Mountain Park Development Project
Water Quality Technical Report

Prepared for

The Irvine Community Development Company

Prepared by

GeoSyntec Consultants
Portland, Oregon

February 2005

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

This report addresses the potential impacts of the proposed Mountain Park Development Project (the Project) on water quality in local surface water bodies, including Gypsum Canyon Creek and the Santa Ana River. To evaluate impacts of the Project on water quality, pollutants of concern are identified based on regulatory and other considerations. Primary pollutants of concern are those pollutants that are anticipated, or potential pollutants in runoff from the project based on proposed land uses, and which have also been identified as causing impairment of receiving waters on the most recent 303(d) list. Other pollutants of concern are those pollutants that might cause or contribute to exceedances of receiving water objectives, or otherwise are anticipated or potential pollutants, that have not been identified as causing impairment of receiving waters. Pollutants of concern for the Project are identified in Section 4.1 and Appendix A. Potential changes in water quality are addressed for pollutants of concern based on runoff water quality modeling, literature information, and professional judgment. Impacts take into account Project Design Features (PDFs) selected consistent with Orange County's Drainage Area Management Plan (DAMP) and the City of Anaheim's Local Implementation Plan. The level of significance of impacts is evaluated based on significance criteria that include predicted runoff quality for proposed versus existing conditions, MS4 Permit and General Construction Permit requirements, and reference to receiving water quality benchmarks from the Basin Plan and California Toxics Rule.

The purpose of this Water Quality Technical Report is to assess the potential impacts on surface water quality associated with the Project and to identify Project Design Features for inclusion in the Project EIR. Elements of this report will be utilized in the future development of the Project WQMP. A final Project WQMP will be prepared for each Development Area or Tract in conjunction with the rough grading plan or final subdivision map, whichever occurs first.

The effects of the proposed development on hydrologic, hydraulic, sedimentation, groundwater, geotechnical, and biological issues are addressed elsewhere. The effects of the proposed development on hydrologic, hydraulic, and sedimentation issues are addressed in the Runoff Management Plan – Volume 1 (Fuscoe Engineering, February 2005). Potential groundwater impacts are addressed in Geosciences' Report on Groundwater Related Issues for the Proposed Mountain Park Development (February 2005). Geotechnical issues are addressed in Leighton's Updated Preliminary Geotechnical Investigation, Mountain Park Project, Gypsum Canyon (February 2005). Potential biological impacts are addressed in PCR Service Corporation's Biological Resources Assessment Report (February 2005). Additionally, Jones and Stokes has prepared a Riparian Habitat Assessment (February 2005), and a Delineation of Wetlands, Other Waters of the United States, and California Department of Fish and Game Jurisdiction (February 2005).

2 ENVIRONMENTAL SETTING

2.1 Project Location

The Project is located in Gypsum Canyon, south of the Riverside (SR-91) Freeway, in Orange County, California (Figure 2-1). The Eastern Transportation Corridor (SR-241) bisects the Project into eastern and western segments. The majority of the Project is in the jurisdiction of the City of Anaheim; however, the southern- and eastern-most portions of the Project are in an unincorporated area of the County of Orange in the City of Anaheim's sphere-of-influence. The site is bounded on the west by The Summit of Anaheim Hills (The Summit) and Sycamore Canyon communities within the City of Anaheim; on the south and southeast by unincorporated undeveloped land within the County of Orange; on the east by Coal Canyon; and to the north across SR-91, Featherly Regional Park (Featherly Park) and residential communities in the City of Yorba Linda.

2.2 Project Area Land Uses

The City of Anaheim approved a Specific Plan for the Project (SP 90-4) in 1991 that allowed for the development of 7,966 residential units, commercial uses, interim sand and gravel mineral extraction, schools, parks, and open space. The approved development pursuant to SP 90-4 was never implemented by the Project applicant. In May 2004, the City of Anaheim approved a General Plan Update (GPA No. 2004-00419) that decreased the intensity of development in the Mountain Park Specific Plan area from 7,966 residential units to 2,500 units and eliminated proposed commercial and mineral extraction uses, two school sites and one neighborhood park site. Along with the General Plan Update, the City of Anaheim also approved an update to Title 18 (Zoning) of the Anaheim Municipal Code, and terminated the Development Agreement No. 91-01 between the City of Anaheim and The Irvine Company relating to the Mountain Park Specific Plan (SP 90-4). The actions related to the Mountain Park Specific Plan area were coordinated with the Project applicant. The Project applicant is currently processing a revised Specific Plan for the Project that is consistent with the recently adopted General Plan and Municipal Code update.

The Mountain Park Specific Plan No. 90-4, hereinafter referred to as the "project site" encompasses approximately 3,001 acres and is proposed to include Development Areas and preserved open space. The project site acreage does not include the approximate 172-acre SR-241 right-of-way through the western portion of the project site. The Mountain Park "study area" is approximately 3,025.3 acres and includes the project site, as well as approximately 24.3 acres for off-site project features (discussed below). The project site is currently undeveloped with the exception of the approximate 300-acre Robertson's Ready Mix sand and gravel mining, concrete ready-mix and All American Asphalt manufacturing facilities located in the northeastern portion of the project site. Robertson's operated under an extraction license agreement with The Irvine Company that terminated in 2004. All American Asphalt operates under a sublicense to Robertson's.

Legend

- Water Quality Gauge
- Rain Gauge
- Streams
- State Route
- Project Boundary
- Drainage Area/ Sub-Drainage Area
- National Forest
- County Boundary
- City Boundary
- Gypsum Canyon Subwatershed

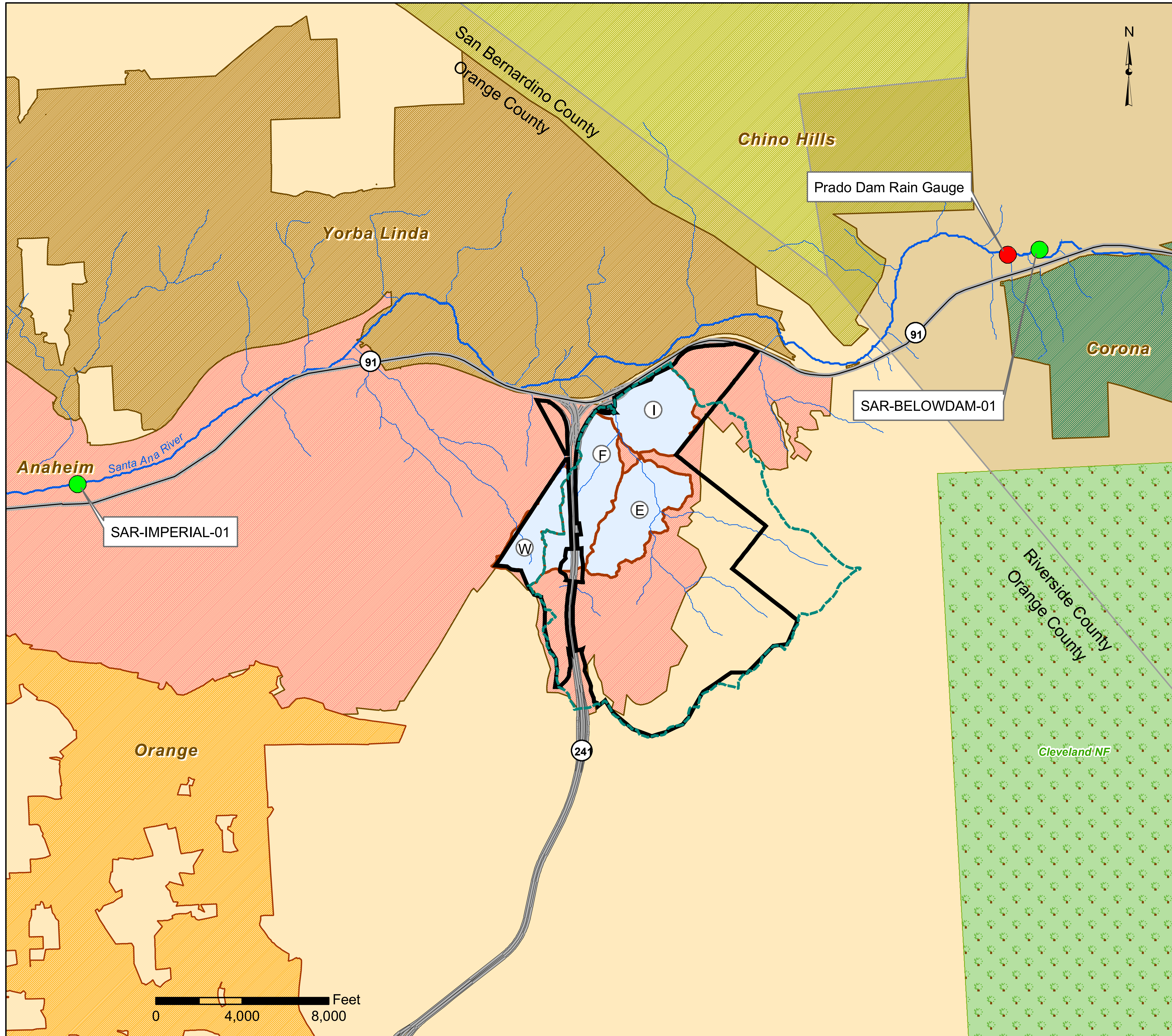
Figure 2-1
Mountain Park Development Project:
Project Location Map

(Project Area Location Adapted from Fuscoe Engineering)

March 2005

P:\GIS\Irvine\MtPark\projects\Mar(05)\MtPark(Fig_2-1).mxd

GeoSyntec Consultants



The Project would allow for the development of a maximum of 2,500 residential units in Development Areas 1, 2, 3, 4, 5 and 7. In addition to residential uses, the Project includes the following: a City fire station, public trail staging area, interpretive center and/or potential store concession northwest of the Santa Ana Canyon Road/Gypsum Canyon Road intersection in Development Area 6; a school site and adjacent community park in Development Area 3; public and private recreational facilities; water reservoirs; and, riding and hiking trails.

