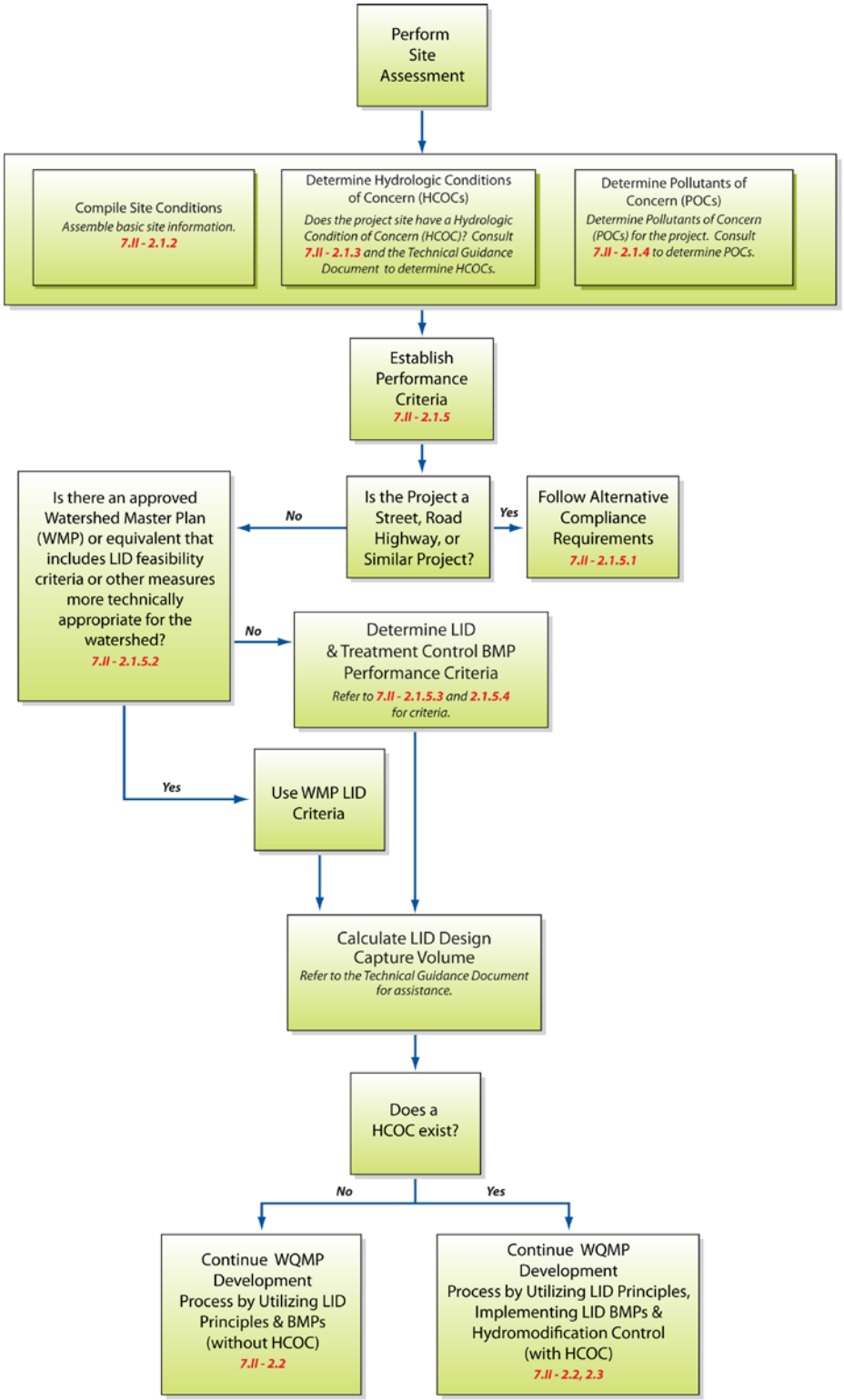
Each of these steps is described in more detail in the following subsections. A flow chart of the key steps and decisions required for site assessment is shown in **Figure 7.II-4.**

7.II – 2.1.2 Compile Site Conditions

Basic information for the site that must be compiled includes:

- Community Name or Planning Area (if located in planned community): Provide exhibit of project site and surroundings in sufficient detail to allow project location to be plotted on a base map.
- Site specifics such as general and specific location, site address, and size (acreage to the nearest 1/10 acre).

Figure 7.II-4
Assessment for Priority Projects



Note: Model WQMP sections shown in red

- Watershed name: Provide the name of the receiving water for the proposed project discharge and information on how runoff may enter the receiving water (i.e. through an un-named tributary or discharging directly into the water).
- Site characteristics, including description of site drainage and how it ties with drainage of surrounding property. Reference to the Project WQMP's Plot Plan showing drainage flow arrows and how drainage ties to drainage of surrounding property.
- Additional information described in the Technical Guidance Document Section 3, as necessary to support evaluation of LID feasibility, selection and design, potentially including:
    - Topography
    - Soil Type and Geology
    - Groundwater Considerations
        - Groundwater Levels
        - Groundwater/Soil Contamination
        - Protection of Groundwater Quality
        - Groundwater Recharge
        - Groundwater/Surface Water Interactions
    - Geotechnical Considerations
        - Collapsible Soils
        - Expansive Soils
        - Slopes
        - Liquefaction
    - Managing Off-Site Drainage
    - Existing Utilities
    - Environmentally Sensitive Areas

Site assessment also involves making determinations and compiling information relative to two primary issues:

- Determine Hydrologic Conditions of Concern (HCOCs)
- Determine Pollutants of Concern (POCs)

For projects and sites in which both HCOCs and POCs must be considered as discussed below, the evaluations will be closely linked, as described in the following sections.

7.II - 2.1.3 Determine Hydrologic Conditions of Concern

Priority Project proponents shall use these guidelines to identify if HCOCs are associated with the proposed project. Projects with HCOCs shall mitigate them by utilizing the hydromodification control measures set forth in the Project WQMP.

7.II – 2.1.3.1 Introduction to Hydromodification Control

Hydromodification is the alteration of natural flow characteristics and sediment supply, which can result from new development and significant redevelopment projects without appropriate preventative controls. Common impacts to the hydrologic regime resulting from development include increased runoff volume and velocity; reduced infiltration; increased flow frequency, duration, and peaks; and faster time to reach peak flow. Under certain circumstances, new development and significant redevelopment could also result in the reduction in the amount of sediment supplied to the channel for transport. If the sediment supplied to the channel is reduced such that in-stream flows are transporting sediment faster than it can be replenished, then erosion of the channel's bed and bank may occur. These changes have the potential to permanently impact downstream channels and habitat integrity. A change to a Priority Project site's hydrologic characteristics would be considered a condition of concern if the change would have a significant impact on downstream natural channels and habitat integrity. In determining whether an impact is significant, the cumulative effects on the watershed must be considered.

7.II – 2.1.3.2 Determine if a Project Must Evaluate HCOCs

The first step to determine whether or not HCOCs must be evaluated is based on the Proposed Project's location and point of discharge. Both permits contain conditions under which it is presumed that the project does not have the potential to have an HCOC, based on the characteristics of downstream receiving waters, as noted below:

- North County Permit:
    - All downstream conveyance channels that will receive runoff from the project are engineered, hardened and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected.
- South County Permit:
    - Discharges of stormwater from the project are to underground storm drains discharging directly to bays or the ocean.
    - Discharges of stormwater runoff from the project are to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to ocean waters, enclosed bays, estuaries, or water storage reservoirs and lakes.

To assist in determining whether a proposed project is located such that HCOCs need to be considered, maps of the watersheds and drainage areas have been developed that indicate where HCOCs may potentially exist. The maps may be found in the Technical Guidance Document.

These maps may be used by local jurisdictions and project proponents to determine whether HCOCs need to be considered; or local jurisdictions may, at their discretion, determine through an engineering analysis that accounts for the same factors, the downstream conveyance channels within or downstream of their jurisdiction that meet these criteria.

Subsequent sections of the Model WQMP describe alternative requirements for projects with and without HCOCs that must be considered.

7.II – 2.1.4 Determine Pollutants of Concern

Urban runoff from a developed site and stormwater pollution associated with the runoff has the potential to contribute pollutants, including suspended solids/sediment, nutrients, metals, microbial pathogens, oil and grease, toxic organic compounds, and trash and debris from the municipal storm drain system to tributary receiving waters. Pollutants of concern associated with new development and redevelopment projects are a function of both receiving issues and pollutants that can be found in runoff from developed land uses.

7.II – 2.1.4.1 Receiving Water Pollutants of Concern

For the purposes of identifying receiving water pollutants of concern, and selecting appropriate Treatment Control BMPs for new development projects, pollutants are grouped in seven general categories:

Suspended Solids / Sediment – Suspended solids / sediment consist of soils or other surficial materials that are eroded and then transported or deposited by the action of wind, water, or gravity. Excessive sedimentation can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth. The largest source of suspended solids / sediment is typically erosion from disturbed soils.

Nutrients – This category includes the macro-nutrients nitrogen and phosphorus. They commonly exist in the form of mineral salts dissolved or suspended in water and as particulate organic matter transported by stormwater. Excessive discharge of nutrients to water bodies and streams can cause eutrophication, including excessive aquatic algae and plant growth, loss of dissolved oxygen, release of toxins in sediment, and significant swings in hydrogen ion concentration (pH). Primary sources of nutrients in urban runoff are fertilizers, trash and debris, and eroded soils. Urban areas with improperly managed landscapes can be substantial sources.

Metals – Certain metals can be toxic to aquatic life if concentrations become high enough to stress natural processes. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Copper and zinc are typically associated with building materials, including galvanized metal and ornamental copper, and automotive products, including tires and brake pads. 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. The primary source of metals in urban stormwater is typically commercially available metal products and automobiles.

Microbial Pathogens (Bacteria and Viruses) – Bacteria and viruses are ubiquitous microorganisms that thrive under a range of environmental conditions. Water containing excessive pathogenic bacteria and viruses can create a harmful environment for humans and aquatic life. The source of pathogenic bacteria and viruses is typically the transport of animal or human fecal wastes from the watershed, but pathogenic organisms do occur in the natural environment. Non-pathogenic bacteria (fecal coliform and E. Coli) that can be more routinely detected and quantified are used as indicator organisms to suggest the potential presence of pathogens.

Oil and Grease – Oil and grease are characterized as high-molecular weight organic compounds. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality. Introduction of these pollutants to water bodies may occur due to the wide use and application of these products in municipal, residential, commercial, industrial, and construction areas. Primary sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants, and waste oil disposal.

Toxic Organic Compounds – Organic compounds (pesticides, solvents, hydrocarbons) at toxic concentrations constitute a hazard to humans and aquatic organisms. Stormwater coming into contact with organic compounds can transport excessive levels of organics to receiving waters. Dirt, grease, and grime retained in cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life. Sources of organic compounds include landscape maintenance areas, vehicle maintenance areas, waste handling areas, and potentially most other urban areas.

Trash and Debris – Trash (such as paper, plastic, and various waste materials) are general waste products that can typically be found throughout the urban landscape. Debris includes waste products of natural origin which are not naturally discharged to water bodies (such as landscaping waste, woody debris, etc.) The presence of trash and debris may have a significant impact on the recreational value of a water body and upon the health of aquatic habitat.

7.II – 2.1.4.2 Expected Pollutants from Project Components

Using **Table 7.II-2**, pollutants that are expected to be generated or have a potential to be generated from a Priority Project may be identified. Site-specific conditions shall also be considered for potential pollutant sources, such as legacy pesticides or nutrients in site soils as a result of past agricultural practices or hazardous materials in site soils from industrial uses. Hazardous materials that have been remediated and do not pose a current or future threat to stormwater quality are not considered a pollutant of concern.

To identify if the project's receiving waters are currently impacted by pollutants of concern, each Priority Project proponent shall, at a minimum, do the following:

- Identify the proximate receiving water for each point of discharge and all water bodies downstream of the receiving water, using hydrologic unit basin numbers as identified in the most recent version of the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) prepared by the State Water Resources Control Board; the Water Quality Control Plan for the Santa Ana Basin prepared by the Santa Ana Regional Board; or the Water Quality Control Plan for the San Diego Basin, prepared by the San Diego Regional Board.
- Identify each proximate and downstream receiving water identified above that is listed on the most recent list of Clean Water Act Section 303(d) impaired water bodies (Table 7.II-3 (or as revised, see Regional Board websites for most recent 303(d) List) or for which a Total Maximum Daily Load (TMDL) has been adopted (Table 7.II-4) (or as revised, see Regional Board websites for most recent list of adopted TMDLs) and is being implemented.

  - Table 7.II-3 includes both the current list of impairments adopted by the State Water Resources Control Board in 2006, and the pending updated list of impairments that have been adopted by the individual Regional Boards and are pending expected approval by the State Board in 2010.
  - Table 7.II-4 lists TMDLs that have been adopted and are being implemented in the Orange County Watersheds as of May 2010 (check with the State Water Resources Control Board for updates to adopted TMDLs within Orange County).

- Compare the list of pollutants for which the receiving waters are impaired or for which TMDLs have been adopted with the pollutants anticipated to be generated by the land uses included in the project (as identified in **Table 7.II-2**)

Primary Pollutants of Concern are any pollutants anticipated to be generated by the project using **Table 7.II-2** that have also been identified as causing impairment of project receiving waters (**Table 7.II-3)** or for which TMDLs are in place (**Table 7.II-4)**. Other pollutants of concern are those pollutants anticipated to be generated by the project using **Table 7.II-2** that have not been identified as causing impairment or have an adopted TMDL for the project's receiving waters.

Further information on pollutants of concern may also be available from the environmental impact assessment for the project (e.g., project-specific pollutant evaluations in California Environmental Quality Act (CEQA) Environmental Impact Reports). This site-specific information should be used to supplement, or in some cases supersede, the pollutants of concern identified through the methods described in this section. Watershed planning documents should also be reviewed for identification of specific implementation requirements that address pollutants of concern.

Table 7.II-2 Anticipated and Potential Pollutants Generated by Land Use Type

Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris
Detached Residential Development	E	E	N	E	E	E	N	E
Attached Residential Development	E	E	N	E	E	E(2)	N	E
Commercial/ Industrial Development	E(1)	E(1)	E(5)	E(3)	E(1)	E	E	E
Automotive Repair Shops	N	N	E	N	N	E	E	E
Restaurants	E(1)(2)	E(1)	E(2)	E	E(1)	E	N	E
Hillside Development >5,000 ft²	E	E	N	E	E	E	N	E
Parking Lots	E	E(1)	E	E(4)	E(1)	E	E	E
Streets, Highways, & Freeways	E	E (1)	E	E(4)	E(1)	E	E	E
Retail Gasoline Outlets	N	N	E	N	N	E	E	E

E = expected to be of concern

N = not expected to be of concern

(1) Expected pollutant if landscaping exists on-site, otherwise not expected.

(2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.

(3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.

(4) Bacterial indicators are routinely detected in pavement runoff.

(5) Expected if outdoor storage or metal roofs, otherwise not expected.

Table 7.II-3 Summary of the 2006 and 2010 303(d) Listed Water Bodies and Associated Pollutants of Concern for Orange County

Region	Water Body	Pollutant																	
		Bacteria Indicators/ Pathogens		Metals		Nutrients		Pesticides		Toxicity		Trash		Salinity/ TDS/ Chlorides		Turbidity		Other Organics	
		2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List
Region 8 Santa Ana	Anaheim Bay			X	X			X	X	X	X							X	X
	Bolsa Chica Channel			X	X														
	Buck Gully Creek	X	X																
	Huntington Beach State Park	X																X	X
	Huntington Harbor	X	X	X	X			X	X	X	X							X	X
	Los Trancos Creek (Crystal Cove Creek)	X	X																
	Newport Bay, Lower			X		X	X	X	X	X	X							X	X
	Newport Bay, Upper (Ecological Reserve)			X	X	X	X	X	X	X	X					X	X	X	X
	San Diego Creek, Reach 1	X	X	X	X	X	X	X	X										
	San Diego Creek, Reach 2			X															
	Seal Beach	X	X															X	X
	Silverado Creek	X	X											X	X				

Table 7.II-3 Summary of the 2006 and 2010[1] 303(d) Listed Water Bodies and Associated Pollutants of Concern for Orange County (Continued)

Region	Water Body	Pollutant																	
		Bacteria Indicators/ Pathogens		Metals		Nutrients		Pesticides		Toxicity		Trash		Salinity/ TDS/ Chlorides		Turbidity		Other Organics	
		2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List	2006 List	2010 List
Region 9 San Diego	Aliso Creek (Mouth)	X	X																
	Aliso Creek (20 Miles)	X	X			X	X			X	X								
	Dana Point Harbor	X	X		X						X								
	Pacific Ocean Shoreline, Aliso Beach HSA	X																	
	Pacific Ocean Shoreline, Dana Point HSA	X																	
	Pacific Ocean Shoreline, Laguna Beach HSAs	X																	
	Pacific Ocean Shoreline, Lower San Juan HSA	X	X																
	Pacific Ocean Shoreline, San Clemente HA at San Clemente City Beach, North Beach	X	X																
	Pacific Ocean Shoreline, Other San Clemente and San Joaquin Hills HAs	X																	
	Pacific Ocean Shoreline, San Mateo Canyon HAs		X																
	Prima Deshecha Creek				X	X	X									X	X		
	San Juan Creek	X	X		X		X	X			X								
	Segunda Deshecha Creek					X	X				X					X	X		

[1] 2010 303(d) list information will be updated upon approval of the final 303(d) list

Table 7.II-4 Summary of the Status of TMDLs for Waterbodies in Regions 8 and 9

Region	Water Body	Pollutant				
		Bacteria Indicators/ Pathogens	Metals	Nutrients	Pesticides	Turbidity/ Siltation
Region 8 Santa Ana	Newport Bay, Lower	Implementation Phase	Technical TMDLs	Implementation Phase	Technical TMDLs	Implementation Phase
	Newport Bay, Upper (Ecological Reserve)	Implementation Phase	Technical TMDLs	Implementation Phase	Technical TMDLs	Implementation Phase
	San Diego Creek, Reach 1		Technical TMDLs	Implementation Phase	Technical TMDLs and Implementation Phase	Implementation Phase
	San Diego Creek, Reach 2		Technical TMDLs	Implementation Phase		Implementation Phase
Region 9 San Diego	Aliso Creek (20 Miles) Pacific Ocean Shoreline, Laguna Beach HSAs	Implementation Phase				
	Dana Point Harbor Pacific Ocean Shoreline HSAs	Implementation Phase or In Progress				
	Pacific Ocean Shoreline, San Clemente HA	In Progress				
	San Juan Creek (mouth)	Implementation Phase				

7.II – 2.1.5 Establish Performance Criteria

Using the information compiled in the above steps, several overall performance criteria need to be established for the proposed project under consideration. These include:

- Determine if the project is a street, road, highway, or above ground linear lined drainage facility with similar characteristics
- Determine hydromodification control performance criteria
- Determine site design and LID performance criteria
- Determine treatment control BMP performance criteria
- Calculate the LID design storm capture volume
- Complete site assessment process

Once the performance criteria have been established, the next step is to develop and select site design practices and on-site LID BMPs and hydromodification control BMPs based on these project-specific criteria.