Approximately 2,163 acres of the project site would be preserved as open space outside of the Development Areas, including Natural Communities Conservation Program (NCCP) open space areas, open space devoted to conservation easements, and other open space. Open space areas are primarily located in the southern portion of the project site.

The Project includes construction of a bridge structure over SR-241 for a proposed roadway extending between development areas east and west of SR-241 (Mountain Park Drive), and implementation of the Weir Canyon Road/SR-241 interchange.

The Project would also require the implementation of off-site project features. The locations of the components of the Project that would be off-site are depicted on Figure 2-2 and include: drainage improvements within Featherly Regional Park; realignment and improvements to Gypsum Canyon Road between Santa Ana Canyon Road and Featherly Regional Park; improvements to Santa Ana Canyon Road immediately west of Gypsum Canyon Road and the entry to the project site; removal of pavement and installation of median improvements at the eastern terminus of Weir Canyon Road at the western Project boundary; roadway improvements at the current terminus of Oak Canyon Road; and, remedial fill slopes north of Development Area 5. Some of these off-site project features occur within the Caltrans right-of-way. The Project also includes connections to existing off-site utilities. These off-site improvements will require approvals from the following agencies: Orange County Sanitation District (sewer connection), County of Orange Harbors Beach and Parks Department (Featherly Park drainage improvements); Caltrans (encroachment into SR-241 and SR-91 right-of-way), the City of Anaheim (off-site roadway improvements), and the City of Yorba Linda (off-site sewer connections within the City).

2.3 Receiving Waters and Beneficial Uses

The project site comprises approximately 3,001 acres within the 3,200 square mile Santa Ana River regional watershed. It incorporates 2,686 acres of the approximately 3,379 acre Gypsum Canyon Creek local watershed, a 146-acre West drainage area, a 155-acre East drainage area, and several off-site drainage areas that ultimately drain into the Lower Santa Ana River, Reach 2 (Fuscoe Engineering, 2005).

The Gypsum Canyon Creek local watershed is primarily undeveloped, with the exception of some modifications made by the sand and gravel extraction operations in the northeast corner of the site and the construction of SR-241. The main, central floor slopes gently upward at

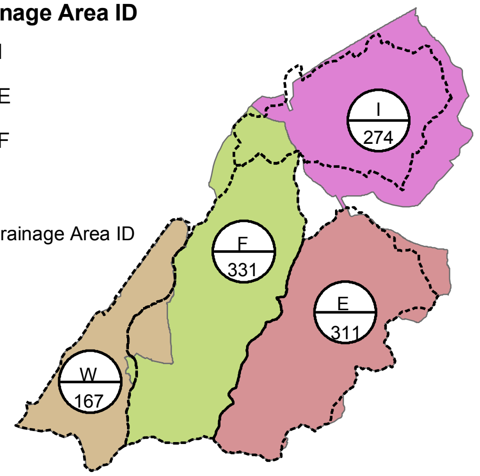
Watershed Key Map

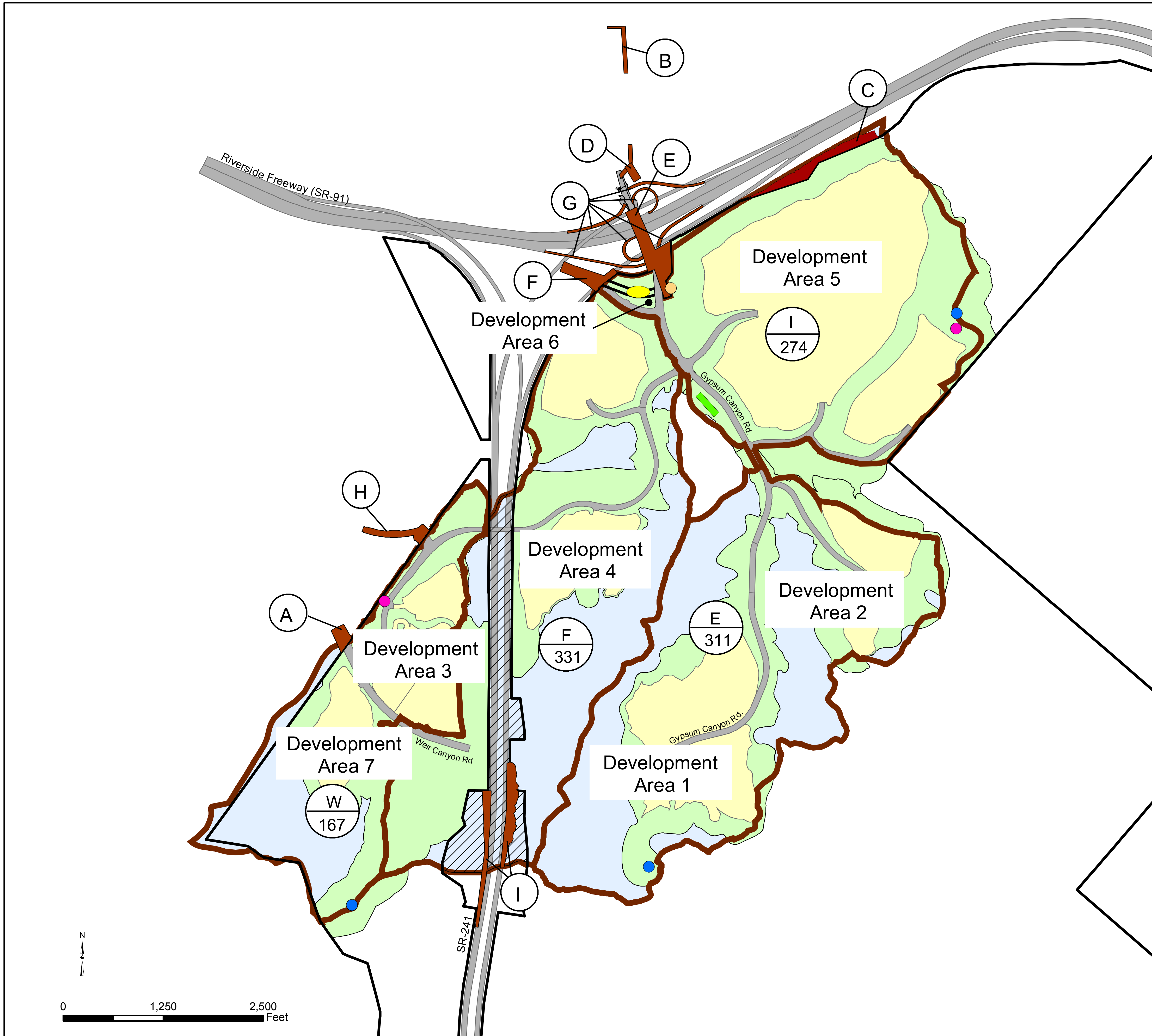
Legend

- Drainage Area/ Sub-drainage Area Boundary: Existing Conditions
- Drainage Area/ Sub-drainage Area Boundary: Developed Conditions

Drainage Area/ Sub-drainage Area ID

- Sub-drainage Area I
- Sub-drainage Area E
- Sub-drainage Area F
- Drainage Area W
- F 331 — Drainage Area/ Sub-drainage Area ID, Acreage





Legend

- Sewer Lift Station
- Booster Pump Station (water)
- Water Reservoir
- Roads
- Fire Station/ Trail Head
- Proposed Community Center
- Off-site Project Features
- Pad Areas
- Primary Impact Area
- Modeled Areas Outside of Project Area
- Project Boundary
- Drainage Area/ Sub-drainage Area
- F 331 — Drainage Area/ Sub-drainage Area ID, Acreage

Off-site Project Features

- (A) Weir Canyon Rd/ Blue Sky Way Intersection
- (B) SARI Line Connection
- (C) SR 91 Right-of-way
- (D) Featherly Regional Park
- (E) Gypsum Canyon Rd
- (F) Santa Ana Canyon Rd
- (G) SR-91 Interchange Impact Area
- (H) Oak Canyon Road
- (I) Interchange Grading

Figure 2-2
Mountain Park Development Area: Project, Impact, Drainage Areas, and Sub-drainage Areas

(Adapted from boundaries provided by Fuscoe Engineering)

March 2005
P:\GIS\Irvine\MtPark\projects\Mar(05)\MtPark(Fig_2-2).mxd

GeoSyntec Consultants

approximately two percent from north to south. The eastern and western sides, along with the southern walls of the canyon, mostly consist of steep slopes ranging from 30 to 75 percent. The creek is ephemeral and expected existing peak flow rates range from 1,030 cfs for the two year storm to 3,230 for the 25 year storm (Fuscoe Engineering, 2005).

The "project impact area" encompasses 872.7 acres and includes all area needed for project site grading to accommodate proposed residential uses, infrastructure, and amenities, as well as additional area required for fuel modification beyond the grading limits (Fuscoe Engineering, 2005). The four drainage areas modeled for this report (sub-drainage Areas I, F, E, and drainage area W from the draft Runoff Management Plan Volume I) encompass the total development area, infrastructure, and the amenities within the primary impact area; and the open space that surrounds the primary impact area within each drainage area (Figure 2-2). Modeling was also conducted for the off-site project features that will add new impervious surface: the realignment and improvements to Gypsum Canyon Road and the improvements to Santa Ana Canyon Road.

The drainage areas assessed for this report do not include the reserve open space areas within the Project boundary (sub-drainage areas A, B, C, D, G, and H in the draft Runoff Management Plan Volume I). Since no development is proposed in the reserve open space areas, loads and concentrations of pollutants of concern in runoff from these areas will not be affected by the Project. The projected changes in loads associated with the Project are captured by modeling the drainage basins containing the project impact area. By disregarding the runoff volume and pollutant loads from the reserve open space, changes in concentrations for most constituents would be higher than would be the case if the total Project area were modeled. In this respect, the projected changes in concentration are conservative (i.e., higher). Modeling is discussed in detail in Appendix B of this report.

Approximately 808 acres within sub-drainage areas I, F, and E are tributary to Gypsum Canyon Creek in the existing site condition (Figure 2-2). Proposed development within these sub-drainage areas includes Development Areas 1, 2, 4, and 5; the City fire station, store concession, and adjacent public trail staging area (Development Area 6); a private recreation center; water reservoirs in Sectors 1 and 5; a pump station and lift station; and riding and hiking trails. The proposed grading plan will increase the Gypsum Canyon Creek local watershed by approximately 23 acres from portions of the East drainage area and the freeway drainage areas. The proposed grading plan for sub-drainage area F (Development Area 4) incorporates approximately 22 acres that drain to the north to SR-91. This increase in area will be offset by the loss of 22 acres to the West drainage area from Development Area 4. These changes in area are illustrated in the Watershed Key Map on Figure 2-2.

The West drainage area comprises approximately 146 acres west of SR-241 (Fuscoe Engineering, 2005). The West drainage area includes two sub-drainage areas that fall outside the Gypsum Canyon watershed boundary. The southern sub-drainage area (West A) is an undeveloped area of approximately 114.5 acres adjacent to The Summit of Anaheim Hills (City of Anaheim) property that drains into the existing storm drain system of The Summit. This residential development ultimately drains into Reach 2 of the Santa Ana River, downstream of Gypsum Canyon Creek via Weir Canyon Road. The northern sub-drainage area (West B) is an undeveloped 31.5-acre area north of West A and adjacent to The Summit that drains north via a concrete lined drainage channel parallel to the SR-241 and ultimately discharges into the Santa Ana River, Reach 2 under Santa Ana Canyon Road. The existing storm drain systems that receive drainage from both of the West sub-drainage areas are concrete-lined and do not include naturally-occurring drainage courses. Proposed development within the Drainage Area W (West A plus West B) includes Development Areas 3 and 7 and a water reservoir. The proposed grading plan will increase the W drainage area by approximately 21 acres

The East drainage area is comprised of approximately 155 acres and is located at the northeastern portion of the project site. It includes a 37 acre sub-drainage area (East A) tributary to the Santa Ana River through a culvert under SR-91 , while the remaining sub-drainage area (East B – 118 acres) drains northeast towards Coal Canyon and discharges through a different culvert under SR-91 to the Santa Ana River. The existing quarry site extends approximately 6 acres into the East drainage area. The proposed boundary of Development Area 5 would extend east and north beyond the existing Gypsum Canyon watershed boundary into the East drainage area and the East SR-91 frontal slope drainage area. Approximately 10 acres within the East drainage area will be graded to drain back towards the Project's drainage facilities within Gypsum Canyon. Approximately 7 acres of East A sub-drainage area will be gained to Gypsum Canyon, while approximately 3 acres of East B sub-drainage area will be gained to Gypsum Canyon. Of these 10 acres, approximately 6 acres are currently disturbed by the existing quarry site.

There are also three primary freeway drainage areas that fall outside the Gypsum Canyon watershed and collect flows within the Project boundary and adjacent off-site areas including the SR-91/SR-241 drainage area, the SR-91/Gypsum Canyon Road drainage area, and the East SR-91 frontal slope drainage area. A brief summary of each of these freeway drainage areas is provided below.

- *SR-91/SR-241 Drainage Area* – a 95-acre drainage area that collects runoff into a series of improved storm drain systems from on-site and off-site areas adjacent to the SR-241 connection with the SR-91 and delivers flows to the Santa Ana River under Santa Ana Canyon Road.

- *SR-91/Gypsum Canyon Road Drainage Area* – a 26-acre drainage area that falls to the north of the Gypsum Canyon watershed boundary but contains portions within the Project boundary. This drainage area collects flows from the freeway system and existing

Gypsum Canyon Road and connects into the triple box culvert that drains Gypsum Canyon.

- *East SR-91 Frontal Slope Area* – a 34-acre drainage area located between Gypsum Canyon watershed and the SR-91 and that includes two improved concrete culverts to collect runoff from the SR-91 frontal slopes and convey runoff under the freeway to the Santa Ana River.

Receiving waters for the Project include Gypsum Canyon Creek and the Santa Ana River. The Water Quality Control Plan for the Santa Ana River Basin (the Basin Plan) (SARWQCB, 1995) lists beneficial uses of major water bodies within this region (Table 2-1). Gypsum Canyon Creek is not specifically designated with beneficial uses in the Basin Plan, but the Santa Ana River is listed and has specific beneficial uses assigned to it.

Table 2-1: Beneficial Uses of Receiving Waters

Water Body	Beneficial Uses							
	MUN	AGR	GWR	REC1	REC2	WARM	WILD	RARE
Santa Ana River Reach 2	E	P	P	P	P	P	P	P

P – Present or potential beneficial use
E – Excepted from municipal drinking water standard (MUN) designation

As identified in Table 2-1 above, the beneficial uses of Reach 2 of the Santa Ana River include the following:

- AGR -- Agricultural supply waters used for farming, horticulture, or ranching
- GWR -- Groundwater recharge for natural or artificial recharge of groundwater
- REC1 -- Water contact recreation involving body contact with water and ingestion is reasonably possible
- REC2 -- Non-contact water recreation for activities in proximity to water, but not involving body contact
- WARM -- Warm freshwater habitat to support warm water ecosystems
- WILD -- Wildlife habitat waters that support wildlife habitats
- RARE -- Waters that support rare, threatened, or endangered species and associated habitats

The Santa Ana River is divided into six reaches in the Basin Plan. Runoff from the Project will enter the Santa Ana River at Reach 2, which begins at the Prado Dam and extends downstream to 17^{th} Street in Santa Ana (SARWQCB, 1995). Rapid percolation basins operated by the Orange County Water District (OCWD) are located in the streambed in the downstream end of Reach 2. As much of the stream flow as possible is recharged into the Orange County groundwater basin in the forebay/recharge area, and therefore the downstream end of Reach 2. Below the recharge areas near Anaheim, the Santa Ana River is normally dry, except in low flow channels and during wet weather conditions. Santa Ana River flows are a significant source of groundwater recharge in the lower basin, which provides domestic supplies for more than two million people.

The dividing line between reaches 2 and 3 of the Santa Ana River is Prado Dam, a flood control facility built and operated by the U.S. Army Corps of Engineers in 1941 (USACOE, 1998). The dam includes a subsurface groundwater barrier, and as a result all ground and surface waters from the upper basin (2,230 square miles of the 3,200 square mile Santa Ana River watershed) are forced to pass through the dam (or over the spillway). Generally, when the water surface elevation in the reservoir pool behind the dam is below the top of the buffer pool elevation, water conservation releases are made. These releases are coordinated with the OCWD and are based upon the capacity of their groundwater recharge facilities and agreements with other agencies. If the water surface in the reservoir exceeds the top of the buffer pool, flood control releases commence. The objective of the flood control operation is to drain the reservoir back to the top of the buffer pool as quickly as possible without exceeding the capacity of the channel downstream. In current practice, when the water surface in the reservoir exceeds the top of the buffer pool, releases are increased to match inflow up to 5,000 cfs. When inflows exceed 5,000 cfs, the excess water is stored in the reservoir. The 5,000 cfs limit on controlled releases may increase to over 30,000 cfs when downstream channel improvements which are part of the Corps of Engineers' Santa Ana River project are completed.

2.4 <u>Existing Receiving Water Quality</u>

Water quality data at two monitoring stations in the Santa Ana River, one 5 miles upstream and one 5.3 miles downstream of Gypsum Canyon (Figure 2-1), were provided by the Orange County Water District (OCWD) and are summarized in Table 2-2:

- Santa Ana River 0.9 miles below the Prado Dam (SAR-BELOWDAM-01) (upstream of the project site); and
- Santa Ana River at the Imperial Highway (SAR-IMPERIAL-01) (downstream of the project site).