7.II - 2.1.5.1 Determine if the Project is a Street, Road, Highway, or Above Ground Linear Lined Drainage Facility with Similar Characteristics

If the proposed project is a street, road, highway, or freeway with 5,000 square feet or more of paved surface, the project shall incorporate USEPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the maximum extent practicable standard. This category includes the impervious area within the right-of-way associated with any paved surface used for the transportation of automobiles, trucks, motorcycles and other vehicles. Routine road maintenance activities where the footprint is not changed are excluded. Separate compliance requirements for these projects are discussed in Section 7.II – 2.2.4.

The alternative compliance approach described in Section 7.II – 2.2.4 applies only to stand-alone public agency projects. Streets, roads or highway projects that are planned and constructed as part of a private new development or significant redevelopment project, even if they will become dedicated public right-of-way upon project completion, must be included as part of the overall Project WQMP for the private project.

Access roadways of 5,000 square feet or more of paved surface associated with flood control, drainage, and wet utilities projects shall also incorporate Green Street infrastructure. This does not include drainage improvements, flood control basins, wet utilities, and other non-linear drainage facilities.

7.II – 2.1.5.2 Determine Hydromodification Performance Criteria

For projects that may have an impact on the site's hydrologic regime, an assessment of potential hydromodification impacts and appropriate controls is required. The requirements are significantly different between the North County and South County permit areas as further described below:

North County Requirements

For proposed projects within the North County permit area that may have an HCOC, each Priority Project proponent must determine the impact of the proposed development on the downstream hydrologic characteristics. The evaluation of potential impacts is based on the following for a two-year frequency storm event:

- Increases in runoff volume;
- Decreases in infiltration;
- Changes in time of concentration;
- Potential for increases in post development downstream erosion; and,
- Potential for adverse downstream impacts on physical structure, aquatic and riparian habitat.

A project does not have an HCOC if either of the following conditions is met:

- The volumes and time of concentration of stormwater runoff for the post-development condition do not significantly exceed those of the predevelopment condition for a two-year frequency storm event (a difference of five percent or less is considered insignificant).
- The site infiltrates at least the runoff from a two-year storm event.

If a hydrologic condition of concern exists, priority projects shall implement on-site or regional hydromodification controls such that:

- Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and
- Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent.

Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to:

- Retain the excess volume from the two-year runoff event to the maximum extent practicable, and
- Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.

At any point in this process, a project-specific engineering analysis conducted by a licensed geomorphic professional may find that the level of hydrologic control provided through on-site, regional, and/or in-stream hydromodification controls is adequate to addresses hydrologic conditions of concern.

Orange County will be developing Watershed Master Plans for the North County permit area that integrates water quality, hydromodification, water supply, and habitat conditions for the following watersheds:

- Coyote Creek-San Gabriel River
- Anaheim Bay-Huntington Harbor
- Santa Ana River
- Newport Bay-Newport Coast

The Watershed Master Plans will include: (1) maps to identify areas susceptible to hydromodification including downstream erosion, impacts on physical structure, impacts on riparian and aquatic habitats and areas where stormwater and urban runoff infiltration is possible and appropriate; (2) a hydromodification model to make available as a tool to enable project proponents to readily select stormwater preventive and mitigative site BMP measures; and (3) identification of regional facilities and their tributary areas in which different site performance standards may apply.

Once a Watershed Master Plan is available for the watershed in which a the proposed project is located, the plans may specify hydromodification management standards for each sub-watershed and will provide assessment tools to readily select stormwater preventive and mitigative site BMP measures. Watersheds that do not have developed Watershed Master Plans should use the HCOC criteria detailed in this section and in the Technical Guidance Document.

Watershed Master Plans will also identify integrated water quality, hydromodification, water supply, and habitat strategies. These strategies may include identification of regional facilities and their tributary areas or identification of watershed-based considerations related to retention of stormwater on-site which could be used to improve the application of feasibility criteria described in Section 7.II -2.2.5.

South County Requirements

For new development or redevelopment projects within South Orange County, interim hydromodification criteria apply until a Hydromodification Management Plan is adopted. Priority Projects must implement the following criteria by comparing the predevelopment (naturally occurring) and post-project flow rates and durations using a continuous simulation hydrologic model:

- For flow rates from ten percent of the two-year storm event to the five-year storm event, the post-project peak flows shall not exceed predevelopment (naturally occurring) peak flows.
- For flow rates from the five-year storm event to the ten-year storm event, the post-project peak flows may exceed predevelopment (naturally occurring) flows by up to ten percent for a one-year frequency interval.

7.II - 2.1.5.3 Determine LID BMP Performance Criteria

The following performance criteria for LID implementation are stated in the permits:

- Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event ("design capture volume").
- A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration cannot be feasibly implemented for the full design capture volume. In this case, infiltration, harvest and use, and evapotranspiration practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.

It is expected that a diversity of controls will be provided, if feasible, to achieve the greatest feasible retention of the design capture volume, then if necessary, biotreatment of the remaining design capture volume.

The design capture storm depth is the 85th percentile, 24-hr storm depth that, when applied to the project site results in the design capture volume. The design capture storm depth varies across the county and is shown in Appendix B. The Technical Guidance Document provides information for determining the applicable "design capture storm depth" to apply to a project to calculate design capture volume as well as guidance for recommended hydrologic methods.

Equivalent performance criteria have been synthesized from permit requirements with consideration of the MEP standard and analysis of local precipitation and evapotranspiration patterns. The following performance criteria result in capture and retention and/or biotreatment of 80 percent of average annual stormwater runoff volume. The performance criteria for LID are stated as follows:

- LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) stormwater runoff up to 80 percent average annual capture efficiency, or
- LID BMPs must be designed to:
    - retain, on-site, (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the "design capture volume", and
    - recover (i.e., draw down) the storage volume as soon as possible after a storm event (see criteria for maximizing drawdown rate in the Technical Guidance Document), and, if necessary
    - biotreat, on-site, additional runoff, as feasible, up to 80 percent average annual capture efficiency (cumulative, retention plus biotreatment), and, if necessary
    - [North Orange County only] retain or biotreat, in a regional facility, the remaining runoff up to 80 percent average annual capture efficiency (cumulative, retention plus biotreatment, on-site plus off-site), and, if necessary
    - fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency.

Per the South County Permit, the volume provided in the pre-filter detention volume (surface storage) and pores of biotreatment BMPs may not be less than 75 percent of the design capture volume, regardless of the average annual capture efficiency achieved.

Instructions for calculating BMP requirements to meet these criteria are provided in the Technical Guidance Document.

Criteria for evaluating the feasibility of retention and, if necessary, biotreatment on-site are provided in Section 7.II-2.2.5. These criteria are based on the MEP standard.

7.II - 2.1.5.4 Determine Treatment Control BMP Water Quality Performance Criteria

This section contains performance criteria for treatment control BMPs. Note that satisfaction of LID performance criteria also fully satisfies treatment control performance criteria.

North County Requirements

If LID performance criteria have not been met through retention and biotreatment, then treatment control BMPs may be used solely or as part of an alternative compliance approach (See Section 8). Sizing of treatment control BMP(s) would be provided based on the unmet volume as calculated in Section 8 of the Technical Guidance Document.

South County Requirements

If LID performance criteria have not been met through retention and biotreatment, treatment control BMPs shall be provided. Two potential cases could arise with respect to performance criteria of treatment control BMPs:

- LID performance criteria can be partially, but not fully met with LID BMPs.
  - Sizing of treatment control BMP(s) shall be based on the unmet volume to achieve cumulative 80 percent average annual capture efficiency as calculated in Section 8 of the Technical Guidance Document.
- The project or a drainage area within the project cannot feasibly incorporate any LID BMPs.
  - Sizing shall be provided based on one of the following criteria:
    - Capture and infiltrate, filter, or treat 80 percent of average annual runoff volume,

      OR
    - Capture and infiltrate, filter, or treat the runoff from the 24-hour, 85th percentile storm event, as determined from the County of Orange's 85th Percentile Precipitation Isopluvial Map and draw down the stored volume in no more than 48 hours following the end of precipitation,

      OR
    - Treat the maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two,

      OR
    - The maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour, for each hour of a storm event.

7.II - 2.1.5.5 Complete Site Assessment Process

The information generated under Sections 7.II -2.1.1 through 7.II-2.1.5 shall be documented and used in subsequent steps of the WQMP development process. The next step is to develop and select site design measures and on-site LID BMPs as discussed in Section 7.II-2.2.

7.II – 2.2 Develop and Select Site Design Measures and LID BMPs

The North and South County Permits both stress the importance of project planning and design utilizing the principles of LID, which is defined as an ecosystem-based approach to designing a built environment that remains a functioning part of an ecosystem rather than existing apart from it. LID is an approach to urban stormwater management that does not rely entirely on end-of-pipe structural methods; rather, it strategically integrates stormwater controls into the urban landscape. Permit requirements can be addressed through the use of structural and non-structural LID techniques, which reduce the discharge of pollutants and the effects of changes to runoff patterns caused by land use modifications.

7.II – 2.2.1 Introduction to Site Design Measures and LID BMPs

The primary goal of LID is to preserve a site's predevelopment hydrology. The effects of changes to runoff patterns and pollutant loading caused by land use modifications can be reduced through the use of structural and non-structural techniques that store, infiltrate, evaporate, and detain runoff.

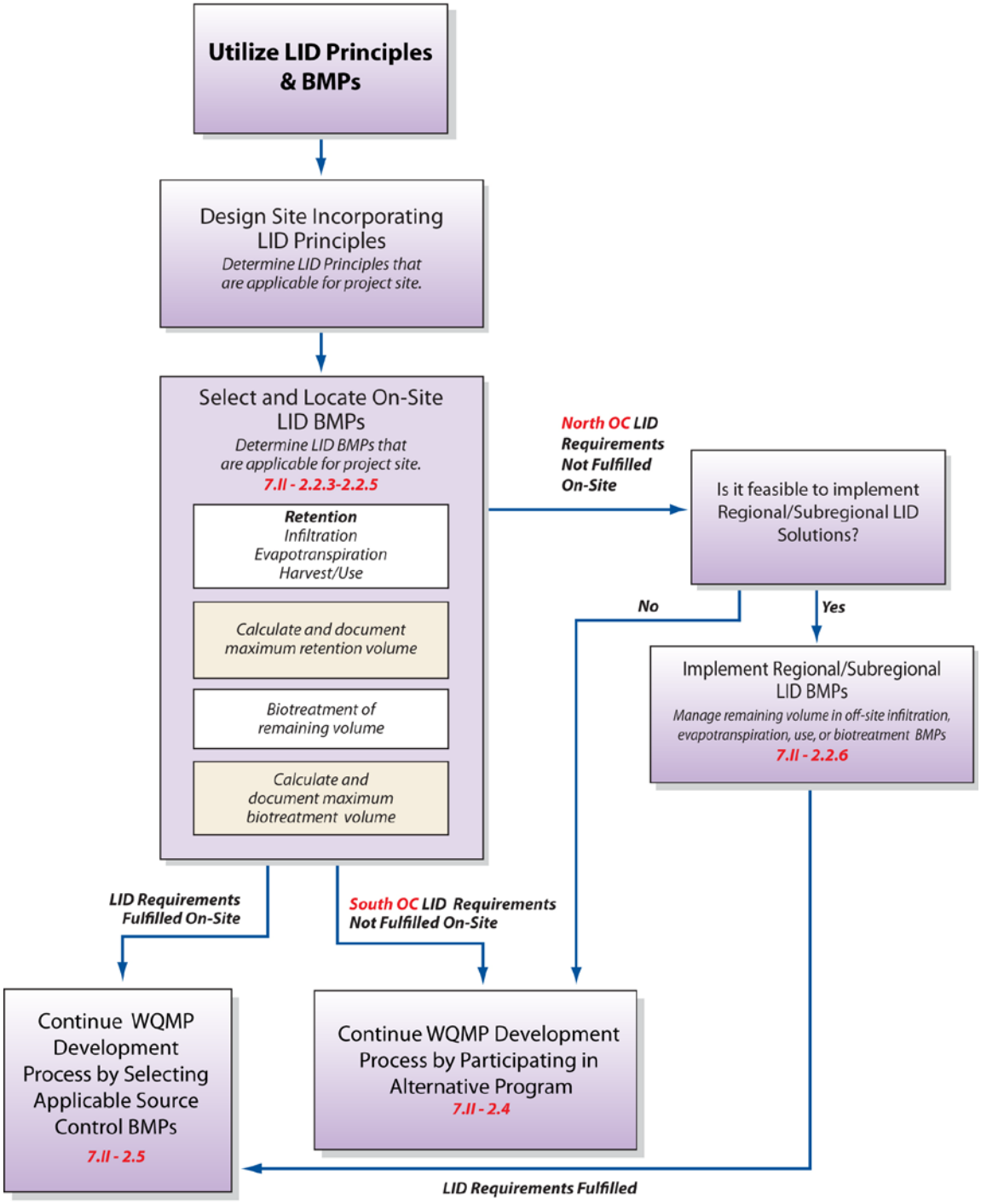
Pre-development conditions in North Orange County are defined as the conditions of the project immediately prior to project submittal (i.e., the existing conditions). In South Orange County, pre-development is defined as the naturally occurring (pre-human disturbance) conditions.

Both the North and South County Permits contain requirements to implement LID practices for the purposes of water quality control and hydromodification control for Priority Projects. Section 2 in the Technical Guidance Document provides guidance on the permit requirements related to BMP performance expressed as performance criteria for LID, treatment control, and hydromodification control BMPs.

While requirements for LID, treatment control, and hydromodification control are stated independently in the Permits, and Priority Projects must demonstrate compliance with each individually, these provisions overlap significantly and some management practices may fulfill or partially fulfill a portion of one or more of each of these requirements. The LID and treatment control requirements are especially interrelated because full compliance with LID requirements inherently results in compliance with treatment control requirements. LID and hydromodification control requirements are also interrelated as both are based on reduction of runoff volume as their first priority.