The data were taken from January 2000 through June 2003, at least once per month but occasionally more frequently. Monitoring occurred on 73 dates at the Prado Dam location and on 61 dates at the Imperial Highway location during this period; however, the number of samples for each constituent was generally less than the total number of sampling dates and varied depending on the constituent. The data includes both wet weather and dry weather sampling.

Water quality data were also collected by the Orange County Environmental Management Agency (OCEMA) at a monitoring station in the Santa Ana River in close proximity to the Project. These data are outdated, as they were taken in the late 1970's and early 1980's, and do not appear to reflect current conditions in the Santa Ana River as affected by the operation of the Prado dam.

Table 2-2: Monitoring Data for Santa Ana River Reach 2

Parameter	Santa Ana River below Prado Dam[1] (SAR-BELOWDAM-01)			Santa Ana River at Imperial Highway[1] (SAR-IMPERIAL-01)		
	# of samples	Mean	Range	# of samples	Mean	Range
TSS (mg/L)	6	61	7.5 – 77	4	101	53 - 140
Turbidity (NTU)[2]	51	19	1 - 180	48	20	0.7 – 78
Nitrate (mg/L as N)	62	5.2	1.4 - 14	51	3.8	0.5 – 8.4
TKN (mg/L as N)	62	0.8	0.02 – 2.1	51	0.8	0.02 – 2.2
Orthophosphate[3] (mg/L as P)	56	0.8	0.3 – 1.5	47	0.7	0.4 – 1.7
Dissolved Copper (μg/L)	10	6.5	2 – 16	10	10.5	2.1 – 35
Total Copper (μg/L)	5	10.2	4.1 – 14	7	11.6	5 - 22
Total Lead (μg/L)	5	0.7	0.1 – 2	6	0.5	0.1 – 2.2
Total Zinc (μg/L)	5	10	5 - 19	6	18	5 - 70
Hardness (mg/L as $CaCO_3$)	56	240	81 - 281	48	266	193 - 515

[1]Source: Orange County Water District.
[2]Turbidity is measured as "nephelometric turbidity units", which is a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions.
[3]Orthophosphate is the readily bioavailable portion of total phosphorous.

The monitoring data reflects the effect of managed flows from the Prado Dam. For instance, TSS concentrations are much lower than those typically observed in uncontrolled river systems in Southern California. TSS does increase slightly from the Prado Dam monitoring station downstream to the Imperial Highway station. The relatively high nitrate levels (on average from 3.8 to 5.2 mg/L as N) reflect that the flows in the river above Prado Dam are dominated by tertiary treated wastewater. OCWD manages an extensive network of constructed wetlands behind the Prado Dam to reduce nitrate levels in the river to below drinking water standards (10 mg/L as N). The ratio of dissolved copper to total copper shows that most of the copper is in the dissolved phase, which reflects the low TSS and turbidity concentrations. The high hardness values (averages ranging from 240 to 266 mg/L as $CaCO_3$) are typical of streams in Orange County.

Water quality data were also collected by OCEMA at a monitoring station in Gypsum Canyon Creek once in March 1992 and once in March 1995 during storm flow conditions. Hardness was measured at 230 mg/L as $CaCO_3$ in 1992 and 450 mg/L as $CaCO_3$ in 1995. Measurements of trace metals indicated a total copper concentration of 5 μg/L, a total lead concentration of 5 µg/L, and a total zinc concentration of 20 µg/L in 1992 and a dissolved copper concentration of 50 µg/L in 1995. Nitrate-nitrogen was not detected at the detection limit of 1 mg/L.

3 REGULATORY SETTING

3.1 Clean Water Act

In 1972, the Federal Water Pollution Control Act [later referred to as the Clean Water Act (CWA)] was amended to require National Pollutant Discharge Elimination System (NPDES) permits for the discharge of pollutants to waters of the United States from any point source. In 1987, the CWA was amended to require that the United States Environmental Protection Agency (EPA) establish regulations for permitting of municipal and industrial stormwater discharges under the NPDES permit program. The EPA published final regulations regarding stormwater discharges on November 16, 1990. The regulations require that municipal separate storm sewer system (MS4) discharges to surface waters be regulated by a NPDES permit.

In addition, the CWA requires the States to adopt water quality standards for water bodies and to have those standards approved by the EPA. Water quality standards consist of designated beneficial uses for a particular water body (e.g. wildlife habitat, agricultural supply, fishing etc.), along with water quality criteria necessary to support those uses. Water quality criteria are prescribed concentrations or levels of constituents – such as lead, suspended sediment, and fecal coliform bacteria – or narrative statements which represent the quality of water that support a particular use. Because California had not established a complete list of acceptable water quality criteria, EPA established numeric water quality criteria for certain toxic constituents in the form of the California Toxics Rule (“CTR”) (40 CFR 131.38).

Water bodies not meeting water quality standards are deemed “impaired” and, under CWA Section 303(d), are placed on a list of impaired waters for which a Total Maximum Daily Load (TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a “factor of safety” included). Once established, the TMDL is allocated among current and future pollutant sources to the water body.

Neither Gypsum Canyon Creek nor the Santa Ana River below the confluence with Gypsum Canyon Creek (Reaches 1 and 2) are included on the 2002 303(d) list of impaired waterbodies. There are no TMDLs established or in process for Gypsum Canyon Creek or Reaches 1 and 2 of the Santa Ana River.

3.2 MS4 Permit

In 2002, the Santa Ana Regional Water Quality Control Board (SARWQCB), issued an NPDES (Order No. R8-2002-0010) for discharges of urban runoff in public storm drains in northern Orange County. The Permittees are the County of Orange, the Orange County Flood Control

District, and the northern Orange County cities, including the City of Orange, (collectively "the Co-Permittees"). This permit regulates stormwater discharges from municipal separate storm sewer systems (MS4s) in the Project area. The NPDES permit details requirements for new development and significant redevelopment projects, including specific sizing criteria for treatment control Best Management Practices (BMPs). The following describes pertinent portions of the Permit that address:

- Receiving water limitations (Section IV)
- Technology-based standards including MEP and BAT/BCT (Section XII.B), and
- Local implementation.

3.2.1 Receiving Water Limitations

Section IV of the NPDES Permit contains receiving water limitations for discharges from MS4s. This section states:

> "Discharges from MS4s shall not cause or contribute to exceedances of receiving water quality standards (designated beneficial uses and water quality objectives) for surface waters or groundwaters."

To implement the requirements of the NPDES permit, including the Receiving Water Limitations, the Co-Permittees have developed a 2003 Drainage Area Management Plan (DAMP) that includes a New Development and Significant Redevelopment Program (OCPFRD, 2003). The MS4 Permit states in pertinent part:

> "The DAMP and its components shall be designed to achieve compliance with receiving water limitations. It is expected that compliance with receiving water limitations will be achieved through an iterative process and the application of increasingly more effective BMPs. The permittees shall comply with Sections III.2 and IV of this order through timely implementation of control measures and other actions to reduce pollutants in urban stormwater runoff in accordance with the DAMP and other requirements of this order, including any modifications thereto."

3.2.2 Technology-based Standards

Section XII.B of the 2002 municipal separate storm sewer system (MS4) NPDES Permit required the Permittees to review Appendix G of the 1993 Drainage Area Management Plan (DAMP) and to submit for review and approval by the SARWQCB a revised Water Quality Management Plan (WQMP) that specifies BMP requirements for new development and significant redevelopment.[1] Section XII.B.1 identifies the project categories that must

[1] The revised WQMP developed by the County and the Cities and approved by the Regional Board is the "Model WQMP." As described in the DAMP and Model WQMP, project-specific WQMPs prepared by project owners/developers are "Project WQMPs."

incorporate treatment control BMPs sized to meet the requirements of permit section XII.B.3.[2] Section XII.B.2 encouraged the Permittees to allow the implementation of regional and/or watershed management programs to address runoff from new development and significant redevelopment, and stated the following, which applies to the requirement for the Permittees to revise the DAMP and develop a revised WQMP:

> "The goal of the WQMP is to develop and implement practicable programs and policies to minimize the effects of urbanization on site hydrology, urban runoff flow rates or velocities and pollutant loads. This goal may be achieved through watershed-based structural treatment controls, in combination with site-specific BMPs. The WQMP shall reflect consideration of the following goals, which may be addressed through on-site-and/or watershed-based BMPs.
>
> "a. The pollutants in post-development runoff shall be reduced using controls that utilize best available technology (BAT) and best conventional technology (BCT).
>
> "b. The discharge of any listed pollutant to an impaired waterbody on the 303(d) list shall not cause an exceedance of receiving water quality objectives."

Pursuant to Section XII.B of the Permit, the Permittees (including the County of Orange and the City of Anaheim) prepared a Model WQMP and submitted it to SARWQCB for review and approval. On September 26, 2003, the board of SARWQCB authorized the agency's Executive Officer to approve the Model WQMP, with slight revisions. By letter dated September 30, 2003, the Executive Officer issued that approval.

The NPDES Permit is governed by the Maximum Extent Practicable (MEP) standard of the federal Clean Water Act, as indicated by Section XIX.2 which states:

> "The purpose of this Order is to require the implementation of best management practices to reduce, to the maximum extent practicable, the discharge of pollutants from the MS4 in order to support reasonable further progress towards attainment of water quality objectives."

The 2002 MS4 Permit also incorporates the BAT and BCT Clean Water Act technology standards to be reflected in the revised WQMP (i.e., Model WQMP). However, BAT and BCT are not defined by the Permit. Federal law specifies factors relating to the assessment of BAT including: age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving effluent reduction; non-water quality environmental impacts (including energy requirements); and other factors as the Administrator deems appropriate. Clean Water Act §304(b)(2)(B). Factors relating to the assessment of BCT include: reasonableness of the

---

[2] The 2003 DAMP and Model WQMP refer to this list of project categories as "Priority Projects."

relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived; comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources; the age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; non-water quality environmental impact (including energy requirements); and other factors as the Administrator deems appropriate. Clean Water Act §304(b)(4)(B).

The Administrator of U.S. EPA has not issued regulations specifying BAT or BCT for urban runoff. However, as indicated in the revised DAMP, "all priority projects shall design, construct, and implement structural Treatment Control BMPs that meet the design standards in this section and achieve the appropriate standard, as specified in the Third Term Permits…." (Quantity Design Standard for Treatment Control BMPs (page 7.II-33)). The Permittees considered the "appropriate standard" of the NPDES Permit when updating the DAMP and preparing the model WQMP. Those standards include BAT and BCT as they are referenced in the NPDES Permit.

The New Development and Significant Redevelopment Program of the DAMP provides a framework and a process for following the NPDES permit requirements and incorporates watershed protection/stormwater quality management principles into the Co-Permittees' General Plan process, environmental review process, and development permit approval process. The New Development and Significant Redevelopment Program includes a Model Water Quality Management Plan (WQMP) that defines requirements and provides guidance for compliance with the NPDES permit requirements for project-specific planning, selection, and design of BMPs in new development or significant redevelopment projects.

3.2.3 Local Implementation Plan

Per the requirements of the DAMP and MS4 Permit, local jurisdictions, including the City of Anaheim, have adopted a Local Implementation Plan (LIP) containing policy and implementation documents for compliance with the DAMP/MS4 Permit. Section A.7 of the LIP contains the new development and redevelopment component based upon the model program contained in the DAMP. Using its local LIP as a guide, the City of Anaheim will approve project-specific WQMPs as part of the development plan and entitlement approval process for discretionary projects, and prior to issuing permits for ministerial projects. The information in this report will serve as the technical basis for the Mountain Park Project WQMP.

One of the requirements for WQMPs pursuant to the City's program is that all priority new development and significant redevelopment projects are required to develop and implement a project WQMP that addresses:

- Regional or watershed programs (if applicable)
- Routine structural and non-structural Source Control BMPs
- Site Design BMPs (as appropriate)

- Treatment Control BMPs (Treatment Control BMP requirements may be met through either project specific (on-site) controls or regional or watershed management controls that provide equivalent or better treatment performance
- The mechanism(s) by which long-term operation and maintenance of all structural BMPS will be provided

The DAMP/LIP is consistent with the technology-based standards set by the MS4 Permit, including the Maximum Extent Practicable Standard (MEP), as well as consideration of the technology-based goals included in Section XII.B.2 that are applicable to point source discharges - Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT). MEP is a technology-based standard established by Congress in CWA section 402(p)(3)(B)(iii) that MS4 discharges must meet. The Orange County MS4 Permit defines "Maximum Extent Practicable" as "the maximum extent feasible, taking into account considerations of synergistic, additive, and competing factors, including but not limited to, gravity of problem, technical feasibility, fiscal feasibility, public health risks, societal concerns, and social benefits." Compliance with the MS4 Permit and DAMP/LIP requirements for site design, source control, and treatment control BMPs satisfies the MEP standard.

In addition to other BMPs, the LIP requires treatment control BMPs to be implemented for all priority projects, defined to include all projects meeting any of the following criteria:

1. Residential development of 10 units or more.

2. Commercial and industrial development greater than 100,000 square feet (including parking area).

3. Automotive repair shops.

4. Restaurants where the land area of development is 5,000 square feet or more (including parking area).

5. Hillside development on 10,000 square feet or more, which are located on areas with known erosive soil conditions or where natural slope is 25 percent or more.

6. Impervious surface of 2,500 square feet or more located within, directly adjacent to (within 200 feet), or discharging directly to receiving waters within Environmentally Sensitive Areas.

7. Parking Lots 5,000 square feet or more, or with 15 parking spaces or more, and potentially exposed to urban runoff.

8. 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.

Project-based treatment BMPs in a WQMP must meet certain criteria as per the LIP, including specified design criteria and other selection factors based on the pollutants of concern expected from a project site. Primary pollutants of concern are those pollutants that are anticipated or potential pollutants in runoff from the project based on proposed land uses and which have also been identified as causing impairment of receiving waters on the most recent 303(d) list. Other pollutants of concern are those pollutants that are anticipated or potential pollutants that have not been identified as causing impairment of receiving waters. Pollutants of concern for the Project are identified in Section 4.1 and Appendix A.

The DAMP/LIP includes sizing criteria for both volume-based and flow-based BMPs. The sizing criteria options for volume-based BMPs, such as extended detention basins, are as follows:

1. The volume of runoff produced from a 24-hour, 85^{th} percentile storm event, as determined from the local historical rainfall record; or,

2. The volume of annual runoff produced by the 85^{th} percentile, 24-hour rainfall event, determined as the maximized capture stormwater volume for the area, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998); or,

3. The volume of annual runoff based on unit basin storage volume, to achieve 80% or more (Santa Ana Regional Board region) volume treatment by the method recommended in California Stormwater Best Management Practices Handbook – Industrial/Commercial (1993); or,

4. The volume of runoff, as determined from the local historical rainfall record, that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85^{th} percentile, 24-hour runoff event.

Sizing of water quality basins for the Project were estimated consistent with Option 2, the WEF Manual of Practice Method. This method was chosen because it takes into account drain time, which affects the level of treatment, and usually provides for treatment of a larger runoff volume.

Flow-based BMPs such as biofiltration must be designed to infiltrate or treat the maximum flow rate generated from one of the following scenarios:

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

2. The maximum flow rate of runoff produced by the 85^{th} percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two.

3. The maximum flow rate of runoff, as determined from the local historical rainfall record that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85^{th} percentile hourly rainfall intensity multiplied by a factor of two.

Biofiltration BMP sizes for the Project were assumed for modeling purposes to be consistent with Option 2, or two times the 85^{th} percentile hourly rainfall intensity as determined from the historical rainfall record at the Prado Dam rain gage, which was determined to be 0.21 inches per hour. This method was chosen because it will provide for treatment of a larger runoff volume.

3.3 Construction Permits

Pursuant to the CWA Section 402(p), requiring regulations for permitting of certain stormwater discharges, the State Water Resources Control Board (SWRCB) has issued a statewide general NPDES Permit for stormwater discharges from construction sites ((NPDES No. CAS000002) California Water Resources Control Board Resolution No. 2001-046; Modification of Water Quality Order 99-08-DWQ State Water Resources Control Board (SWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity (adopted by the SWRCB on April 26, 2001)).

Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres (effective March 2003) are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with the SWRCB. Each applicant under the Construction General Permit must ensure that a Stormwater Pollution Prevention Plan (SWPPP) is prepared prior to grading and implemented during construction. The primary objective of the SWPPP is to identify, construct, implement, and maintain BMPs to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the construction site during construction.

The Project is also subject to the requirements of the Caltrans NPDES Storm Water Permit (CAS000003) for the off-site impact areas within the State Right of Way (ROW). In addition, a Caltrans Encroachment Permit must be obtained prior to any work within the State ROW.

3.4 General Waste Discharge Requirements for Construction Non-stormwater Discharges

The Santa Ana Regional Water Quality Control Board has issued General Waste Discharge Requirements (WDRs) under Order No. R8-2003-0061 (NPDES No. CAG 998001) governing non-stormwater construction-related discharges from activities associated with project development within the Project development areas. This permit addresses discharges from activities such as dewatering, water line testing, and sprinkler system testing. The discharge requirements include provisions mandating notification, testing, and reporting of dewatering and testing related discharges. The General WDRs authorize such construction-related activities so long as all conditions of the permit are fulfilled.

3.5 Basin Plan

The Water Quality Control Plan for the Santa Ana River Basin (Santa Ana Basin Plan) (SARWQCB, 1995 as amended) designates beneficial uses and water quality objectives for waterbodies. Specific objectives are provided for the larger water bodies within the region as well as general objectives for ocean waters, bays and estuaries, inland surface waters, and ground waters. In general, narrative objectives require that degradation of water quality does not occur due to increases in pollutant loads that will impact the beneficial uses of a water body. For example, the Santa Ana Basin Plan requires that, "Inland surface waters shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors." Water quality objectives apply within receiving waters and do not apply directly to runoff; therefore, water quality objectives from the Basin Plan are utilized as benchmarks for comparison in the quantitative assessments and are also examined in the qualitative assessments in the Impacts Analysis section below. Table 2-1 above lists the beneficial uses of applicable receiving waters.