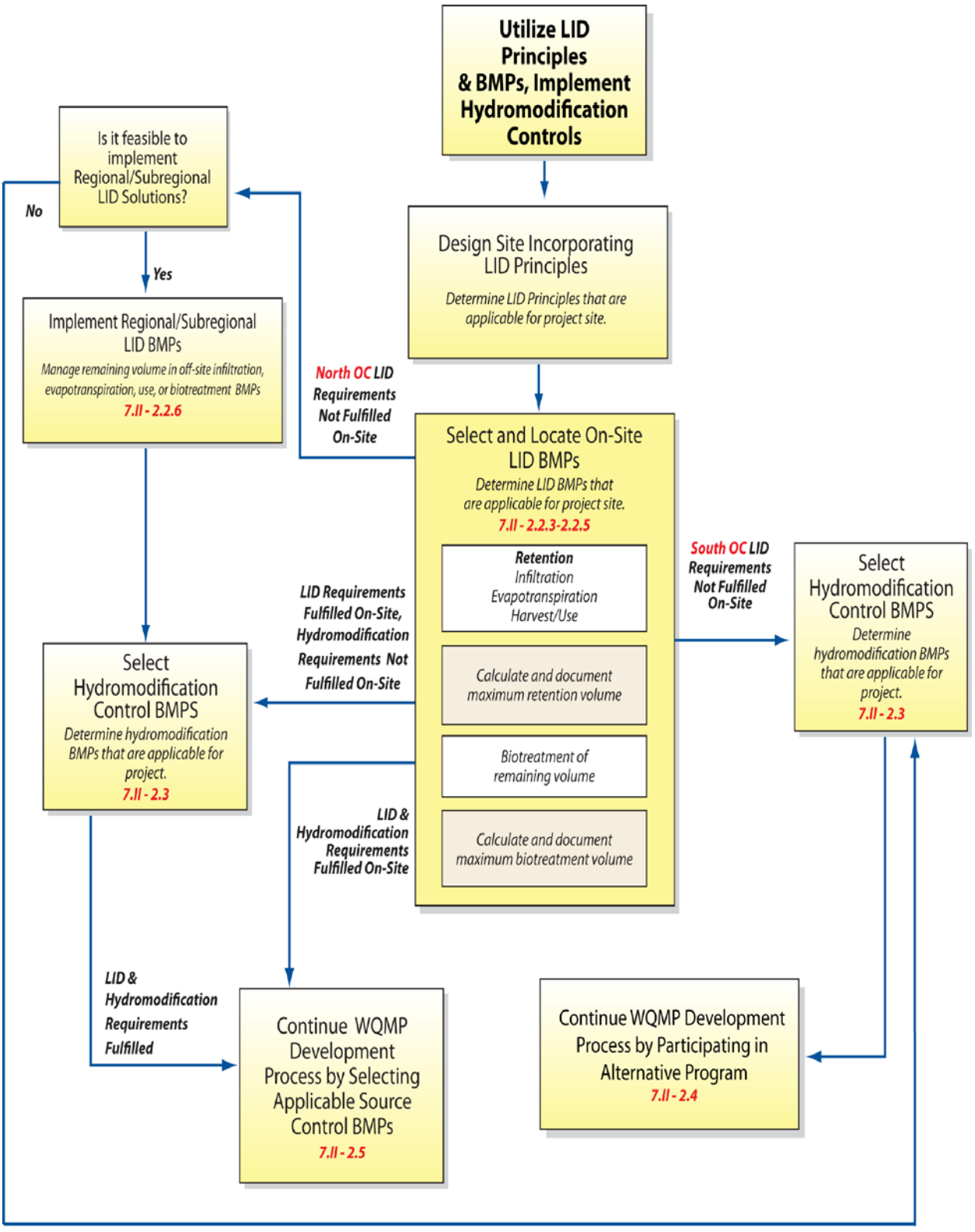
The steps involved in selecting LID practices are described in more detail in the following subsections. A flow chart of the key steps and decisions required for selecting LID BMPs is shown in **Figure 7.II-5** for projects where there is no potential for HCOCs and **Figure 7.II-6** for Projects which must consider HCOCs**.** The Technical Guidance Document expands on these steps and provides specific instructions for selecting, designing, and documenting the use of LID practices.

Figure 7.II-5
Design the Site Incorporating LID Principles – No HCOCs



Note: Model WQMP sections shown in red

Figure 7.II-6
Low Impact Development Selection Process – With Potential HCOCs



Note: Model WQMP sections shown in red

7.II – 2.2.2 Site Design Practices

LID site design practices include a wide range of potential practices that can be implemented to reduce the volume of stormwater runoff generated on a project site as well as improve the quality of runoff that leaves the site. LID site design is predominantly "preventative" in nature as it consists of practices that reduce the amount of runoff and other impacts before, or immediately after, they occur. Examples of "preventative" aspects of LID site design include reduction of impervious area, preservation of drainage courses, and restoration of impacted soils. Descriptions of the most common site design practices are provided in Technical Guidance Document Section 4.

There are no numeric performance criteria for site design practices, however, LID site design should be considered as the first priority in the hierarchy of LID implementation, beginning with the earliest phases of a project. The use of effective site design practices can result in smaller LID, treatment control, and/or hydromodification control BMPs than if site design practices are not used. Including space for BMPs in the site design at the earliest phases of the project planning process can allow projects to more easily satisfy numeric performance criteria.

On-site LID practices that should be considered include, but are not limited to, the following:

- Maximize Natural Infiltration Capacity
- Preserve Existing Drainage Patterns and Time of Concentration
- Protect Existing Vegetation and Sensitive Areas
- Minimize Impervious Area
- Disconnect Impervious Areas
- Minimize Construction Footprint
- Re-vegetate Disturbed Areas

Each of these techniques is described further in the following subsections.

7.II – 2.2.2.1 Maximize Natural Infiltration Capacity

A key component of LID is taking advantage of a site's natural infiltration and storage capacity. This will limit the amount of runoff generated, and therefore the need for mitigation BMPs. An assessment of site soils/geology will help to define areas with high potential for infiltration and surface storage. These areas are typically characterized by

- Hydrologic Soil Group A or B soils, and possibly Hydrologic Soil Group C soils
- Mild slopes or depressions
- Historically undeveloped areas

7.II – 2.2.2.2 Preserve Existing Drainage Patterns and Time of Concentration

Integrating existing drainage patterns into the site plan will help maintain a site's predevelopment hydrologic function. Preserving existing drainage paths and depressions will help maintain the time of concentration and infiltration rates of runoff, decreasing peak flows.

Analysis of the existing site drainage patterns during the site assessment phase of the project can help to identify the best locations for buildings, roadways, and stormwater BMPs.

Minimize site grading that eliminates small depressions, which can provide storage of small storm volumes. Where possible, add additional depression "micro" storage throughout the site's landscaping. Mild gradients can be used to extend the time of concentration, which reduces peak flows and increases the potential for additional infiltration.

7.II – 2.2.2.3 Protect Existing Vegetation and Sensitive Areas

When planning the site, avoid disturbing areas containing dense vegetation or well-established trees. 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 can take decades. Sensitive areas, such as wetlands, streams, floodplains, or intact forest, should also be avoided.

Vegetative cover can also provide additional volume storage of rainfall by retaining water on the surfaces of leaves, branches, and trunks of trees during and after storm events. On sites with a dense tree canopy this storage can provide additional volume mitigation.

7.II – 2.2.2.4 Minimize Impervious Area

One of the principal causes of hydrologic and water quality impacts due to development is the creation of impervious surfaces. Impervious cover can be minimized through identification of the smallest possible land area that can be practically impacted or disturbed during site development. It is important to note that local laws and ordinances may dictate minimum requirements for road widths or building setbacks that cannot be reduced due to public health and safety concerns.

7.II – 2.2.2.5 Disconnect Impervious Areas

Runoff from 'connected' impervious surfaces commonly flows directly to a stormwater collection system with no opportunity for infiltration into the soil. For example, roofs and sidewalks commonly drain onto parking lots, and the runoff is conveyed by the curb and gutter to the nearest storm inlet. Runoff from numerous impervious drainage areas may converge, combining their volumes, peak runoff rates, and pollutant loads. Disconnecting impervious areas from conventional stormwater conveyance systems allows runoff to be collected and managed at the source or redirected onto pervious surfaces such as vegetated areas. This reduces the amount of directly connected impervious area (DCIA), and will reduce the peak discharge rate by increasing the time of concentration (Tc), maximize the opportunity for infiltration by reducing the velocity of flows and providing for greater contact time with the soil, and maximize the opportunity for evapotranspiration during transport.

Disconnection practices may be applied in almost any location, but impervious surfaces must discharge into a suitable receiving area for the practices to be effective. Information gathered during the site assessment will help inform the determination of appropriate receiving areas. Typical receiving areas for disconnected impervious runoff include landscaped areas and/or LID BMPs (see Section 7.II-2.2.3). Runoff must not flow toward building foundations or be redirected onto adjacent private properties. Setbacks from buildings or other structures may be required to ensure soil stability.

Receiving areas must be located down gradient from runoff discharges. In a residential setting, this could mean that roof runoff discharges to either the front yard or the back yard, depending on the site configuration. As compared to conventional development, some potential techniques for redirecting flows to vegetated areas may require local design standards to be revisited.

7.II – 2.2.2.6 Minimize Construction Footprint

Minimizing the amount of site clearing and grading can dramatically reduce the overall hydrologic impacts of site development. This applies primarily to new construction but the principles can be adapted to retrofit and infill projects as well.

Soil compaction resulting from the movement of heavy construction equipment can reduce soil infiltration rates by 70-99 percent (Gregory et al, 2006). Even low levels of compaction caused by light construction equipment can significantly reduce infiltration rates. In addition, compaction can destroy the complex network of biota in the soil profile that support the soil's ability to capture and mitigate pollutants. Soil compaction severely limits the establishment of healthy root systems of plants that may be used to revegetate the area. For these reasons, it is very important to avoid unnecessary damage to soils during the construction process. The use of clearly defined protection areas will help to preserve the existing capacity of the site to store, treat and infiltrate stormwater runoff.

7.II – 2.2.2.7 Re-vegetate Disturbed Areas

Maximizing plant cover protects the soil and improves ability of the site to retain stormwater, minimize runoff, and help to prevent erosion. Plants have multiple positive impacts on downstream water quality. First, the presence of a plant canopy (plus associated leaf litter and other organic matter that accumulates below the plants) can intercept rainfall, which reduces the erosive potential of precipitation. With less eroded material going to receiving waters, turbidity, chemical pollution, and sedimentation are reduced. Second, a healthy plant and soil community can help to trap and remediate chemical pollutants and filter particulate matter as water percolates into the soil. This occurs through the physical action of water movement through the soil, as well as through biological activity by plants and the soil microbial community that is supported by plants. Third, thick vegetative cover can maintain and even improve soil infiltration rates.

7.II – 2.2.3 Select, Locate, and Size LID BMPs

After reviewing the site design measures and LID BMP information and consulting the Technical Guidance Document, project proponents should select and locate applicable site design measures and LID BMPs on-site based on the performance criteria established in Section 7.II - 2.1.5. In general, site design measures should be considered first and will have the effect of reducing the effective runoff volume to be managed that is generated from developed areas of the site through site design measures described above. LID BMPs must then be considered in the following order and will have the effect of:

- Retaining runoff volume created from the developed areas through either infiltration, evapotranspiration or harvest and use; or
- Providing biotreatment, with some additional infiltration or evapotranspiration, and discharging the remaining treated runoff.

-

Table 7.II-5: LID BMPs by Category

Infiltration	Evapo-transpiration and Evaporation	Harvest and Use	Biotreatment
➢ Infiltration Trenches ➢ Infiltration Basins ➢ Bioretention without underdrains ➢ Drywells ➢ Permeable Pavement ➢ Proprietary Infiltration	➢ Green Roofs ➢ Brown Roofs ➢ Blue Roofs	➢ Cisterns ➢ Underground Detention ➢ Irrigation Use ➢ Domestic Use	➢ Bioretention with underdrains ➢ Stormwater Planter Boxes with underdrains ➢ Constructed Wetlands ➢ Vegetated Swales ➢ Vegetated Filter Strips ➢ Dry Extended Detention Basins ➢ Wet Extended Detention Basins ➢ Proprietary Detention

Table 7.II–5 provides a list of LID BMPs that can be considered within each of the above categories. The Technical Guidance Document provides detailed descriptions, performance, design criteria, and other design criteria for the full list of retention and biotreatment BMPs. Because biotreatment BMPs must be properly engineered and maintained to satisfy the LID requirements of the Permits, a summary of specific design operation and maintenance criteria for biotreatment systems is contained in Appendix C.

The Technical Guidance Document (Sections 3.5 and 3.6) describe an approach for selecting, locating, and sizing LID BMPs. For many sites, combinations of any or all of the above practices may be possible and appropriate.

7.II – 2.2.4 Select, Locate and Size LID BMPs for Street, Road, or Highway Projects or Projects with Similar Constrained Right of Way Characteristics

Public street, road, and highway projects and other public projects with similar constrained characteristics are generally more limited in design flexibility and the availability of right-of-way to incorporate many LID BMPs, in particular retention BMPs. Design approaches described in the USEPA Managing Wet Weather with Green Infrastructure: Green Streets guidance should be considered consistent with the MEP standard.

The limitations associated with public roadway and similar linear projects result in a functionally different application of the MEP standard. In addition, the USEPA Green Streets guidance includes neither sizing criteria nor an explicit hierarchy of controls (i.e., it does not differentiate between retention, biotreatment, and treatment control BMPs). Such projects must attempt, as their first priority, to apply the approaches described in the Green Streets guidance to meet the numeric sizing criteria described in Section 7.II-2.1.5. Where these criteria cannot be met, rationale must be provided, and then reduced design criteria may be used consistent with the opportunities of the project. The amount of runoff volume that is estimated to be captured through the incorporation of applicable LID BMPs does not need to be calculated and documented. This approach satisfies the LID, treatment control, and hydromodification control requirements for an applicable project.

These requirements apply to stand-alone public agency roadway projects.

EPA's "Green Streets" guidance offers examples of the types of BMPs to consider for residential streets, commercial streets, arterials streets, and alleys.

- Residential Streets

  Residential streets may offer the greatest potential for incorporating Green Streets techniques in new neighborhoods or retrofitting existing streets as traffic is typically slower and less frequent. Residential street areas are also more likely to have some landscape features available for BMP implementation.

  BMPs that should be considered for residential streets include:

  - Stormwater curb extensions
  - Permeable pavement
  - Vegetated swales

- Commercial Streets

  Commercial streets accommodate a wide range of uses including drivers, bikers, transit riders, on-street parking, pedestrians, etc. These multiple uses can make finding space to address stormwater quality requirements challenging. There are, however, several BMP implementation options that should be considered when planning for and designing commercial streets, including:

  - Stormwater planters
  - Stormwater curb extensions
  - Permeable pavement

- Arterial Streets

  Arterial streets are typically wide stretches of pavement with little vegetated area and access to pedestrians. Despite these constraints, there are still opportunities to incorporate Green Street concepts during the planning and design of arterial streets. Vegetated swales can be incorporated along arterials during design, and can be retrofitted within existing vegetated medians and other right of way areas.

  - Vegetated swales
  - Permeable pavement

- Alleys

  Residential alleys can comprise a significant amount of impervious surface. Green Street concepts that effectively reduce and treat runoff from alleys include:

  - Permeable pavement
  - Vegetated swales

The EPA guidance describes how some of these BMPs may be used in combination to achieve optimal benefits in runoff reduction and water quality improvement. See Section 6.10 of the Technical Guidance Manual for additional details on BMP implementation for streets, roads, and highway projects.

Linear Lined Drainage Projects

If the proposed project will be a lined drainage channel of 5,000 square feet or more of paved surface, similar requirements would apply to the paved roadway surface. This does not include unlined drainage improvements, flood control basins and other non-linear drainage facilities. The BMPs described above can be used in linear drainage infrastructure projects to reduce the volume of runoff generated in those areas and resulting water quality.

7.II – 2.2.5 On-site LID Feasibility Analysis

The goal of the on-site feasibility analysis is to objectively determine the amount of runoff that 1) can feasibly be retained (i.e., infiltrated, evapotranspirated, and/or harvested and used) and, 2) if not completely retained then biotreated on-site. Furthermore, the feasibility analysis will provide the basis for documenting project and site conditions under which it is not feasible to fully meet the LID BMP performance criteria leading to applying for a waiver and compliance with an alternative strategy as discussed further in Section 7.II-2.4.

Thus a technically and economically-based feasibility analysis shall be conducted to:

- Ensure that the Priority Projects meet LID performance criteria to the maximum extent practicable (MEP); and

- Ensure that BMPs are implemented in a way that does not pose significant risk(s) to human health, potentially result in environmental degradation, or conflict with overall water resource management objectives.

The Technical Guidance Document describes in detail a tiered approach for conducting this analysis which should be followed by Priority Projects. Alternative approaches for conducting the feasibility analysis may be used with approval from the reviewing agency. Any approach used for conducting feasibility analysis shall meet the requirements and guidelines described in the following sections. The approach described in the Technical Guidance Document meets these requirements and guidelines.

In South Orange County, development projects greater than 100 acres in total project size, or smaller than 100 acres in size yet part of a larger common plan of development that is over 100 acres, that have been prepared using watershed and/or sub-watershed-based water quality, hydrologic, and fluvial geomorphologic planning principles are subject to alternative requirements for feasibility analysis. These projects may implement regional LID BMPs in accordance with the sizing and location criteria of the South County Permit without first conducting an on-site LID feasibility analysis.

7.II - 2.2.5.1 Overall Structure of On-site Feasibility Analysis Approach

Analysis of the feasibility of meeting LID performance criteria on-site shall be based on a tiered approach in which a Priority Project progresses from general feasibility considerations to more detailed feasibility considerations. The approach shall be implemented such that:

- The factors affecting feasibility may be accounted for at the phase of the project planning process during which they become available, and
- Only LID BMPs that are potentially feasible based on general screening must be considered in the most rigorous phases of the analysis.

The feasibility analysis approach shall be implemented such that:

- BMPs which pose a significant risk to human health, have documented potential for environmental degradation, or are in conflict with overall water resource management approaches may not be used. Factors that shall be considered in this determination are described in Section 7.II-2.2.5.2.
- Of the remaining BMPs, those with a high likelihood of infeasibility based on general screening factors shall not be required to demonstrate consistency with the MEP standard, but may be considered. Factors that shall be considered in this determination are described in Section 7.II-2.2.5.3.
- Remaining BMPs shall be required to be considered and shall be subjected to a rigorous feasibility analysis in order to demonstrate consistency with the MEP standard. Factors that shall be considered in this analysis are described in Section 7.II-2.2.5.3.