3.6 California Toxics Rule

The California Toxics Rule (CTR) is a federal regulation issued by the USEPA providing water quality criteria for potentially toxic constituents in waters with human health or aquatic life designated uses in the State of California. Although not all waters receiving flow from the Project, such as Gypsum Canyon Creek, are designated with human health or aquatic life criteria, making the CTR inapplicable, other waters such as the Santa Ana River do have such designated uses making CTR applicable to them. CTR criteria are applicable to the receiving water body and therefore must be calculated based upon the probable hardness values of the receiving waters for evaluation of acute (and chronic) toxicity criteria. At higher hardness values for the receiving water, copper, lead, and zinc are more likely to be complexed (bound with) components in the water column. This in turn reduces the bioavailability and resulting potential toxicity of these metals.

Monitoring data at two locations in the Santa Ana River near the project site (see Section 2.4 above) were evaluated for hardness. The 10^{th} percentile hardness value of 221 mg/L as $CaCO_3$ was used to approximate CTR criteria and Basin Plan Site Specific Objectives for metals. The 10^{th} percentile value is appropriate because it reduces the influence of low-range outliers, but is a more conservative estimate of hardness than the mean (253 mg/L as $CaCO_3$).

Due to the intermittent nature of stormwater runoff (especially in Southern California), the acute criteria are considered to be more applicable to stormwater conditions than chronic criteria and therefore are used in assessing Project impacts. For example, the average storm duration in the Prado Dam rainfall record is 12.9 hours. Acute criteria represent the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects; chronic criteria equal the highest concentration to which aquatic life can be exposed for an extended period of time (four days) without deleterious effects.

The Basin Plan objectives and the CTR criteria do not apply directly to discharges of urban runoff, but rather apply within the specified receiving waters. Nonetheless, these criteria can provide useful benchmarks to assess the potential for the Project discharges to affect the water quality of receiving waters. In this document, these criteria are used as benchmarks to evaluate the potential ecological impacts of stormwater runoff to the receiving waters of the Project.

4 POLLUTANTS OF CONCERN AND SIGNIFICANCE CRITERIA

4.1 List of Pollutants of Concern

The pollutants of concern for the water quality analysis have been chosen based upon the regulations described above and the pollutants that are anticipated or potentially could be generated by the Project (based on the proposed land uses) that have been identified by regulatory agencies as potentially adversely affecting receiving water quality. Appendix A lists the pollutants of concern, the basis for their selection, and the significance criteria that will be applied for each.

As mentioned above, the receiving waters for the Project are not identified as impaired and thus have no 303(d) listed constituents that would lead to primary pollutants of concern.

The following pollutants, considered as "other pollutants of concern" by the DAMP Model WQMP, were chosen as pollutants of concern for purposes of evaluating water quality impacts based on three jointly applied criteria: (1) pollutants that have impaired urban surface receiving waters in other areas, (2) prevalence in urban runoff, and (3) regulatory requirements and guidance, including the MS4 Permit and the DAMP/LIP. The pollutants of concern are:

Sediments (TSS and Turbidity) **–** Excessive erosion, transport, and deposition of sediment in surface waters can be a significant form of pollution resulting in major water quality problems. Sediment imbalances impair waters' designated uses. Excessive sediment can impair aquatic life by filling interstitial spaces of spawning gravels, impairing fish food sources, filling rearing pools, and reducing beneficial habitat structure in stream channels. In addition, excessive sediment can cause taste and odor problems in drinking water supplies and block water intake structures.

Nutrients (Nitrogen and Phosphorus) **–** Nutrients are inorganic forms of nitrogen and phosphorus. There are several sources of nutrients in runoff from urban areas, mainly fertilizers in runoff from lawns, pet wastes, failing septic systems, atmospheric deposition from industry and automobile emissions. Nutrient over-enrichment is especially prevalent in agricultural areas, such as the agricultural areas upstream of Prado Dam, where manure and fertilizer inputs significantly contribute to nitrogen and phosphorus levels in streams and other receiving waters. Wastewater treatment plant discharges can also contribute significant nutrient loads to receiving streams. Eutrophication due to excessive nutrient input can lead to changes in periphyton, benthic, and fish communities; extreme eutrophication can cause hypoxia or anoxia, resulting in fish kills. As a result of eutrophication, algal scum, water discoloration, and the release of toxic metals from sediment can also occur.

Trace Metals (Copper, Lead and Zinc) – The primary sources of trace metals in stormwater are typically commercially available metals used in transportation, buildings, and infrastructure. Metals are also found in fuels, adhesives, paints, and other coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, and mercury, are typically not detected in urban runoff or are detected at very low levels (LA County, 2000); therefore, copper, lead, and zinc are used in this analysis to represent all metals potentially present in stormwater runoff from the Project site. Metals are of concern because of toxic effects on aquatic life and the potential for ground water contamination. High metal concentrations can bioaccumulate in fish and shellfish and affect beneficial uses of a waterbody.

Pathogens (Bacteria, Viruses, and Protozoa) – Urban runoff may contain elevated levels of pathogenic organisms, as well as natural areas due to wildlife. The presence of pathogens in runoff may result in waterbody impairments such contaminated drinking water sources. Elevated pathogens may be caused by the transport of animal or human fecal wastes or from plant matter or soils from the watershed. An indicator organism such as fecal coliform or fecal Enterococcus is used for pathogens due to the difficulty of monitoring for pathogens directly.

Petroleum Hydrocarbons (Oil and Grease and PAHs) – The sources of oil, grease, and other petroleum hydrocarbons in urban areas include spillage of fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff can be contaminated by leachate from asphalt roads, wearing of tires, and deposition from automobile exhaust. Petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can accumulate in aquatic organisms from contaminated water, sediments, and food and are toxic to aquatic life at low concentrations. Hydrocarbons can persist in sediments for long periods of time and result in adverse impacts on the diversity and abundance of benthic communities. Hydrocarbons can be measured as total petroleum hydrocarbons (TPH), oil and grease, or as individual groups of hydrocarbons, such as PAHs.

Pesticides – Pesticides (including herbicides, insecticides, and fungicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide may result in runoff containing toxic levels of its active component.

Trash & Debris – Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic debris (such as leaves, grass cuttings, and food waste) are general waste products on the landscape that can be entrained in urban runoff. The presence of trash & debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter such as food wastes in urban trash can create a high biochemical oxygen demand in a stream and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

4.2 Other Pollutants

The DAMP includes two additional categories of pollutants of concern that are associated with urban runoff – organic compounds and oxygen-demanding compounds. The pollutants in these two categories are subsumed by the categories above.

Organic compounds include a wide range of chemicals such as pesticides, hydrocarbons, and solvents. Industrial land uses are not proposed for the Project and therefore industrial chemicals such as solvents are not expected to be present in the runoff from the Project at detectable levels. Hydrocarbons and pesticides are potential sources of pollution for the Project and are believed to be the primary types of organic compounds likely to be present. As hydrocarbons and pesticides are addressed individually in this document, the general category of organic compounds is addressed through assessment of these constituents.

Oxygen demanding substances are compounds that can be biologically degraded by microorganisms in receiving waters. Compounds such as organic food wastes in trash and anhydrous ammonia in fertilizer are examples of the oxygen demanding compounds that may be present in urban runoff. Ammonia is typically detected at very low levels in urban runoff, likely due to the oxidation of ammonia to nitrate by bacteria in soil (nitrates are typically detected at higher concentrations than ammonia in urban runoff and do not exert an oxygen demand). Oxygen demand can be measured as "five-day biochemical oxygen demand" (BOD_5). This test involves the measurement of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The mean BOD_5 reported in the LA County database in runoff from open space and high density single family residential land uses was 12 mg/L and 16 mg/L, respectively (Los Angeles County, 2000). In contrast, the typical BOD_5 concentration in a medium strength untreated domestic wastewater is 220 mg/L and, after secondary treatment, is 30 mg/L (Metcalf and Eddy, 1979). As nutrients and trash are addressed individually in this document, the general category of oxygen demanding substances is addressed through assessment of these constituents.

Santa Ana River flows are a significant source of groundwater recharge which provides domestic supplies for the Orange County Water District. Total dissolved solids (TDS) are of concern in drinking water supplies; the Department of Health recommends that the concentration of TDS in drinking water be limited to 1,000 mg/L due to taste considerations (SARWQCB, 1995). The TDS Basin Plan water quality objective for Santa Ana River Reach 2 is 580 mg/L (SARWQCB, 2004). In comparison, the average TDS concentration in runoff from single family residential land use measured by LA County is 58 mg/L (Los Angeles County, 2000). Further, TDS typically declines with increases in impervious surface associated with development since TDS is often a product of runoff accumulating salts from exposed soils. Therefore, TDS is not considered a pollutant of concern for the Project.

Some other pollutants that are listed in the Basin Plan, but are not of concern in urban runoff include un-ionized ammonia, cadmium, and boron. Un-ionized ammonia is a pollutant typical of wastewater treatment plant discharges but not of urban runoff. Cadmium, as mentioned above, was detected in only three percent of the monitoring data collected by Los Angeles County for residential land uses (Los Angeles County, 2000) and thus is not expected to be found at levels of concern in the project runoff. Boron is not considered a problem in drinking water until concentrations of 20 to 30 mg/L are reached (SARWQB, 1995). The Basin Plan objective for boron is 0.75 mg/L in surface waters to protect irrigation supplies for citrus crops. The mean boron concentration in residential runoff measured by Los Angeles County was 0.13 mg/L (Los Angeles County, 2000) and is expected to be similarly low in project runoff. Therefore, these constituents are not considered a pollutant of concern for the Project.