7.II - 2.2.5.2 Criteria for Determining BMPs that are Suitable for Consideration

BMPs shall be screened categorically to determine which types of BMPs are suitable for consideration for a given project site. BMPs are suitable except those that pose a significant documented risk to human health, have significant documented potential for environmental

degradation, or are in conflict with overall water resource management approaches as documented by a study with sufficient resolution to support this finding. BMP categories defined for the purpose of this screening include: 1) infiltration BMPs, 2) harvest and use BMPs, 3) evapotranspiration BMPs, and 4) biotreatment BMPs.

Regional maps may be employed to support screening where the cost of site-specific investigation is prohibitively high compared to total project costs. This determination should also consider the uncertainty of regional maps in determining which types/sizes of projects should be able to use these maps. Uncertainty in the use of regional maps may be reduced through conservative application of criteria (i.e., adjusting the threshold criteria such that BMPs would tend to be deemed feasible where uncertainty exists) or the improvement and/or validation of maps, potentially allowing broader application of regional maps for evaluating LID feasibility.

Feasibility criteria for categories of BMPs are provided below. Guidance for applying these criteria is provided in the Technical Guidance Document.

Infiltration BMPs

Infiltration BMPs shall be considered except as described in this section. Infiltration BMPs are deemed infeasible where any of the following conditions exist:

- Stormwater infiltration would result in significant documented risks to drinking water quality and groundwater quality that cannot be reasonably and technically mitigated. This determination shall consider vertical separation to seasonally high groundwater table, horizontal separation to drinking water supply wells, quality of runoff from tributary land uses, and other factors.
- Stormwater infiltration would result in a significant documented risk of mobilizing or moving contamination under brownfield sites or adjacent to brownfield sites that cannot be reasonably and technically avoided, as documented by a site-specific study or available watershed study with sufficient resolution to determined the specific parts of the project where infiltration is restricted.
- Stormwater infiltration would result in a significant documented risk of causing or contributing to plume movement of a groundwater pollutant plume (man-made or natural) under the site or in close proximity that cannot be reasonably and technically avoided, as documented by a site-specific study or available watershed study with sufficient resolution to determined the specific parts of the project where infiltration is restricted.
- Stormwater infiltration would result in significantly increased risks of geotechnical hazards such as liquefaction or landslides that cannot be reasonably and technically mitigated as documented by a geotechnical professional.
- Infiltration of runoff would violate downstream water rights. While it is not anticipated that infiltration of runoff would violate water rights in Orange County, water law in California is complex, and this document does not exclude the possibility that a rightful water rights claim could restrict infiltration of stormwater. The South County Permit

contemplates the potential for stormwater management activities to violate water rights at F.3.d.(6)(d).

- Use of infiltration BMPs would otherwise result in a violation of codes or ordinances or pose a significant documented risk to human health, have significant documented potential to result in environmental degradation, or conflict with overall water resource management approaches as documented by a study with sufficient resolution to support this finding.

Infiltration BMPs may be deemed wholly or partially infeasible where:

- Reduction of runoff over pre-developed conditions would be partially or fully inconsistent with watershed-scale management strategies and/or would impair beneficial uses of the receiving water. The level of allowable reduction shall be documented in a site-specific study or available watershed study with sufficient resolution to determine the specific parts of the project where reduction of runoff is restricted and to what degree reduction of runoff is restricted in these parts.
- Increase in infiltration over natural conditions would be partially or fully inconsistent with watershed-scale management strategies and/or would have significant documented potential to cause impairments to downstream beneficial uses (e.g., change of seasonality of ephemeral washes or seeps at the beach), as documented by a site-specific or available watershed study with sufficient resolution to determined locations where infiltration should be restricted and to what degree infiltration shall be restricted.

Harvest and Use BMPs

Harvest and Use BMPs shall be considered except as described in this section. Harvest and Use BMPs are deemed infeasible where any of the following conditions exist:

- Use of harvested water for the type of demand on the project would violate codes or ordinances in effect at the time of project application. Note: The Permits require that codes/ordinances which presently serve as barriers to implementation of Permit provisions should be identified and effort should be undertaken to revise these as appropriate. However, this document does not have the authority to modify codes/ordinances, and it remains a likely possibility that some forms of harvest and use will be in violation of codes/ordinances for some time.
- Harvest and use of runoff would violate downstream water rights. While it is not anticipated that infiltration of runoff would violate water rights in Orange County, water law in California is complex, and this document does not exclude the possibility that a rightful water rights claim could restrict infiltration of stormwater. The South County Permit contemplates the potential for stormwater management activities to violate water rights at F.3.d.(6)(d).
- Harvest and use of runoff would otherwise result in a violation of codes or ordinances in effect at the time of project submittal, pose a significant documented risk to human health, have significant documented potential to result in environmental degradation, or conflict with overall water resource management approaches as documented by a study with sufficient resolution to support this finding.

Harvest and use BMPs may be deemed wholly or partially infeasible where:

- Reduction of runoff over pre-developed conditions would be partially or fully inconsistent with watershed-scale management strategies and/or would impair beneficial uses of the receiving water. The level of allowable reduction shall be documented in a site-specific study or available watershed study with sufficient resolution to determine the specific parts of the project where reduction of runoff is restricted and to what degree reduction of runoff is restricted in these parts.
- The site is designated for reclaimed water use for irrigation and/or toilet flushing and insufficient demand is available for both reclaimed and harvested stormwater use.

Evapotranspiration BMPs

Evapotranspiration (ET) BMPs may be considered except where:

- Evapotranspiration BMPs conflict with codes or ordinances in effect at the time of project application (e.g., low water use landscaping requirements).
- Evapotranspiration BMPs would otherwise result in a violation of codes or ordinances or pose a significant documented risk to human health, have significant documented potential to result in environmental degradation, or conflict with overall water resource management approaches as documented by a study with sufficient resolution to support this finding.

Green roofs, brown roofs, and blue roofs are currently considered beyond the MEP standard in Orange County and are not required to be considered but are encouraged. These BMPs may always be considered where they meet the criteria listed above.

Biotreatment BMPs

If LID performance criteria cannot be met through use of retention BMPs, then biotreatment BMPs shall be considered except as described in this section. Biotreatment BMPs are deemed infeasible where any of the following conditions exist:

- Biotreatment BMPs conflict with codes or ordinances in effect at the time of project application (e.g., low water use landscaping requirements).
- Biotreatment BMPs would otherwise result in a violation of codes or ordinances or pose a significant documented risk to human health, have significant documented potential to result in environmental degradation, or conflict with overall water resource management approaches as documented by a study with sufficient resolution to support this finding.

7.II - 2.2.5.3 Criteria for Implementing Feasible BMPs to MEP

If LID performance criteria cannot be met with the selected BMPs (Section 7.II-2.2.5.2), a rigorous feasibility analysis shall be conducted to demonstrate that the LID BMPs that are considered suitable for the project are implemented to the MEP consistent with the hierarchy of controls embedded in the LID performance criteria. This analysis shall be based on technical and non-technical factors, taking into account considerations of synergistic, additive, and competing factors, including, but not limited to, gravity of the problem, technical feasibility,

fiscal feasibility, public health risks, societal concerns, and social benefits. BMPs may be applied beyond the MEP.

This feasibility analysis shall be conducted based on:

- Technically-derived screening factors based on project characteristics, site conditions, and other factors expressed as conditions under which a certain BMP or BMP type would have a very low potential for being consistent with the MEP for the project, and
- Minimum criteria for BMP selection, BMP design, and site design that shall be met to demonstrate that LID BMPs have been installed to the MEP, and
- Minimum criteria for incremental cost effectiveness that must be achieved to require use of a BMP to achieve the MEP.

These components are described in the following sections.

Technically Derived Screening Factors for MEP Determination

Technically-derived screening factors shall be based on technical analyses that seek to establish conditions under which a BMP or BMP type would have limited cost effectiveness or be otherwise inconsistent with the MEP in the great majority of cases. These may include, but are not limited to:

- Conditions under which measured infiltration rates are too low to provide significant benefit with reasonable dedication of land area,
- Conditions under which harvest and use is very unlikely to be cost effective or is not reliable due to insufficient, inconsistent, or unreliable demand for harvested water,
- Conditions under which green roofs, brown roofs, and blue roofs are beyond MEP because of uncertainty of performance, potential conflicts with overall water resource management approaches, and/or degree of societal acceptance.

Minimum Criteria for System Design

Retention BMPs (infiltration, harvest and use, evapotranspiration) shall be provided to meet LID performance criteria to the MEP. Where performance criteria cannot be completely achieved by retention BMPs, the remaining portion of the performance criteria shall be biotreated to the MEP. Any remaining performance criteria shall be met through alternative programs.

The following conditions shall be met to demonstrate that retention has been provided to MEP, and, if necessary, biotreatment has been provided to MEP:

- BMPs shall be selected based on the opportunities of the project, through a rigorous BMP prioritization process in which all feasible BMPs are considered, and
- Site design shall be sufficient to allow for LID BMPs to the MEP with consideration for project type and site constraints, and
- Volume reduction shall be maximized, up to the target capture efficiency, by:

  - Providing as much storage as technically feasible given site constraints, up to the design capture volume, in retention BMPs, and
  - Designing the BMPs to draw down as quickly as possible given site constraints (Refer to the Technical Guidance Document for criteria for maximizing draw down rate), and

- If necessary, biotreatment shall be maximized, up to 80 percent cumulative average annual capture efficiency, while promoting retention up to the MEP by:
  - Providing as much storage as technically feasible given site constraints, up to the design capture volume, in retention plus biotreatment BMPs, and
  - Designing the BMPs to draw down at a rate consistent with design requirements to provide adequate treatment functionality.

If these conditions are met, and the resulting system still does not meet LID performance criteria, then the remaining portion of the LID performance criteria shall be met through an alternative program. If these conditions are not met, the application of LID BMPs cannot be deemed consistent with the MEP standard and additional measures must be taken such as revising site plans and increasing storage volume in order to meet these conditions and demonstrate consistency with the MEP standard.

The Technical Guidance Document provides a stepwise approach for applying these criteria as part of the system configuration and design process. Alternatively, a customized feasibility analysis may be developed and conducted at the discretion of the project proponent and approval of the applicable planning authority to demonstrate consistency with LID performance criteria to the MEP, taking into account considerations of synergistic, additive, and competing factors, including, but not limited to, gravity of the problem, technical feasibility, fiscal feasibility, public health risks, societal concerns, and social benefits.

Minimum Cost Effectiveness

BMPs meeting minimum criteria for system design, but which achieve less than a certain threshold of relative cost effectiveness (compared to other approved BMP types) shall not be required to be selected for use. This threshold shall be developed taking into account considerations of synergistic, additive, and competing factors, including, but not limited to, gravity of the problem, technical feasibility, fiscal feasibility, public health risks, societal concerns, and social benefits.

Consistency with Watershed Management Strategies

LID BMPs which are inconsistent with approved watershed management strategies shall not be required to be considered and in some cases may be considered infeasible. On-site infiltration, harvest and use, evapotranspiration, and biotreatment BMPs are considered optional where the following condition is met:

- An approved watershed-based plan has identified a subregional or regional BMP opportunity and demonstrated that this opportunity meets the following criteria:

- The sub-regional/regional BMP is located such that runoff from the project would be conveyed to the BMP prior to discharge to a receiving water. However, stormwater runoff from an individual project may be conveyed to a regional treatment system via a receiving water if the pollutants in the runoff have been controlled on-site using LID techniques to the MEP and beneficial uses of the receiving water have not been impacted, and

- The sub-regional/regional BMP is sufficiently sized to receive runoff from the project, and

- The sub-regional/regional BMP is sited and designed such that it will provide greater overall benefit than would be achieved by biotreatment BMPs on-site, including combined considerations of pollutant loading, hydrologic loading, groundwater recharge, potable water demand, and SmartGrowth goals.

The sub-regional/regional BMP will be adequately maintained into perpetuity.

7.II – 2.2.6 LID Practices Implemented on a Regional or Sub-Regional Basis

7.II – 2.2.6.1 General Approach

While most of the LID practices and LID BMPs described in this Model WQMP are focused at an individual project level, it may be most appropriate to implement LID on a broader regional or sub-regional basis for certain development conditions. Though LID principles may be considered universally applicable, there could be constraining factors, such as soil conditions, groundwater levels, soil and/or groundwater contaminants, space restrictions or redevelopment conditions which result in conditions under which it would be consistent with the MEP standard to integrate LID principles into regional or sub-regional plans without requiring upstream projects to first maximize on-site control. Such conditions could be identified as part of a watershed-level LID planning process undertaken by multiple jurisdictions and project proponents within a common watershed. Also, if new sub-regional or regional BMP opportunities using LID approaches, such as a regional infiltration basin or natural treatment system (NTS) basin, have been identified in an approved Watershed Master Plan with provisions for participation by upstream new development projects, LID performance standards may be met through a combination of on-site and regional LID measures without first maximizing on-site control.

These approaches would require that the benefit achieved in sub-regional or regional facilities be demonstrated to be equivalent or better to what would have been achieved by on-site controls. Target cumulative capture efficiency of 80 percent shall still apply to strategies that combine on-site and off-site LID BMPs.

Community and neighborhood parks, golf courses, or other large, open landscape areas downstream of development are some examples of places where a regional or sub-regional level approach to LID could be implemented consistent with the MEP standard, as opposed to a project by project approach, if necessary conditions are met.

These approaches could require multiple jurisdictions and project proponents within a common watershed to develop a watershed-based management strategy to be implemented on a jurisdictional basis. With rising concern over preserving resources and water quality, more regional approaches to development and controlling the impacts of stormwater runoff may become increasingly necessary, through participation in watershed-level LID planning along with distributed site by site controls.

As an example of implementing LID on a regional basis, several individual developments potentially in conjunction with other agencies could propose a regional system to address storm water runoff from all the developments collectively. Use of a regional infiltration basin, regional wetland, or groundwater injection facility with other distributed swales and bioretention areas could achieve LID requirements on a regional basis. The LID BMPs selected and designed in a regional LID approach should have the capacity to infiltrate, harvest and use, evapotranspire and/or biotreat at least the design capture volume from the entire tributary area.

On a sub-regional basis, multi-use areas could meet LID requirements for several projects with conditions that make on-site implementation impractical. Using a neighborhood wetpond BMP for harvest and use, along with other common areas used for runoff capture and infiltration could achieve LID requirements. A high density housing unit development with a small strip mall and a school could connect all roof drains to vegetated areas, and construct a storm water infiltration gallery below the school playground as another example of sub-regional implementation.

The described approach requires that runoff be directed from a new development/significant redevelopment projects to the regional BMP without first discharging into waters of the U.S.

7.II – 2.2.6.2 North County Permit Area Specific Requirements for Regional LID BMPs

In the North County permit area, Priority Projects shall prioritize LID practices in the following manner:

- LID practices shall be implemented on-site, which is the preferred approach.
- LID practices shall be implemented on a sub-regional basis.
- LID practices shall be implemented on a regional basis.

7.II – 2.2.6.3 South County Permit Area Specific Requirements for Regional LID BMPs

Where a development project greater than 100 acres in total project size, or smaller than 100 acres in size yet part of a larger common plan of development that is over 100 acres, has been prepared using watershed and/or sub-watershed based water quality, hydrologic, and fluvial geomorphologic planning principles that implement regional LID BMPs in accordance with the sizing and location criteria of the South County Permit and acceptable to the Regional Board, such standards shall govern review of projects and shall be deemed to satisfy the South County Permit's requirements for LID site design, buffer zone, infiltration and groundwater protection standards, source control, treatment control, and hydromodification control standards. Regional BMPs must clearly exhibit that they will not result in a net impact from pollutant loadings over and above the impact caused by capture and retention of the design storm with on-site LID BMPs.

For South Orange County, Priority Projects that do not meet the above criteria, participation in a regional program is considered Alternative Compliance and requires that an on-site LID BMP waiver request first be prepared before participating in a subregional/regional LID solution. Additional Alternative Compliance information can be found in Section 2.4, and details concerning on-site LID BMP waivers can be found in Section 2.4.1.

7.II – 2.3 Selecting Hydromodification Control BMPs

Hydromodification control BMPs shall be used, if necessary, to meet the hydromodification performance criteria described in Section 7.II -2.1.5. Hydromodification control BMPs may be integrated with LID BMPs as described in Section 7.II – 2.2. Hydromodification controls may also be regional or in-stream, although on-site hydromodification control BMPs are the first priority. Potential hydromodification control BMPs are described in the following sections.

In North Orange County, Water Quality Credits may be utilized in certain cases to reduce the hydromodification performance criteria. Detailed explanation of these reductions can be found in Section 7.II-2.4.1. The Water Quality Credit Program is considered part of the alternative compliance program with respect to meeting water quality obligations. However, credits can be applied to reduce hydromodification requirements as part of the LID compliance evaluation.

7.II – 2.3.1 Non-Structural Measures

Similar to LID site design measures, non-structural hydrologic source control measures can be considered for use in addressing hydromodification impacts.

7.II – 2.3.1.1 Minimization of Impervious Areas / Preservation of Open Spaces (On-Site and Regional)

Project design to minimize impervious areas will reduce the increase in runoff volumes and rates that need to be managed. Open spaces with non-compacted soils will also provide opportunities for infiltration of impervious area runoff, and help to preserve the pre-development water budget (consisting of infiltration, evapotranspiration, percolation, subsurface flows, groundwater recharge, and surface runoff).

7.II – 2.3.1.2 Prioritize Soils for Development and Infiltration (On-Site and Regional)

Where possible, development within a project should be located preferentially on existing poorly infiltrating soils, leaving soils with good infiltration rates as areas for flow and volume management and groundwater recharge. If development is to occur on well infiltrating soils, then preservation of infiltration capacity and utilization of on-site infiltration facilities should be prioritized.

7.II - 2.3.1.3 Riparian Buffer Zones (In-Stream)

Establishing riparian buffer zones, where no development is allowed, prevents direct impacts to riparian habitat. It also can help prevent changes to channel geometry or bed and bank materials that can contribute to increase erosion independent of upstream flow changes. Finally, if flow can be routed slowly through the buffer, it can provide areas for infiltration and/or slower runoff rates.

7.II – 2.3.1.4 Pass Through Sediments from Open Spaces (In-Stream)

Where possible, drainage pathways for open spaces upstream of developments should be designed to pass coarse sediments from natural areas to the natural stream channels. Maintaining natural sediment supplies to streams will help to reduce the potential for excess erosion. Additional analysis or maintenance protocols may be required to ensure downstream flood protection.

7.II – 2.3.2 Structural Measures

7.II – 2.3.2.1 On-Site Volume and Flow Management (Distributed)

A variety of volume / flow management structural BMPs are available that utilize the following two basic principles:

- Manage excess runoff volumes through one or more of the following pathways: infiltration, evapotranspiration, harvest and use, discharge at a rate below the critical rate for adverse impact, or discharge downstream to a non-susceptible water body.

Detain runoff and release it in a controlled way that either mimics pre-development flow durations or reduces flow durations to account for a reduction in sediment supply. Distributed facilities are LID BMPs, typically controlling runoff from less than ten acres. These types of facilities are discussed in the Technical Guidance Document Chapter 6. These types of facilities will also help to achieve the LID performance standard.

7.II – 2.3.2.2 Detention / Retention Basins (On-site and Sub-Regional/Regional)

Detention/retention basins are stormwater management facilities that are designed to detain and infiltrate runoff from one or multiple projects or project areas. These basins are typically shallow with flat, vegetated bottoms. Detention/retention basins can be constructed by either excavating a depression or building a berm to create above ground storage, such that runoff can drain into the basin by gravity. Runoff is stored in the basin as well as in the pore spaces of the surface soils. Pretreatment BMPs such as swales, filter strips, and sedimentation forebays minimize fine sediment loading to the basins, thereby reducing maintenance frequencies.

Detention/retention basins for hydromodification management incorporate outlet structures designed for flow duration control. These basins can also be designed to support flood control and LID and treatment control objectives in addition to hydromodification control. If underlying soils are not suitable for infiltration, the basin may be designed for flow detention only, with alternative practices to manage increased volumes, such as harvest and use, discharge at a rate below the critical rate for adverse impacts, or discharge to a non-susceptible water body.

To the maximum extent possible, detention/retention basins should be designed to receive flows from developed areas only, for both design optimization, as well as to avoid intercepting coarse sediment from open spaces that should ideally be passed through to the stream channel. Reduction in coarse sediment loads contributes to channel instability.

7.II – 2.3.2.3 Options for In-Stream Controls

Hydromodification management can also be achieved by in-stream controls, including drop structures, bed and bank reinforcement, and grade control structures. In-stream controls are

desirable where a stream channel has already been impacted by existing development. In-stream controls must not adversely impact beneficial uses or result in sustained degradation of water quality of receiving waters.

7.II – 2.3.2.4 Drop Structures

Drop structures are designed to reduce the channel slope, thereby reducing the shear stresses generated by stream flows. These controls can be incorporated as natural appearing rock structures with a step-pool design which allows drop energy to be dissipated in the pools while providing a reduced longitudinal slope between structures.

7.II – 2.3.2.5 Grade Control Structures

Grade control structures are designed to maintain the existing channel slope while allowing for minor amounts of local scour. These control measures are often buried and would entail a narrow trench across the width of the stream backfilled with concrete or similar material, as well as the creation of a "plunge pool" feature on the downstream side of the sill by placing boulders and vegetation. A grade control option provides a reduced footprint and impact compared to drop structures, which are designed to alter the channel slope.

7.II – 2.3.2.6 Bed and Bank Reinforcement

Channel reinforcement serves to increase bed and bank resistance to stream flows. In addition to conventional techniques such as riprap and concrete, a number of vegetated approaches are increasingly utilized, including products such as vegetated reinforcement mats. This technology provides erosion control with an open-weave material that stabilizes bed and bank surfaces and allows for re-establishment of native plants, which serves to further increase channel stability.

7.II – 2.4 Develop Alternative Compliance Plans

This section describes alternative compliance approaches for proposed projects that are <u>not</u> able to fully meet LID requirements in one of the following ways:

- Site design and on-site LID BMPs
- Regional or subregional LID projects in North Orange County as defined in Section 7.II-2.2.6.
- Development projects in South Orange County greater than 100 acres in total project size or smaller than 100 acres in size yet part of a larger common plan of development that is over 100 acres, that have been prepared using watershed and/or sub-watershed based water quality, hydrologic, and fluvial geomorphologic planning principles that implement regional LID BMPs as described in Section 2.2.6 of the Model WQMP.

For such alternative compliance approaches, a project proponent must apply for a LID BMP Waiver and develop an alternative compliance plan for the remainder of the LID and treatment control performance criteria not addressed through one of the options listed below. Some projects may qualify for Water Quality Credits that can be applied to reduce the obligation before applying for a LID BMP Waiver. Water Quality Credits are discussed in Section 7.II-2.4.1, and LID BMP Waivers are described below in Section 7.II–2.4.2.

Alternative compliance plans may include one or more of the following elements:

North Orange County project proponents must:

- Implement on-site structural treatment control BMPs, or
- Implement watershed-based structural treatment control BMPs, or
- Contribute to an urban runoff fund, or
- A combination of to the above. address all remaining performance criteria.

South Orange County project proponents must:

- Implement regional/subregional LID solutions if feasible, or
- Implement on-site structural treatment controls (treatment control BMPs), and
    - Implement an off-site mitigation project, or
    - Contribute to a stormwater mitigation fund, or
    - A combination of these to address all remaining performance criteria.

In North Orange County, the use of treatment control BMPs is not required before discharge to waters of the US if other alternative compliance options are provided to fulfill remaining requirements and beneficial uses of receiving waters are not impaired. If treatment control BMPs are used as an alternative compliance option, the performance of these BMPs would be compared to the performance that would be achieve by on-site LID to determine the amount of obligations met. The performance provided by treatment control BMPs may be demonstrated to fully or partially meet the remaining obligations.

In South Orange County, regional/subregional LID solutions can be implemented to fulfill alternative compliance requirements as described in Section 7.II-2.2.6. Alternatively, treatment control BMPs must be incorporated into projects before discharge to waters of the US, and the project must meet remaining LID obligations though another alternative programs. The performance of treatment control BMPs could be compared to the performance that would be achieved by on-site LID to determine the amount of obligations met. The performance provided by treatment control BMPs may be demonstrated to fully or partially meet the remaining obligations.

A flow chart illustrating the key steps for developing an alternative compliance plan approach for North Orange County is shown in **Figure 7.II-7** and for South Orange County in

Figure 7.II-8. The following sections describe Water Quality Credits, LID BMP Waivers, Treatment Control BMPs, Urban Runoff Funds / Mitigation Programs, and Off-Site Mitigation.

7.II - 2.4.1 Water Quality Credits

For certain types of development projects, LID BMPs may be more difficult to incorporate due to the nature of the development, but the development practices may provide other environmental benefits to communities. For example, infiltration BMPs may not desirable for a Brownfield redevelopment site where infiltrated stormwater could cause an adverse impact to groundwater supply, but redevelopment of the site would be expected to have other

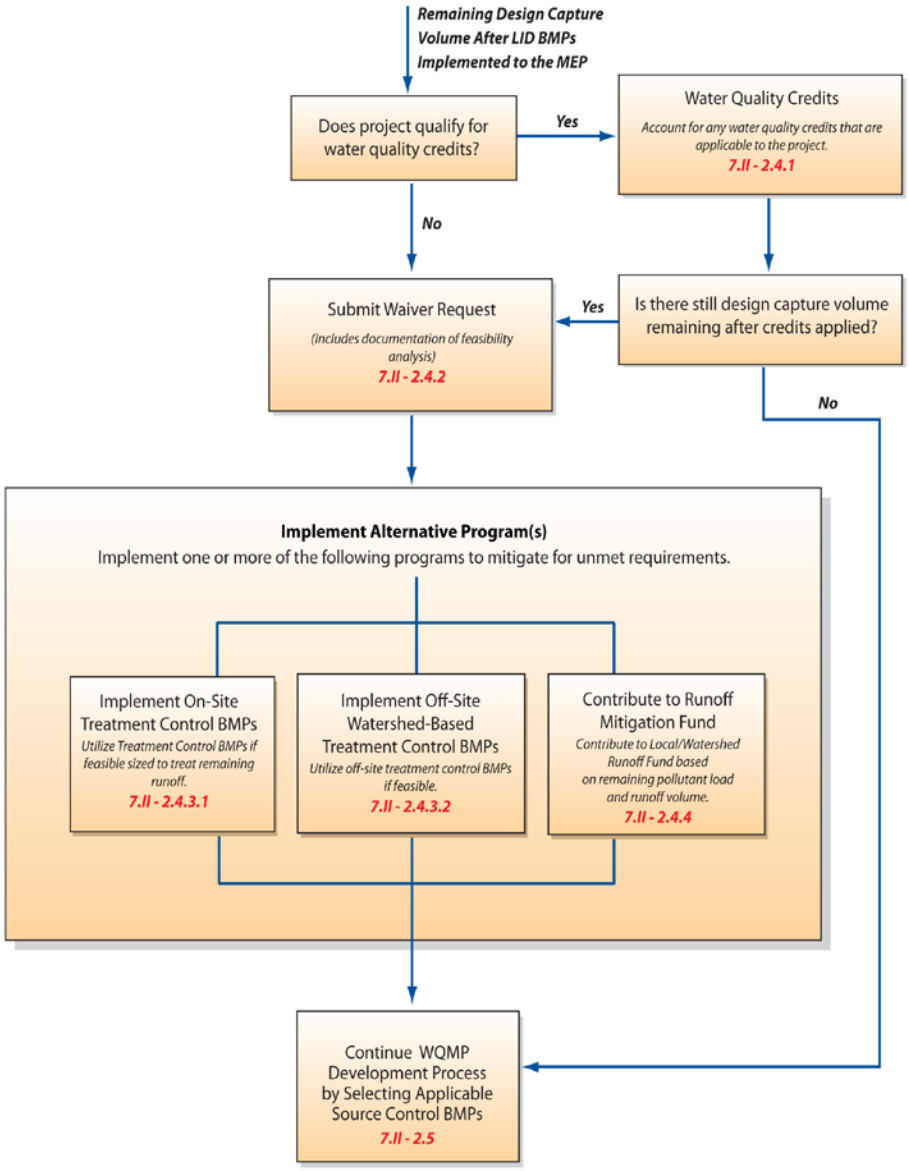
environmental benefits. Alternatively, a redevelopment project could be implemented in a way that reduces the overall impervious footprint of the project site rather than increasing it.

Local jurisdictions may develop a water quality credit program that applies to certain types of development projects after they first evaluate the feasibility of meeting LID requirements on-site. If it is not feasible to meet the requirements for on-site LID, and a project has filed a waiver project proponents for specific project types can apply credits that would reduce project obligations for selecting and sizing other treatment BMPs or participating in other alternative programs.

Projects potentially eligible for consideration for credits include:

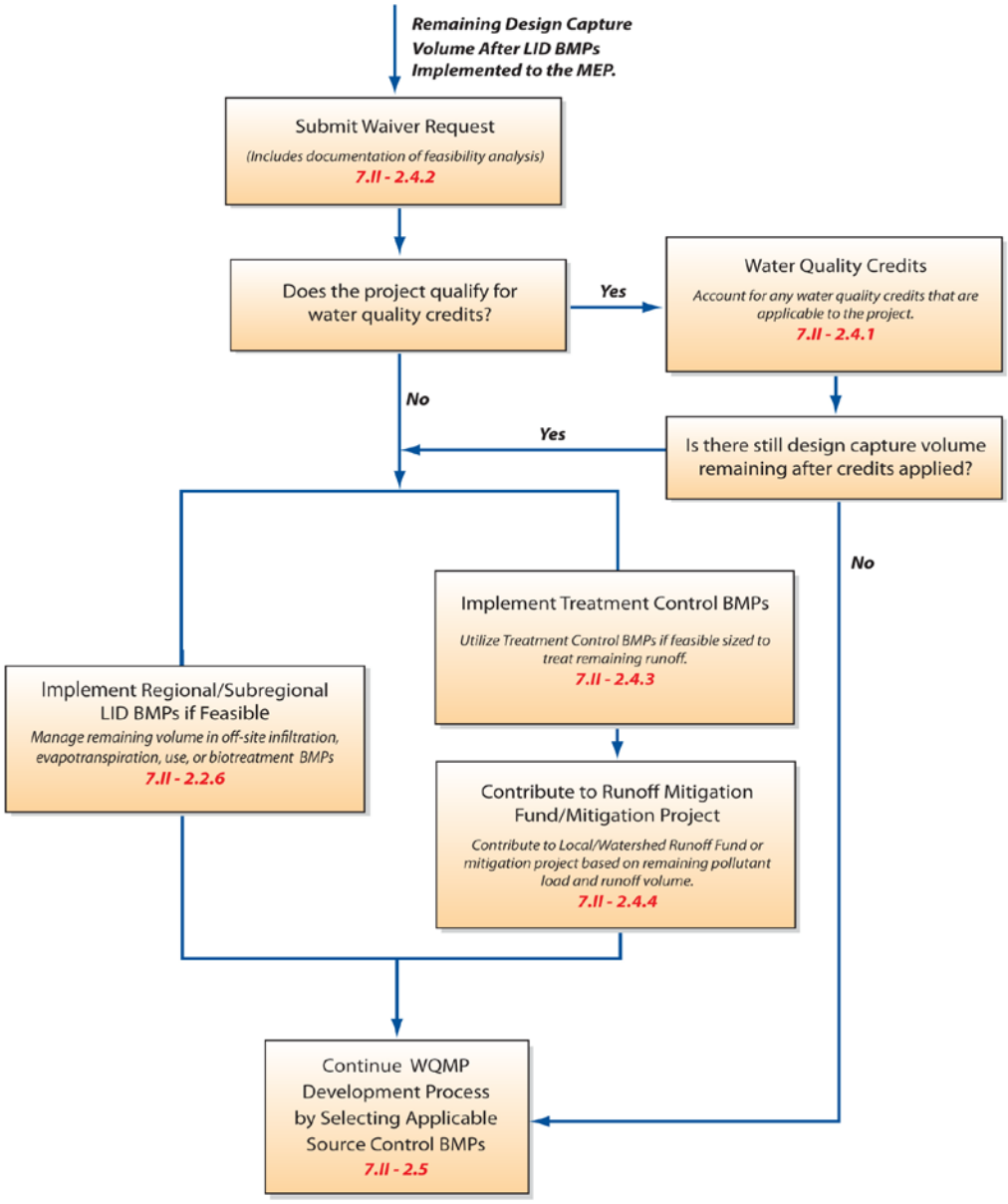
- Redevelopment projects that reduce the overall impervious footprint of the project site;
- Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping);
- Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface water quality if not redeveloped;
- Higher density development projects which include two distinct categories (credits can only be taken for one category:
    - Those with more than seven units per acre of development (lower credit allowance);
    - Vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2, or those having more than 18 units per acre (greater credit allowance);
- Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution);

Figure 7.II-7
Alternative Program Flow Chart for North Orange County



Note: Model WQMP sections shown in red

Figure 7.II-8
Alternative Program Flow Chart for South Orange County



Note: Model WQMP sections shown in red

- Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center. Such projects would not be able to take credit for both categories, but may have greater credit assigned;
- Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories; and
- In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.

These types of projects are provided as examples of those for which water quality credits could apply. Other types of projects that provide environmental benefits may also be proposed for consideration.

The primary function of the credit system is to reduce performance criteria that would be applied to determine the treatment control BMP sizing or the equivalent volume to be used in calculating the amount of off-site mitigation or in-lieu contribution that a project is required to meet. This provision does not exempt the project proponent from first conducting the investigations to determine if is feasible to fulfill the full LID, treatment control, and hydromodification requirements through a combination of site design practices and LID BMPs consistent with the permit hierarchy.