4.3 Significance Criteria and Thresholds for Significance

Appendix A provides the criteria for evaluating the significance of a potential impact for each pollutant of concern. These criteria and the threshold for significance can be summarized as follows:

CEQA Standard - CEQA requires that any potentially substantial increases to pollutant concentrations and/or loads resulting from development must be evaluated for significant adverse impacts to receiving water quality by comparing pre-development and post-development water quality concentrations and loads. This report analyzes the significance of potential impacts based on the results of water quality modeling and qualitative analysis that takes into account water quality controls or BMPs that are considered Project Design Features.

Any increases of pollutant concentrations or loads resulting from development of the Project are considered to be a potential indication of a significant adverse impact. If post-development pollutant loads and concentrations, with treatment in the BMPs specified as PDFs (including water quality basins), are predicted to remain the same or to be reduced compared to existing conditions, then it is concluded that the Project will not cause a significant adverse impact to the ambient water quality of the receiving waters for that constituent. If pollutant loads or concentrations are predicted to increase, the potential impacts are assessed by (1) evaluating compliance of the project PDFs with the MS4 Permit, DAMP/LIP, and General Construction Permit requirements, and (2) by evaluating the magnitude of the potential increase in pollutant load and/or concentration and through comparison to relevant benchmarks including water quality objectives and criteria.

Water Quality Criteria – Comparison of post-development water quality concentrations in the runoff discharge with benchmark receiving water quality criteria as provided in the Basin Plan and the CTR facilitates analysis of the potential for runoff to cause or contribute to exceedances of receiving water quality standards or adversely affect beneficial uses. The water quality criteria are considered benchmarks for comparison purposes only, as such criteria apply within receiving waters as opposed to applying directly to runoff discharges.

Narrative and numeric water quality objectives contained in the Santa Ana Basin Plan apply to the Project's receiving waters. Water quality criteria contained in the CTR provide concentrations that are not to be exceeded in receiving waters more than once in a three year period for those waters designated with aquatic life or human health related uses. Projections of runoff water quality are compared to the acute CTR criteria (as discussed above), as stormwater runoff is associated with episodic events of limited duration, whereas chronic criteria apply to 4-day exposures which do not describe typical storm events in the Project area, which last 13 hours on average.

Because water quality criteria are established to protect beneficial uses of receiving waters, analyses that do not predict violations of water quality criteria from Project runoff also indicate that Project runoff will not adversely impact beneficial uses of receiving waters.

MS4 Permit Requirements for New Development (DAMP) – Satisfaction of MS4 NPDES Permit requirements for new development, as defined in the DAMP/LIP, and construction-related requirements of the General Construction Permit establish compliance with water quality regulatory requirements applicable to stormwater runoff.

The MS4 Permit requires that discharges from storm sewers include controls to reduce discharges of pollutants to the Maximum Extent Practicable. MS4 requirements are met when new development complies with the DAMP/LIP, which was developed by local governments to meet their obligations under the MS4 Permit. Under the DAMP/LIP, the effectiveness of stormwater treatment controls is primarily based on two factors: (1) the amount of runoff that is captured by the controls and (2) the selection of BMPs to address identified pollutants of concern. Selection and numerical sizing criteria for new development treatment controls are included in the MS4 Permit and the DAMP/LIP. If the Project PDFs meet these criteria, and other source control and site design BMPs required by the DAMP/LIP are implemented, it is concluded that no significant impacts will occur as the result of insufficient capacity for stormwater treatment.

Construction General Permit- All development projects which disturb one or more acres are required to obtain coverage under the State Water Quality Control Board's General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit 99-08-DWQ). The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) that describes erosion and sediment control BMPs, as well as material management/non-stormwater BMPs that will be used during the construction phase of development. Compliance with these requirements during the construction phase of a project, including implementation of BMPs consistent with Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT), as required by the Construction General Permit and Section 8 of the

DAMP, is assessed to determine potential significance of impacts. Additionally, construction dewatering must comply with the terms of the General WDRs for construction non-stormwater discharge.

Cumulative Impacts Analysis – CEQA requires a reasonable analysis of the cumulative impacts of a proposed project together with past, present, and reasonably foreseeable future related projects that could produce cumulative impacts with the proposed project.

The application of the criteria to a decision regarding significance requires an integrated or “weight of evidence” approach, rather than a decision based on any one of the individual criterion.

5 PROJECT DESIGN FEATURES FOR WATER QUALITY

In furtherance of the Orange County Drainage Area Management Plan/City of Anaheim Local Implementation Plan (DAMP/LIP) requirements, the Mountain Park Specific Plan includes the following project design features that shall be incorporated into the final Project Water Quality Management Plan (WQMP). These design features meet or exceed the requirements of the DAMP/LIP. Prior to approval of each mass or rough grading plan, the property owner/developer shall submit the Final Project WQMP to the Department of Public Works incorporating the following measures

5.1 Site Design BMPs

The following site design BMPs are practices designed to minimize runoff and the introduction of pollutants in stormwater runoff.

Minimize Impervious Area and Impervious Area Directly Connected to Storm Drains

- Minimize impervious areas by incorporating landscaped areas over substantial portions of the project area consistent with the Development Plan and Concept Landscape Plans. Single family residential landscape areas shall be determined by zoning development standards, including setbacks, lot coverage, street parkway standards, and design objectives;

- Minimize directly connected impervious area by draining parking lots to landscaped areas or bioretention facilities to promote filtration and infiltration of stormwater, if landscaping slopes are less than 2 percent and the project is not adjacent to steep slopes;

- Utilize vegetated areas, e.g., setbacks, swales, end islands, and median strips, for biofiltration and bioretention of nuisance and storm runoff flows from parking lots and other impervious areas;

- Design sidewalks to drain into landscaping and swales prior to discharging to the stormwater conveyance system;

Selection of Construction Materials and Design Practices

- Select building material for roof gutters and downspouts that do not include copper or zinc;

- Construct streets, sidewalks, and parking lot aisles to the minimum widths specified in the Anaheim Municipal Code or adopted Specific Plan and in compliance with the Development Plan and regulations for the Americans with Disabilities Act and safety requirements for fire and emergency vehicle access. Incorporate landscaped buffer areas between sidewalks and streets in compliance with the Development Plan and Anaheim Municipal Code;

Conserve Natural Areas

- Preserve existing riparian areas along Gypsum Canyon Creek and protect with buffer zones per the Development Plan;

- Preserve 2,163 acres of open space within the project boundary outside of the development area, including NCCP open space areas, open space devoted to conservation easements, and other open space;

- Concentrate or cluster development on the least environmentally sensitive portions of the project site (e.g., the quarry site) while leaving the remaining land in a natural, undisturbed condition;

- Use natural drainage systems to the maximum extent practicable or create drainages (e.g., vegetated swales) that mimic natural conveyances and allow for stormwater infiltration as well as pollutant removal;

- Maximize canopy interception and water conservation by preserving existing native trees and shrubs in natural open space areas outside of the development area, incorporating new trees into project design pursuant to landscape and reforestation plan, and including native or drought resistant plants in development plant palettes;

Protect Slopes and Channels

- Protect slopes: minimize erosion potential with vegetative cover, route flows safely away from steep and/or sensitive slopes, stabilize disturbed slopes; and

- Protect channels: control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems, stabilize channel crossings, ensure that increases in runoff velocity and frequency caused by the project do not erode the channel, install energy dissipaters, such as riprap, at the outlets of storm drains or conveyances.

5.2 Source Control BMPs

Effective management of wet and dry weather water quality begins with limiting pollutant sources. The following source control BMPs shall be implemented in order to minimize the amount of pollutants in dry weather (nuisance) flows and in stormwater runoff from the project.

Non-Structural Source Control BMPs

N1: Education for property owners, tenants and occupants - practical information materials shall be provided to the first residents/occupants/ tenants on general housekeeping practices that contribute to the protection of stormwater quality. The Homeowner’s Association (HOA) shall have an ongoing educational material distribution program. At a minimum, these materials shall cover the following topics:

1. The use of chemicals (including household type) that should be limited to the property, and avoidance of discharge of specified wastes via hosing or other means to gutters, catch basins, and storm drains.
2. The proper importance of appropriate irrigation techniques and proper handling/ application of material such as fertilizers, herbicides, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals, and swimming pool drainage.
3. The environmental and legal impacts of illegal dumping of harmful substances into storm drains and sewers.
4. Alternative household products that are safer to the environment.
5. Household hazardous waste collection programs.
6. Used oil-recycling programs.
7. Proper procedures for spill prevention and clean up.
8. Proper storage of materials that pose pollution risks to local waters.
9. Carpooling programs and public transportation alternatives to driving.

N2: Activity restrictions (Conditions, Covenants, and Restrictions) – Conditions, Covenants, and Restrictions (CC&Rs) shall be prepared as necessary and shall address surface water quality protection, or, alternatively, use restrictions shall be developed through lease terms.