7.II – 2.4.1.1 Applying Water Quality Credits to LID and Treatment Control Performance Criteria

To determine the amount of credit a project would qualify for, the first step is to calculate the volume that would need to be satisfied in the absence of any credits as described in Section 8 of the Technical Guidance Document. Any credits would then be taken as a reduction to this remaining volume. The credits would be calculated in one of two ways:

- For redevelopment projects that reduce the overall impervious footprint of the project site compared to current use, the credits would be calculated as follows:
  - Calculate an equivalent "existing" Design Capture Volume for the site (DCV_E) using the LID BMP Performance Criteria defined in Section 7.II-2.1.5.3 and current site conditions
  - Calculate the full Design Capture Volume for the site under the proposed development plan (DCV_P)
  - Subtract to obtain a "credit" volume: (DCV_E) - (DCV_P) = Credit Volume
- For all other categories of projects noted above, the remaining volume to be treated or mitigated would be reduced in accordance with the following portions of the design capture volume :
  - Historic district, historic preservation area, or similar areas – 10 percent
  - Brownfield redevelopment – 25 percent

- Higher density development
  - 7 units/acre – 5 percent
  - Vertical density as defined – 20 percent
- Mixed use development, transit oriented development or live-work development – 20 percent
- In-fill development – 10 percent

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

7.II – 2.4.1.2 Applying Water Quality Credits to Hydromodification Performance Criteria in North Orange County

To calculate the credit to be applied to the hydromodification control performance criteria in North Orange County, the sum of percentages determined above would be applied as a reduction to the 2-yearr, 24-hour storm depth which is used to calculate performance criteria. Water Quality Credits are not available for hydromodification control performance criteria in South Orange County.

7.II – 2.4.2 Waivers

Project proponents can apply for a waiver if it is determined to be infeasible to fulfill the LID performance requirements using either on-site LID practices, through regional LID approaches, or other watershed approaches contained in an approved watershed management plan as described above. Only those proposed projects that have completed a rigorous feasibility analysis as per the criteria developed and approved by the Regional Water Quality Control Board Executive Officer shall be considered for a BMP waiver.

> *For any North Orange County alternative compliance plan, a waiver application must be submitted to the Permittee for approval and to the Executive Officer of the Regional Water Quality Control Board by in writing 30 days prior to approval by the Permittee.*
>
> *For any South Orange County alternative compliance plan, a waiver application must be submitted for Permittee approval, which will be reported to the San Diego Regional Water Quality Control Board within the Permittee's annual stormwater program report.*

Each local jurisdiction is required to adopt conditions that determine what constitutes LID BMP infeasibility as described in Section 7.II – 2.2.5. Some conditions that may make LID BMPs infeasible are as follows:

- Locations that cannot meet the infiltration and groundwater protection guidelines. Where infiltration is technically infeasible, the project must still examine the feasibility of other on-site retention LID BMPs;

- Infill or redevelopment locations where the density and/or nature of the project would create significant difficulty for compliance with the on-site LID BMP requirements; or
- Other site, geologic, soil or implementation constraints identified by the local jurisdiction.

Note that if a particular LID BMP is not technically feasible, other BMPs should be implemented to achieve the same level of compliance. If a rigorous feasibility analysis determines that the cost of BMP implementation greatly outweighs the pollution control benefits, a waiver of the BMPs may be granted.

Project proponents that have been granted a waiver must comply with requirements for the alternative compliance plan selected for the proposed project to mitigate potential negative impacts on the watershed due to the infeasibility of implementing LID BMPs outside of the waiver process.

Criteria for determining if it is infeasible to comply with LID criteria through on-site or regional/sub-regional based approaches are discussed in Section 7.II – 2.2.5, and details are described in the Technical Guidance Document.

7.II – 2.4.3 Treatment Control BMPs

If full implementation of LID BMPs is deemed infeasible and a BMP waiver request has been approved, Treatment Control BMPs can be implemented to prevent pollutants of concern from leaving the project site. The quantitative design standards for Treatment Control BMPs are presented in Section 7.II - 2.1.5.4 of this document and in the Technical Guidance Document. A process for their selection and for determining their location is discussed below.

The strategy for designing Treatment Control BMPs is to treat the remainder of runoff that is not treated by on-site LID BMPs or reduced by a water quality credit program before the runoff is discharged to a-receiving water. The Technical Guidance Document provides explanations and examples of how the remainder of runoff that needs to be treated for a site can be calculated.

7.II – 2.4.3.1 Selection of Treatment Control BMPs

To select a Treatment Control BMP, each Priority Project shall first identify Primary Pollutants of Concern, as described in Section 7.II-2.1.4. Treatment Control BMPs shall be selected as follows:

- Priority Projects shall select a single or combination of Treatment Control BMPs, which address the particular primary pollutant(s) of concern.
- If during the CEQA process a more refined evaluation of the project identifies that impacts on receiving waters may not be significant and that the project will not cause further exceedance of water quality objectives related to the pollutant(s) for which the receiving water is impaired, the project shall not be required to use pollutant-specific treatment BMP(s) but may use any Treatment Control BMP or combination of stormwater Treatment Control BMPs that are designed to mitigate pollution.

- Priority Projects that are not anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater Treatment Control BMPs that are designed to be effective in reducing pollutants of concern.

Treatment Control BMPs should be implemented close to pollutant sources to control pollution to the MEP prior to runoff entering receiving waters.

Detailed descriptions of available Treatment Control BMPs, their effectiveness at addressing specific pollutants, and design guidance are contained in the Technical Guidance Document.

Alternative stormwater Treatment Control BMPs not identified in the Technical Guidance Document may be approved at the discretion of the Permittee provided the alternative Treatment Control BMP can be demonstrated to be as effective in removal of pollutants of concern as other listed BMPs.

7.II – 2.4.3.2 Watershed-based Structural Treatment Control BMPs

In North Orange County, watershed-based Treatment Control BMPs may be implemented off-site for projects that are not able to fully meet LID requirements on-site. These should be implemented in combination with site-specific BMPs, should be located as close as possible to the project site and pollutant sources, and cannot be located within waters of the US. Pollutant removal should be accomplished prior to discharge to waters of the US.

7.II – 2.4.4 Urban Runoff Funds / Mitigation Programs and Off-Site Mitigation Projects

7.II – 2.4.4.1 Urban Runoff Funds / Mitigation Programs

For projects granted a LID BMP Waiver, participation in an urban runoff fund or mitigation program may be required. Payment into an urban runoff fund or mitigation program can be used to address the runoff volume or pollutant load that is not addressed through LID BMPs or other alternative compliance options.

- In North Orange County, payment into a runoff fund or mitigation program can be an alternative to on-site treatment control or off-site mitigation.
- In South Orange County, payment into a runoff fund or mitigation program is an alternative to off-site mitigation, but must be included with implementing on-site treatment controls.

The amount of the contribution will be based on the "unmet" difference between the combination of the project LID BMP design capture and/or water quality volume and pollutant load reduction that would be achieved through full compliance with on-site LID BMPs and the actual LID design capture and/or water quality volume and pollutant load reduction that can be achieved through the combination of LID practices and treatment control BMPs that can be incorporated in the project.

Certain types of projects may qualify for water quality credits that reduce the contribution that needs to be made to an urban runoff fund or mitigation program. The details of the credit program can be found in Section 7.II-2.4.4. Projects proponents should determine if a project qualifies for credits and subtract the credited volume from the "unmet" volume / load described above before determining the amount to be paid to the urban runoff fund or mitigation program.

The urban runoff fund or mitigation fund must be expended for water quality improvement or other related projects. Examples of projects eligible for funding through an urban runoff/mitigation fund include, but are not limited to:

- Green street projects
- Retrofit of existing development projects
- Retrofit incentive programs
- Regional/sub-regional BMPs
- Stream restoration
- Other mitigation projects proposed by Permittees

Projects funded through the urban runoff fund or mitigation program process can be administered by individual jurisdictions, jointly by multiple jurisdictions or by the County, provided they are developed in accordance with the requirements of the Permits. For Projects in the North County permit area, projects must be approved by the Executive Officer and funds must be expended within two years of receipt of the funds or approval of the projects by the Executive Officer, whichever is longer.

Permittees must report in the annual stormwater report on the specifics of the fund, the projects for which the funds are utilized and the projects that choose to participate in the Waiver project and the mitigation fund or mitigation projects.

7.II – 2.4.4.2 Off-Site Mitigation Projects

For projects granted a LID BMP Waiver, an off-site mitigation project or alternative pollutant-reducing project may be considered when on-site treatment or other options are determined infeasible. The project should be implemented within the same hydrologic subarea as the proposed project. Off-site mitigation projects outside of the hydrologic subarea but within the same hydrologic unit may be developed for Permittee approval provided that the project proponent demonstrates that mitigation projects within the same hydrologic subarea are infeasible and that the mitigation project will address similar beneficial use impacts as expected from the proposed project's pollutant load types and amount. Off-site project BMPs should be located as close as possible to the project site and should address a similar mix of land uses to that proposed by the project. The off-site project shall not be located within waters of the US and it shall be demonstrated that equivalent pollutant removal is accomplished prior to discharge to waters of the US. Off-site mitigation projects may include:

- Green streets projects,
- Existing development retrofit projects,
- Retrofit incentive programs,
- Regional BMPs, and
- Stream restoration.

Other off-site mitigation techniques may be proposed to the Permittee for review and approval.

7.II - 2.5 Selecting Source Control BMPs

Source Control BMPs reduce the potential for stormwater runoff and pollutants from coming into contact with one another. Source Control BMPs are defined as any administrative action, design of a structural facility, usage of alternative materials, and operation, maintenance, inspection, and compliance of an area that aims to eliminate or reduce stormwater pollution. Each new development and significant redevelopment project is required to implement appropriate Source Control BMP(s). This Model WQMP categorizes Source Control BMPs as either Structural or Non-Structural Source Control BMPs.

Applicable Source Control BMPs are required within all new development and significant redevelopment projects regardless of their priority, including those identified in an applicable regional or watershed program, unless they do not apply due to the project characteristics.

The following list of Structural and Non-Structural Source Control BMPs are numbered for purposes of the Orange County Stormwater Program and Model WQMP, followed by the CASQA BMP Handbook reference number in parenthesis, where applicable. Additional information for each BMP is contained within the Technical Guidance Document.

7.II – 2.5.1 Structural Source Control BMPs

- S1 Provide Storm Drain System Stenciling and Signage (CASQA BMP Handbook SD-13)
- S2 Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction (CASQA BMP Handbook SD-34)
- S3 Design Trash Enclosures to Reduce Pollutant Introduction (CASQA BMP Handbook SD-32)
- S4 Use Efficient Irrigation Systems and Landscape Design (CASQA BMP Handbook SD-12)
- S5 Protect Slopes and Channels
- S6 Loading Dock Areas (CASQA BMP Handbook SD-31)
- S7 Maintenance Bays and Docks (CASQA BMP Handbook SD-31)
- S8 Vehicle Wash Areas (CASQA BMP Handbook SD-33)
- S9 Outdoor Processing Areas (CASQA BMP Handbook SD-36)
- S10 Equipment Wash Areas
- S11 Fueling Areas (CASQA BMP Handbook SD-30)
- S12 Site Design and Landscape Planning (Hillside Landscaping) (CASQA BMP Handbook SD-10)
- S13 Wash Water Controls for Food Preparation Areas
- S14 Community Car Wash Racks

7.II – 2.5.2 Non- Structural Source Control BMPs

- N1 Education for Property Owners, Tenants and Occupants
- N2 Activity Restrictions
- N3 Common Area Landscape Management (CASQA BMP Handbook SC-73)
- N4 BMP Maintenance
- N5 Title 22 CCR Compliance
- N6 Local Water Quality Permit Compliance
- N7 Spill Contingency Plan (CASQA BMP Handbook SC-11)
- N8 Underground Storage Tank Compliance
- N9 Hazardous Materials Disclosure Compliance
- N10 Uniform Fire Code Implementation
- N11 Common Area Litter Control (CASQA BMP Handbook SC-60)
- N12 Employee Training
- N13 Housekeeping of Loading Docks (CASQA BMP Handbook SD-31)
- N14 Common Area Catch Basin Inspection (CASQA BMP Handbook SC-74)
- N15 Street Sweeping Private Streets and Parking Lots (CASQA BMP Handbook SC-43, SC-70)

7.II - 3.0 Develop BMP Maintenance Requirements

The local jurisdictions shall not accept stormwater structural source control, LID, treatment control, or hydromodification control BMPs as meeting the WQMP requirements unless an Operation and Maintenance (O&M) Plan is prepared (see **DAMP Section 7.6.6**) and a mechanism is in place that will ensure ongoing long-term maintenance of all structural BMPs. This mechanism will be provided by the local jurisdiction or by the project proponent. As part of project review, if a project proponent is required to include interim or permanent structural BMPs in project plans, and if the local jurisdiction does not provide a mechanism for BMP maintenance, the local jurisdiction shall require that the applicant provide verification of maintenance requirements through such means as may be appropriate, at the discretion of the local jurisdiction, including, but not limited to covenants, legal agreements, maintenance agreements, conditional use permits and/or funding arrangements.

7.II - 3.1 Maintenance Mechanisms

Public entity maintenance: The local jurisdiction may approve a public or acceptable quasi-public entity (e.g., the County Flood Control District, or annex to an existing assessment district, an existing utility district, a state or federal resource agency, or a conservation conservancy) to assume responsibility for operation, maintenance, repair and replacement of the BMP. Unless otherwise acceptable to individual local agencies, public entity maintenance agreements shall ensure estimated costs are front-funded or reliably guaranteed, (e.g., through a trust fund, assessment district fees, bond, letter of credit or similar means). In addition, the local jurisdictions may seek protection from liability by appropriate releases and indemnities.

- The local jurisdiction shall have the authority to approve stormwater BMPs proposed for transfer to any other public entity within its jurisdiction before installation. The local jurisdiction shall be involved in the negotiation of maintenance requirements with any other public entities accepting maintenance responsibilities within their respective jurisdictions; and in negotiations with the resource agencies responsible for issuing permits for the construction and/or maintenance of the facilities. The local jurisdiction must be identified as a third party beneficiary empowered to enforce any such maintenance agreement within their respective jurisdictions.

Project proponent agreement to maintain stormwater BMPs: The local jurisdiction may enter into a contract with the project proponent obliging the project proponent to maintain, repair and replace the stormwater BMP as necessary into perpetuity. Security or a funding mechanism with a "no sunset" clause may be required.

Assessment districts: The local jurisdiction may approve an Assessment District or other funding mechanism created by the project proponent to provide funds for stormwater BMP maintenance, repair and replacement on an ongoing basis. Any agreement with such a District shall be subject to the Public Entity Maintenance Provisions above.

Lease provisions: In those cases where the local jurisdiction holds title to the land in question, and the land is being leased to another party for private or public use, the local jurisdiction may assure stormwater BMP maintenance, repair and replacement through conditions in the lease.

Conditional use permits: For discretionary projects only, the local jurisdiction may assure maintenance of stormwater BMPs through the inclusion of maintenance conditions in the conditional use permit. Security may be required.

Alternative mechanisms: The local jurisdiction may accept alternative maintenance mechanisms if such mechanisms are as protective as those listed above.

7.II - 3.2 Permit Closeout Requirements

For discretionary projects, the method approved by local jurisdiction for stormwater BMP maintenance shall be incorporated into the project's permit, and shall be consistent with permits issued by resource agencies, if any. Just as with all other aspects of a project's approved plans and designs, the local authority will make a determination that all requirements of the Project WQMP have been satisfactorily completed prior to close-out of permits and issuance of certificates of use and occupancy (see **DAMP Section 7.6.6**).

For projects requiring only ministerial permits, the method approved by local jurisdiction for stormwater BMP maintenance shall be shown on the project plans before the issuance of any ministerial permits. Verification will occur similar to discretionary projects.

In all instances, the project proponent shall provide proof of execution of a method approved by local jurisdiction for maintenance, repair, and replacement (O&M Plan – See **DAMP Section 5.3**) before the issuance of construction approvals, permit closeout and issuance of certificates of use and occupancy. For all properties, the verification mechanism will include the project proponent's signed statement, as part of the project application, accepting responsibility for all structural BMP maintenance, repair and replacement or an alternative mechanism is approved by the local authority regarding maintenance, repair and replacement of the structural BMP. Local authorities carrying out public projects that are not required to obtain permits shall be responsible for ensuring that a method approved by local jurisdiction for stormwater BMP maintenance repair and replacement is executed prior to the completion of construction.

7.II - 3.3 Maintenance Requirements

O&M Plan: An Operation and Maintenance Plan for the BMPs will be prepared and included as Section 5 of the Project WQMP. The local jurisdiction shall ensure that a copy of O&M plan, prepared by the project proponent satisfactory to the agency, is received prior to permit closeout and the issuance of certificates of use and occupancy. The O&M Plan describes the designated responsible party to manage the stormwater BMP(s), employee's training program and duties, operating schedule, maintenance frequency, routine service schedule, specific maintenance activities, copies of resource agency permits, and any other necessary activities. At a minimum, maintenance agreements shall require the inspection and servicing of all structural BMPs on an annual basis.

The project proponent or approved maintenance entity shall complete and maintain O&M forms to document all maintenance requirements. Parties responsible for the O&M plan shall retain records for at least 5 years. These documents shall be made available to the local jurisdiction for inspection upon request at any time.

As part of the maintenance mechanism selected above, the local jurisdiction shall require the inclusion of a copy of an executed access easement that shall be binding on the land throughout

the life of the project, until such time that the stormwater BMP requiring access is replaced, satisfactory to the local agency.

7.II - 4.0 WQMP Preparation and Approval

The preceding sections describe the requirements and process for developing site design, selecting the appropriate BMPs and other compliance measures, and identifying the BMP maintenance requirements for priority development projects. This section describes the process for documenting this information in a Conceptual/Preliminary, and/or Project WQMP, and for submitting and obtaining approval for the WQMP.

Project proponents are strongly encouraged to incorporate LID and hydromodification control BMPs at the earliest conceptual planning stages of a project for early review, to potentially avoid necessary project changes and delays during the review and approval process. For all projects requiring discretionary or land use entitlement actions, a Conceptual / Preliminary Project WQMP should be submitted during the environmental review phase (CEQA) and prior to approval of entitlements and planning commission approval of a project or other public hearing. Each local jurisdiction may establish specific requirements for when a Conceptual / Preliminary Project WQMPs must be submitted in the planning process. Prior to issuance of grading or building permits, the project applicant must submit the final Project WQMP for review and approval.

The final Project WQMP must be prepared a California registered Civil Engineer.

7.II - 4.1 Conceptual/Preliminary Project WQMP Preparation

To facilitate early water quality planning and ensure that water quality protection and LID principles are considered in the earliest phases of a project, a Conceptual / Preliminary Project WQMP shall be developed for review by the local jurisdiction prior to a complete or final Project WQMP for full review and approval. A Conceptual/Preliminary Project WQMP will be required by the local jurisdiction during the land use entitlement process or as part of a project application for discretionary project approval.

The level of detail in a Conceptual/Preliminary Project WQMP can vary somewhat upon the level of detail known at the time discretionary project approval is sought, but should contain as much of the following information as possible:

- Local project identifier and description (application number, tentative tract number, review number, etc.)
- Site plan (tentative map, major project features, use exhibit, etc.)
- Preliminary site assessment information
    - Most proximate and downstream receiving waters and any impairments
    - Potential pollutants and locations of activities and features that could affect stormwater quality
    - Hydrologic conditions of concern
- LID feasibility analysis (if applicable)

- Proposed LID BMP details and calculations (or sub-regional/regional LID BMPs if applicable)
- Proposed hydromodification control BMPs and calculations
- Any project specific credits or alterative compliance methods planned
- Preliminary Source Control BMP information

7.II - 4.2 Project WQMP Preparation and Submittal

The review and approval of a final Project WQMP is one of the last points at which a local jurisdiction can impose conditions or standards that will minimize the impacts of urban runoff and stormwater pollution on local water resources.

The Project WQMP is expected to fully address site design measures, LID BMPs, hydromodification controls, source control BMPs, and treatment control BMPs (where applicable to the project) to address pollutants or hydrologic conditions of concern.

The Project WQMP when prepared for submittal for approval must include WQMP elements agreed upon at Conceptual/Preliminary Project WQMP acceptance, including:

- Site assessment, identifying any hydrologic conditions of concern and pollutants of concern
- LID feasibility analysis (if applicable)
- Description of LID practices to be implemented
- Documentation supporting water quality credits that can be applied to project
- Description of Source Control BMPs to be implemented
- Plan to achieve alternative LID compliance if applicable
- Any additional hydromodification controls to be implemented
- The mechanism(s) by which long-term operation and maintenance of all structural BMPs will be provided

Any changes to WQMP elements agreed upon at the Conceptual/Preliminary Project WQMP phase should be noted within the Project WQMP submitted for final approval.

7.II - 5.0 Resources and References

Low Impact Development Manual for Southern California: Technical Guidance and Site Planning Strategies	California State Water Resources Control Board and Low Impact Development Center, 2009
Stormwater C.3 Guidebook: Stormwater Quality Requirements for Development Applications, Fourth Edition	Contra Costa Clean Water Program, September 10, 2008
Better Site Design: A Handbook for Changing Development Rules in Your Community (1998) Presents guidance for different model development alternatives.	Center for Watershed Protection 8391 Main Street Ellicott City, MD 21043 410-461-8323 www.cwp.org
Green Streets: A Conceptual Guide to Effective Green Streets Design Solutions	USEPA, 2009
California Urban runoff Best Management Practices Handbooks (1993) for Construction Activity, Municipal, and Industrial/Commercial Presents a description of a large variety of Structural BMPs, Treatment Control, BMPs and Source Control BMPs	Los Angeles County Department of Public Works Cashiers Office 900 S. Fremont Avenue Alhambra, CA 91803 626-458-6959
Caltrans Urban runoff Quality Handbook: Planning and Design Staff Guide (Best Management Practices Handbooks (1998) Presents guidance for design of urban runoff BMPs	California Department of Transportation P.O. Box 942874 Sacramento, CA 94274-0001 916-653-2975
Design and Construction of Urban Stormwater Management Systems, American Society of Civil Engineers (ASCE) Manuals and	ASCE
Effect of urban soil compaction on infiltration rate; Gregory, J.H.; Dukes, M.D.; Jones, P.H.; and G.L. Miller, 2006.	Journal of Soil and Water Conservation 2006 61(3):117-124
Reports on Engineering Practice No. 77/ Water Environment Federation (WEF) Manual of Practice FD-20, 1992.	WEF

Design Manual for Use of Bioretention in Stormwater Management (1993) Presents guidance for designing bioretention facilities.	Prince George's County Watershed Protection Branch 9400 Peppercorn Place, Suite 600 Landover, MD 20785
Design of Stormwater Filtering Systems (1996) by Richard A. Claytor and Thomas R. Schuler Presents detailed engineering guidance on ten different urban runoff-filtering systems.	Center for Watershed Protection 8391 Main Street Ellicott City, MD 21043 410-461-8323
Development Planning for Stormwater Management, A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), (May 2000)	Los Angeles County Department of Public Works http://dpw.co.la.ca.us/epd/ or http://www.888cleanLA.com
Florida Development Manual: A Guide to Sound Land and Water Management (1988) Presents detailed guidance for designing BMPs	Florida Department of the Environment 2600 Blairstone Road, MailStation 3570 Tallahassee, FL 32399 850-921-9472
Guidance Manual for On-Site Stormwater Quality Control Measures, Sacramento Stormwater Management Program.	City of Sacramento Department of Utilities and County of Sacramento Water Resources Division. January 2000.
Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (1993) Report No. EPA–840-B-92-002. Provides an overview of, planning and design considerations, programmatic and regulatory aspects, maintenance considerations, and costs.	National Technical Information Service U.S. Department of Commerce Springfield, VA 22161 800-553-6847
Guide for BMP Selection in Urban Developed Areas (2001)	ASCE Envir. and Water Res. Inst. 1801 Alexander Bell Dr. Reston, VA 20191-4400 (800) 548-2723
Low-Impact Development Design Strategies - An Integrated Design Approach (June 1999)	Prince George's County, Maryland Department of Environmental Resource Programs and Planning Division 9400 Peppercorn Place Largo, Maryland 20774 http://www.co.pg.md.us/Government/DER/PPD/pgcounty/lidmain.htm
Maryland Stormwater Design Manual (1999) Presents guidance for designing urban runoff BMPs	Maryland Department of the Environment 2500 Broening Highway Baltimore, MD 21224 410-631-3000
Methodology for Analysis of Detention Basins for Control of Urban Runoff Quality, Environmental Protection Agency (EPA-440/5-87-001).	

National Stormwater Best Management Practices (BMP) Database, Version 1.0 Provides data on performance and evaluation of urban runoff BMPs	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 703-296-6000
National Stormwater Best Management Practices Database (2001)	Urban Water Resources Research Council of ASCE Wright Water Engineers, Inc. (303) 480-1700
Operation, Maintenance and Management of Stormwater Management (1997) Provides a thorough look at stormwater practices including, planning and design considerations, programmatic and regulatory aspects, maintenance considerations, and costs.	Watershed Management Institute, Inc. 410 White Oak Drive Crawfordville, FL 32327 850-926-5310
Potential Groundwater Contamination from Intentional and Non-Intentional Stormwater Infiltration	Report No. EPA/600/R-94/051, USEPA (1994).
Preliminary Data Summary of Urban runoff Best Management Practices (August 1999) EPA-821-R-99-012	http://www.epa.gov/ost/stormwater/
Reference Guide for Stormwater Best Management Practices (July 2000)	City of Los Angeles Urban runoff Management Division 650 South Spring Street, 7th Floor Los Angeles, California 90014 http://www.lacity.org/san/swmd/
Second Nature: Adapting LA's Landscape for Sustainable Living (1999) by Tree People Detailed discussion of BMP designs presented to conserve water, improve water quality, and to achieve flood protection.	Tree People 12601 Mullholland Drive Beverly Hills, CA 90210 (818) 623-4848 Fax (818) 753-4625
Site Planning for Urban Stream Protection, Department of Environmental Programs, Metropolitan Washington Council of Governments	
Start at the Source (1999) Detailed discussion of permeable pavements and alternative driveway designs presented.	Bay Area Stormwater Management Agencies Association 2101 Webster Street Suite 500 Oakland, CA 510-286-1255
Stormwater, Grading and Drainage Control Code, Seattle Municipal Code Section 22.800-22.808, and Director's Rules, Volumes 1-4. (Ordinance 119965, effective July 5, 2000)	City of Seattle Department of Design, Construction & Land Use 700 5th Avenue, Suite 1900 Seattle, WA 98104-5070 (206) 684-8880 http://www.ci.seattle.wa.us/dclu/Codes/sgdccode.htm

Stormwater Management in Washington State (1999) Vols. 1-5 Presents detailed guidance on BMP design for new development and construction.	Department of Printing State of Washington Department of Ecology P.O. Box 798 Olympia, WA 98507-0798 360-407-7529
The Stormwater Manager's Resource Center. This is a comprehensive site with information on BMP design and sizing. http://www.stormwatercenter.com	Stormwater Pollution Control, Municipal, Industrial and Construction NPDES Compliance, Second Edition. Roy D. Dodson, P.E., 1999.
Texas Nonpoint Source Book – Online Module (1998)www.txnpsbook.org Presents BMP design and guidance information on-line	Texas Statewide Urban runoff Quality Task Force North Central Texas Council of Governments 616 Six Flags Drive Arlington, TX 76005 817-695-9150
The Practice of Watershed Protection by Thomas R. Shchuler and Heather K. Holland	Center for Watershed Protection 8391 Main Street Ellicott City, MD 21043 410-461-8323 www.cwp.org
Urban Runoff Quality Management, American Society of Civil Engineers (ASCE) Manual and Report on Engineering Practice No. 87/Water Environment Federation (WEF) Manual of Practice No.23, 1998.	
Urban Storm Drainage, Criteria Manual – Volume 3, Best Management Practices (1999) Presents guidance for designing BMPs	Urban Drainage and Flood Control District 2480 West 26th Avenue, Suite 156-B Denver, CO 80211 303-455-6277

Appendix A
Acronyms and Glossary

A.1 Table of Acronyms

BMP – best management practice

CEQA - California Environmental Quality Act

CMF – cartridge media filtration

CWA – Federal Clean Water Act

DAMP – Drainage Area Management Plan

DCIA – directly connected impervious area

DEDB – dry extended detention basin

ESA – environmentally sensitive area

ET – evapotranspiration

HCOC – hydrologic condition of concern

HSC – hydrologic source control

IE – irrigation efficiency

IR – effective irrigation area ratio

IWRMP – integrated water resources management plan

LID – low impact development

LIP – Local Implementation Plan

MEP – maximum extent practicable

MS4 – municipal separate storm sewer system

NOC – North Orange County (Region 8- SARWQCB Jurisdictional Area)

NPDES – National Pollutant Discharge Elimination System

NTS – natural treatment systems

OCWD – Orange County Water District

POC – pollutant of concern

RWQCB – Regional Water Quality Control Board

SARWQCB – Santa Ana Regional Water Quality Control Board

SDRWQCB – San Diego Regional Water Quality Control Board

SOC – South Orange County (Region 9 -SDRWQCB Jurisdictional Area)

SQDF - stormwater quality design flow

SQDV – stormwater quality design volume

SSMP – Standard Stormwater Mitigation Plan

TGD – Technical Guidance Document

TMDL – Total Maximum Daily Load

WMA – Watershed Management Area

WQ – water quality

WQDF – water quality design flow

WQDV – water quality design volume

WQMP – water quality management plan

A.2 Glossary of Key Terms

2-year, 24-hour event – a 24-hour storm event expected to be equaled or exceeded, on average, every 2 years.

Agronomic demand – the amount of irrigation required to meet plant water needs, accounting for inefficiencies in irrigation.

Alternative compliance program – encompasses the elements used to satisfied remaining performance criteria after consideration of on-site LID BMPs (and in North Orange County, after consideration of both on-site and sub-regional/regional LID BMPs).

Average annual capture efficiency (a.k.a. capture efficiency) – the estimated percent of long term average annual runoff volume that is managed/controlled by a BMP. Target capture efficiency serves as one element of the performance criteria for LID and treatment control BMPs.

Biotreatment BMP – a class of LID BMPs, biotreatment BMPs are vegetated treat-and-release BMPs that also promote infiltration and/or evapotranspiration.

Biotreatment volume – the volume of storage in biotreatment BMPs, measured from the overflow elevation of the BMP, which would be treated and discharged as the BMP drains; this volume includes surface storage and pore storage but does not include the volume that would be retained in the BMP and discharged to infiltration, ET, or uses.

Crop coefficient – a ratio used to estimate the water needs of a plant pallet in relation to a reference crop, generally defined as grass or alfalfa surfaces whose biophysical characteristics have been studied extensively.

Design capture storm depth – the 85th percentile, 24-hr storm depth as shown in **Error! Reference source not found.**.

Design capture volume – the runoff resulting from the design capture storm depth; one component of the performance criteria for LID BMPs as well as treatment control BMPs.

Design criteria – requirements that serve as the basis for designing a BMP to meet performance criteria. Design criteria may encompass BMP sizing and other characteristics of BMP design.

Drainage Area Management Plan (DAMP) **–** The specific water pollutant control elements of the Orange County Stormwater Program are documented in the Drainage Area Management Plan (DAMP), which is the Permittees' primary policy, planning and implementation document for municipal NPDES Stormwater Permit compliance.

Drawdown – the act of discharging water from a BMP. Drawdown provides storage volume for subsequent storm events. Depending on BMP type, water may discharge to infiltration, ET, various uses, or be treated and released to the downstream system.

Drawdown rate – the rate at which water discharges from a BMP, making storage volume available for subsequent storm events. Depending on BMP type, water may discharge to infiltration, ET, various uses, or be treated and released to the downstream system.

Drawdown time – the time it takes to drain 90 percent of the water in a BMP from brim full. Drawdown time may need to be calculated separately for the retention volume of the BMP and the biotreatment volume of the BMP, in order to support design calculations if both types of volume exist. These separate measures are referred to as the "retention drawdown time" and the "biotreatment drawdown time".

Evapotranspiration (ET) - the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). As used in this TGD, evapotranspiration refers to one or both of these processes.

Evapotranspiration BMP (aka ET BMP) **–** a class of retention BMPs that discharges stored volume predominantly to evapotranspiration; some infiltration may occur. Evapotranspiration includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes.

Fluvial geomorphology - the scientific study of the formation of fluvial landforms (rivers, streams, etc.) and the processes that shape them.

Harvest and Use – The act of capturing stormwater, storing it, and making it available for subsequent use. This act is performed by Harvest and Use BMPs.

Harvest and Use BMP (aka Rainwater Harvesting BMP) **–** a class of retention BMPs that captures stormwater runoff and stores it for subsequent use.

Hydrocollapse - a sudden collapse of granular soils cause by a rise in groundwater dissolving or deteriorating the inter-granular contacts between the sand particles

Hydrologic condition of concern – A land condition (or change in land conditions) that is anticipated to cause hydromodification impact.

Hydrologic source control (HSC) - a class of LID BMPs integrated with site design that retain stormwater runoff and reduce the volume (and potentially rate) of stormwater discharge to the

downstream system. HSCs are differentiated from retention and biotreatment classes of LID BMPs by their higher level of integration with a site and by less strict engineering design criteria. An example includes routing roof runoff into adjacent landscaped areas.

Hydromodification – Changes in runoff and sediment yield caused by land use modifications.

Hydromodification control – Management techniques which reduce the potential for hydromodification impact.

Hydromodification impact – The physical response of stream channels to changes in runoff and sediment yield caused by land use modifications

Infiltration BMP – a class of retention BMPs that discharges stored volume predominantly to deeper infiltration; some evapotranspiration may also occur.

In-stream control *(in hydromodification control context)* **–** Modification of a receiving channel to reduce the potential for hydromodification impacts.

Irrigation Area Ratio – a ratio describing the agronomic irrigation demand for harvested stormwater as a fraction of the tributary area to the stormwater storage device (unitless, see Section **Error! Reference source not found.**)

Irrigation Efficiency – the ratio of plant irrigation needs met to the amount of irrigation water applied. A value of 0.75 implies that 1 inch of irrigation water must be applied to satisfy 0.75 inches of plant water needs.

LID BMP – a BMP that provides retention or biotreatment as part of an LID strategy – these may include hydrologic source controls, retention, and biotreatment, and may be located either on-site or off-site. Examples include bioretention systems (introduced runoff into planter areas for infiltration with no underdrains), filtration thru planter media with underdrains, harvest and use systems, and green roofs

LID site design – the component of LID that relates to the way in which a site is laid out to achieve strategic stormwater management and resource management objectives. Site design practices work synergistically with LID BMPs, treatment control, and hydromodification control strategies. Example practices include minimizing impervious areas and locating pervious areas such that impervious areas can drain to pervious areas.

Liquefaction - a seismically-induced phenomenon in which saturated granular materials, typically possessing low to medium density, undergo matrix rearrangement, develop high pore water pressure, and lose shear strength due to cyclic ground motions induced by earthquakes. This rearrangement and strength loss is followed by a reduction in bulk volume.

Local Implementation Plan (LIP) - The Local Implementation Plan (LIP) describes how the DAMP is being implemented on a local level. The DAMP provides a foundation for the description and detail of how the Orange County Stormwater Permittees implement model programs designed to prevent pollutants from entering receiving waters to the maximum extent

practicable (MEP). The LIP is designed to work in conjunction with the DAMP and each city and the County have developed a comprehensive LIP that is specific to their jurisdiction.

Natural treatment systems (NTS) – refers to systems such as those proposed by the San Diego Creek NTS Master Plan (www.naturaltreatmentsystem.org)

On-site LID practices – LID practices that are implemented within the project boundary; encompasses site design practices, hydrologic source controls, on-site retention BMPs, and on-site biotreatment BMPs.

Performance criteria –permit-based requirements against which the performance of a system is compared to assess compliance. There are three separate types of performance criteria: 1) LID, 2) treatment control, and 3) hydromodification control. These performance criteria are evaluated individually although they can be interrelated. It is possible to meet one and not meet the others, or vice versa. This is synonymous with "performance standard" as used by other guidance documents, but only "performance criteria" is used in this document.

Project Water Quality Management Plan (Project WQMP) - a project submittal that describes the Best Management Practices (BMPs) that will be implemented and maintained throughout the life of a project. This term is used in this TGD to describe Conceptual/Preliminary and final Project WQMPs.

Retention BMP – a class of LID BMPs including infiltration BMPs, evapotranspiration BMPs, and harvest and use BMPs whose design does not allow surface discharges to occur below the design storm volume; these BMPs either infiltration, evapotranspire, or allow for use of the retention volume.

Retention volume – the volume of storage in retention and biotreatment BMPs, measured from the overflow elevation of the BMP, which would be retained and discharged to infiltration, ET, or uses as the BMP drains. All storage volume is retention volume in retention BMPs.

Sizing criteria – specific design criteria related to BMP size that serve as a basis for meeting performance criteria.

Standard Stormwater Mitigation Plan (SSMP) – see Project WQMP

Susceptibility (*in hydromodification context*) **–** a channel's lack of ability to resist physical response due to hydromodification

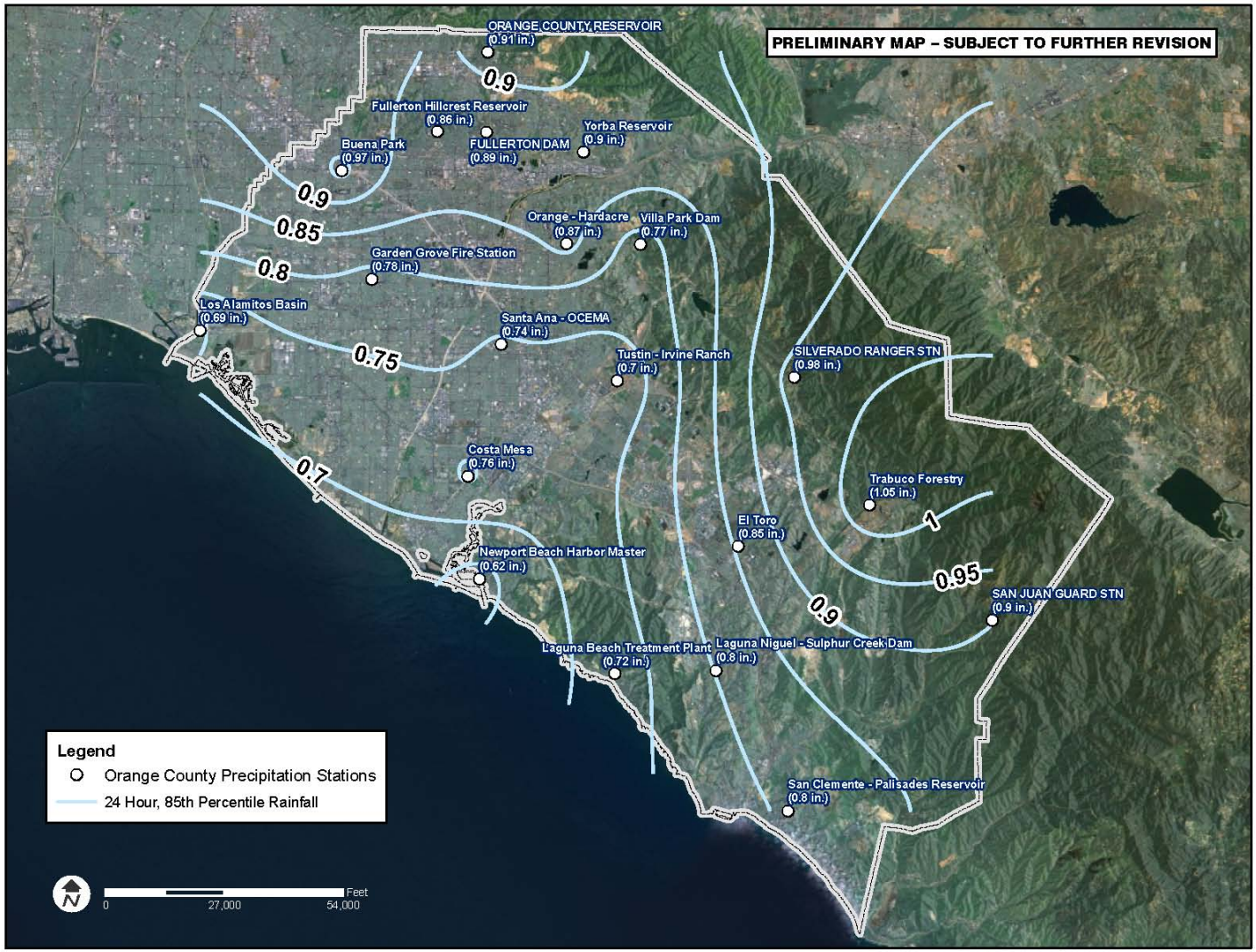
Treatment control BMP – a treat and release BMP that addresses pollutants of concern, but is not a biotreatment BMP. Examples include sand filters and cartridge media filters.

Waiver - process by which project proponents must document and submit a request to implement alternative requirements if it is determined to be infeasible to fulfill the on-site LID performance requirements.

Water quality credit system – the system by which certain project types are granted reduction in the criteria for determining treatment control and/or offsite mitigation requirements for alternative program requirements.

Watershed Management Area (WMA) - Watershed Management Areas (WMAs) are used in the countywide Water Quality Strategic Plan as the structure for water resource management. The eleven watersheds in Orange County are grouped by similar characteristics into three Watershed Management Areas: North, Central, and South County.

Appendix B
Design Capture Storm Depth Map



Appendix C
Biotreatment Design, Operation, and Maintenance Requirements

Biotreatment BMPs are a broad class of structural LID BMPs that treat stormwater using a suite of treatment mechanisms characteristic of biologically active systems. Biotreatment BMPs provide a variety of unit treatment mechanisms to address both suspended and dissolved constituents. Biotreatment BMPs may be either flow-based (limited storage) or volume-based (storage a key design component) and are designed to treat stormwater and discharge treated stormwater to the downstream conveyance system. Biotreatment BMPs can be designed to promote infiltration and evapotranspiration even though they are treat-and-release BMPs. Systems not designed primarily to infiltrate or evapotranspire stormwater may still reduce the volume of stormwater via incidental infiltration and evapotranspiration.

Operations and maintenance of biotreatment BMPs should emphasize preservation of hydraulic function and robust biological processes. Biotreatment BMPs typically utilize "soft" infrastructure (e.g., vegetative slope stabilization as opposed to rip rap slope stabilization) and therefore require an adaptive approach to maintenance and performance enhancement, more typical of landscape maintenance than maintenance of hard infrastructure.

The following sections provide principles that should govern the design, operation, and maintenance of biotreatment BMPs installed to meet permit requirements in Orange County.

C.1 Conceptual Biotreatment Design Requirements

Biotreatment design requirements shall be consistent with the following principles:

- **Biotreatment BMPs shall be sized according to permit requirements.**
- **Biotreatment BMPs shall incorporate unit processes to address pollutants of concern. See Table B-1 for guidance.**
- **Biotreatment BMPs shall support a robust vegetative and microbial community appropriate to the local climate:**
    - For bioretention systems[2], select vegetation that is drought tolerant and can survive extended periods of saturated soils.
    - For constructed stormwater wetlands and wet detention basins (wet ponds), select native species that include significant rhizomes and provide habitat benefits
    - For constructed stormwater wetlands and wet detention basins (wet ponds) provide appropriate mix of open water to vegetated area.
    - For dry extended vegetated detention basins, select a variety of plant species that are drought tolerant, but can also survive periodic inundation.

[2] The use of the term "bioretention systems" in this appendix refers to bioretention with underdrains, rain gardens with underdrains, planter boxes with underdrains, curb-extension planter boxes with underdrains, proprietary bioretention systems, and other similar BMPs.

- Provide an irrigation system, if necessary, for plant establishment and maintenance.

- **Biotreatment BMPs shall incorporate amended media and soils designed for the intended function of the BMP.**
  - Select amended media for use in bioretention systems that is effective at removing pollutants of concern, can absorb and evapotranspirate runoff, and where appropriate, can facilitate infiltration.
  - Select media and soils that will not potentially leach pollutants, specifically dissolved nutrients and metals in some cases.
  - Amend soils in dry extended detention basins to provide suitable soils for supporting plants, which can absorb and evapotranspire runoff and where appropriate facilitate infiltration.
  - Design wet detention basins (wet ponds) and constructed stormwater wetlands using soils that support growth of attached plants.

- **BMPs hydraulics shall be designed with consideration for treatment functions.**
  - For all biotreatment BMPs, design inlets or overland flow entry to BMPs to prevent scour or re-entrainment of pollutants.
  - Provide maximum flow path distance between outlet and inlet and with sufficient length to width ratio to limit short circuiting.
  - For constructed stormwater wetlands and wet detention basins, provide the water quality design volume in the wet pool at a minimum.
  - For seasonal constructed stormwater wetlands and seasonal wet detention basins, ensure that dry weather flows are present during seasonally wet period to maintain vegetation and prevent stagnant water.
  - For constructed stormwater wetlands and wet detention basins designed to be continually wet (opportunities may be limited in Orange County), ensure that a low-flow source of water is present to maintain vegetation and prevent stagnant conditions.
  - For bioretention systems , provide media contact time sufficient for pollutant removal, with upper limitations on contact time to avoid leaching of retained pollutants.
  - For bioretention systems, design media mix and layer separation systems (i.e. between media and gravel layers) to reduce potential for clogging.
  - For bioretention systems that will include infiltration as a component, design a 2-feet or greater gravel pool below the underdrains (where used; ensure that the soils below this area can infiltrate (i.e. do not compact, or if compacted, restore soil infiltration capacity).)

- Consider use of outlet control for bioretention systems rather than using media with lower infiltration rates for hydraulic control to aid in avoiding clogging.
- For bioretention systems, do not use geotextile fabrics between layers due to clogging issues; use progressively-graded aggregate layers to prevent migration of fines if necessary.
- For bioretention systems limit ponding depths to 12 inches, unless system is isolated from public access, then ponding depths should be limited to 18 inches.
- For bioretention systems and dry extended detention basins, surface ponding should be limited to 48 hours for purposes of vector control.
- For biotreatment BMPs that employ extended detention, design outlet structures to ensure appropriate drawdown times and patterns; ensure that small storms receive appropriate extended detention times.
- For vegetated swales and filter strips, provide level spreaders and check dams where appropriate to promote even distribution of flow across the system.
- Design systems such that high flows (flood flows) are either bypassed or can be passed through the BMP without re-entraining captured materials, soils, or media.

- **Biotreatment BMPs shall be subject to rigorous construction oversight, acceptance, and documentation process.**
  - Provide construction oversight to ensure that the BMP is installed as designed.
  - Consider conducting a flow test for bioretention systems to ensure that they are function properly.
  - Require the preparation of as-built drawings that clearly indicated design features of the BMP and inlet and outlet systems.
  - Inspect BMPs after initial commissioning to ensure that they are functioning as intended.

C.2 Conceptual Biotreatment Operation Requirements

An operation and maintenance plan shall be developed for biotreatment BMPs that includes the following elements:

- **Frequency and type of inspections,**
- **Observations during wet weather to visually observe whether the BMP is functioning as intended,**
- **List of parameters/checklists for identifying maintenance needs and triggering maintenance activities,**
- **Vegetation management plan, including routine maintenance, and irrigation, if necessary,**
- **Sediment, trash and debris removal, and**

- **Routine and major (infrequent) maintenance activities.**

C.3 Conceptual Biotreatment Maintenance Requirements

Biotreatment maintenance requirements shall be consistent with the following principles:

- **Routine maintenance shall be provided to ensure consistently high performance and extend facility life.**
    - Maintain vegetation and media to perpetuate a robust vegetative and microbial community (thin/trim vegetation, replace spent media and mulch).
    - Periodically remove dead vegetative biomass to prevent export of nutrients or clogging of the system.
    - Remove accumulated sediment before it significantly interferes with system function.
    - Where filtration/infiltration is employed, conducted maintenance to prevent surface clogging (surface scarring, raking, mulch replacement, etc.).
    - Add energy dissipation and scour-protection as required based on facility inspection.
    - Routinely remove accumulated sediment at the inlet and outlet and trash and debris from the entire BMP.
- **Major maintenance shall be provided when the performance of the facility declines significantly and cannot be restored through routine maintenance.**
    - Replace media / planting soils as triggered by reduction in filtration/infiltration rates or decline in health of biological processes.
    - Provide major sediment removal to restore volumetric capacity of basin-type BMPs.
    - Repair or modify inlets/outlets to restore original function or enhance function based on observations of performance.

Table C-1: Unit Processes and Pollutants Address by Biotreatment BMPs										
			Dissolved Fraction							
Unit Treatment Process	Suspended solids / sediment	Particulate-bound pollutants	Nitrogen compounds	Phosphorus	Heavy metals	Microbial / viral pathogens	Oils and grease	Dissolved toxic organic compounds	Trash and debris	**Biotreatment BMPs Potentially Providing Process**
Particulate Settling (Density separation)	**X**	**X**							**X**	• Bioretention systems • Wet detention basins • Constructed stormwater wetlands • Dry extended detention basins
Size exclusion (trash racks, outlet structures. Media filtration)									**X**	• Dry extended detention basins • Wet detention basins • Constructed stormwater wetlands • Bioretention systems
Floatable Capture (Density separation -outlet structures designed to remove floatables)							**X**		**X**	• Dry extended detention basins • Wet detention basins • Constructed stormwater wetlands
Vegetative Filtration	**X**	**X**					**X**		**X**	• Vegetated swales and filter strips • Constructed stormwater wetlands • Dry extended detention basins (with low-flow channel)
Inert Media Filtration	**X**	**X**			**X**[1]	**X**	**X**		**X**	• Bioretention systems • Dry extended detention basins (with sand filtration outlet)
Sorption/Ion Exchange within media or soils				**X**	**X**		**X**	**X**		• Bioretention systems • Vegetated swales and filter strips • Wet detention basins • Constructed stormwater wetlands

Table C-1: Unit Processes and Pollutants Address by Biotreatment BMPs										
			Dissolved Fraction							
Unit Treatment Process	Suspended solids / sediment	Particulate-bound pollutants	Nitrogen compounds	Phosphorus	Heavy metals	Microbial / viral pathogens	Oils and grease	Dissolved toxic organic compounds	Trash and debris	**Biotreatment BMPs Potentially Providing Process**
Microbially Mediated Transformation (oxidation, reduction, or facultative processes)			**X**	**X**	**X**		**X**	**X**		• Wet detention basins • Constructed stormwater wetlands
Microbial Competition/ Predation						**X**				• Wet detention basins • Constructed stormwater wetlands • Bioretention systems
Biological Uptake			**X**	**X**	**X**	**X**	**X**	**X**		• Wet detention basins • Constructed stormwater wetlands • Bioretention systems
Solar Irradiation						**X**		**X**		• Wet detention basins • Constructed stormwater wetlands • Dry extended detention basins (minor)

1 – Inert media filters (i.e. sand) in fact have shown the ability to remove dissolved constituents either after they have been “seasoned” (i.e. organics have built up in the media) or they contain iron which can result in dissolved metals removals.