N3: Common area landscape management - ongoing maintenance shall be consistent with City of Anaheim Landscape Water Efficiency (Chapter 10.19 of the Anaheim Municipal Code), plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (DAMP Section 5.5). See also, efficient irrigation systems under structural controls.

N4: Structural BMP maintenance – Homeowners Associations (HOAs) shall be responsible for the inspection and maintenance of structural BMPs (including treatment controls) located within the HOA boundaries. These BMPs are outlined below.

N11: Common area litter control - HOA shall conduct litter patrol; provide for covered trash receptacles, trashcans with lids, and emptying of trash receptacles in common areas; note trash disposal violations by tenants/homeowners or businesses and report the violations to the owner/HOA for investigation shall be conducted.

N14: Common area drainage facility inspection - privately-owned drainage facilities shall be inspected each year and, if necessary, cleaned and maintained prior to the storm season, no later than October 1st each year. Drainage facilities include catch basins and inlets, catch basin inserts, water quality basins, detention basins, other treatment facilities, and open drainage channels.

N15: Street sweeping private streets and parking lots - streets shall be swept prior to the storm season in late summer/early fall, no later than October 1st of each year. Parking lots at the private community center shall be swept weekly at a minimum, weather permitting.

Structural Source Control BMPs

Provide Storm Drain Stenciling and Signage - all storm drain inlets and catch basins, constructed or modified, within the project area shall be stenciled or labeled. Signs, which prohibit illegal dumping, shall be posted at public access points along channels and creeks within the project area. Legibility of stencils and signs shall be maintained.

Trash Area Design – trash areas shall be paved, designed not to allow run-on, screened or walled to prevent off-site transport of trash; and covered to minimize direct precipitation. Common area litter control shall include a litter patrol, covered trash receptacles, emptying of trash receptacles in a timely fashion, and noting trash violations by tenants/homeowners and reporting the violations to the owner/HOA for investigation. Connection of trash area drains to the municipal storm drain system shall be prohibited.

Efficient Irrigation - the timing and application methods of irrigation water in common areas shall minimize the runoff of excess irrigation water into the stormwater conveyance system.

Protect Slopes and Channels - stormwater BMPs shall be included to decrease the potential for erosion of slopes and/or channels, and may include appropriate conveyance structures, landscaping, etc.

Hillside Landscaping - hillside areas that are disturbed by project development shall be landscaped with deep-rooted, drought tolerant plant species selected for erosion control.

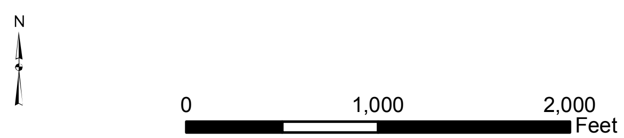
Fire Station - catch basin inserts with hydrocarbon absorption mats shall be provided for the fire station and vehicle maintenance shall be performed indoors and shall therefore not enter into the storm drain system because indoor drains flow to the sanitary sewer system.

5.3 Treatment Control BMPs

Priority projects within Orange County are required to reduce pollutants of concern in stormwater discharges to the maximum extent practicable through the incorporation and implementation of treatment control BMPs. To meet this requirement, new development projects shall implement a single or combination of stormwater treatment BMPs that will address the pollutants of concern. Treatment BMPs set forth in the DAMP are listed in Table 5-1, along with the pollutants of concern addressed by each.

The Project will utilize extended detention basins (also referred to as water quality basins) and biofilters as treatment control BMPs. Extended detention basins are included in the detention basin category in Table 5-1. These BMPs, when combined with the site design and source control BMPs described above, will address all of the pollutants of concern. The effectiveness of the selected treatment BMPs is described in detail in Appendix B, section B.4.4.

Stormwater runoff from the majority of the disturbance area will be routed to one of nine water quality basins (Figure 5-1). Collectively, the water quality basins will treat runoff from 488 acres within the disturbance area. The water quality basins will incorporate dry extended detention to provide water quality treatment for storm flows. Trash racks will be installed on the inlets into the water quality basins to aid in capturing trash and debris. Dry extended detention basins are designed with outlets that detain the runoff volume from the water quality design storm (e.g., the 85th percentile 24-hour event) for some minimum time (in this case 36 hours) to allow particles and associated pollutants to settle out. The water quality basins will also incorporate wetland vegetation in a low flow channel in the bottom of the basin for the treatment of dry weather flows and small storm events. Wetland vegetation provides one of the most effective methods for pollutant removal. As runoff flows through the wetland vegetation, pollutant removal is achieved through settling and biological uptake of nutrients and dissolved pollutants within the vegetation. These basins are not designed or anticipated to contain ponded, standing water for periods in excess of 36 to 48 hours. A conceptual illustration of an extended detention basin is provided in Figure 5-2.



Legend

- WQ Basin Location
- Sewer Lift Station
- Booster Pump Station (water)
- Water Reservoir
- Roads
- Fire Station/ Trail Head
- Proposed Community Center
- Onsite Areas Treated by Filter Strips
- Off-site Areas Treated by Filter Strips
- Treatment to be Provided by School/Park
- Areas Treated by WQ Basins
- Pad Areas
- Primary Impact Area
- Modeled Areas Outside of Project Area
- Drainage Area/ Sub-Drainage Area
- F / 331 — Drainage Area/ Sub-drainage Area ID; Acreage

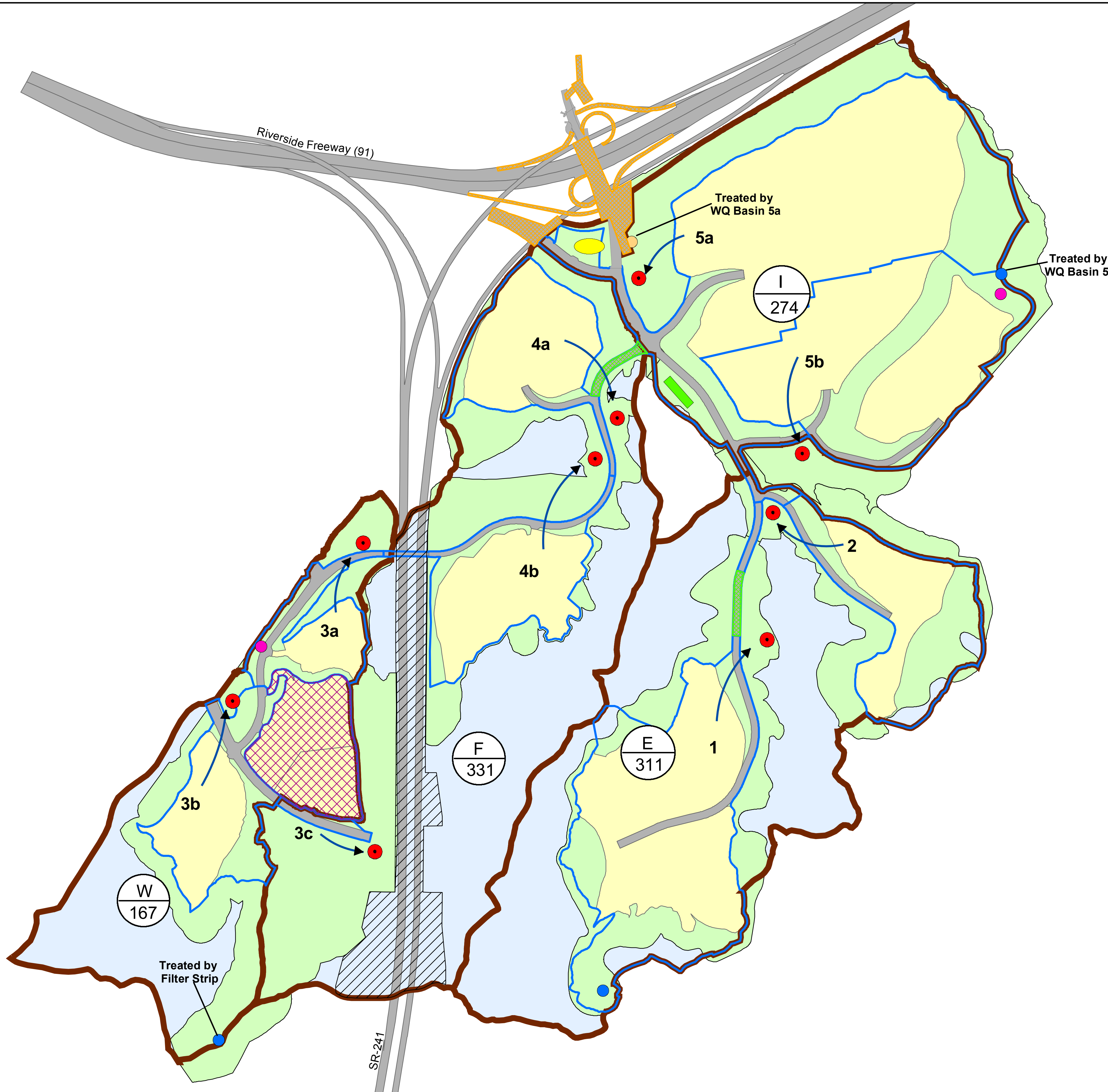


Figure 5-1
Mountain Park Development Areas: Drainage Area and Sub-drainage Area Boundaries and Treatment Areas

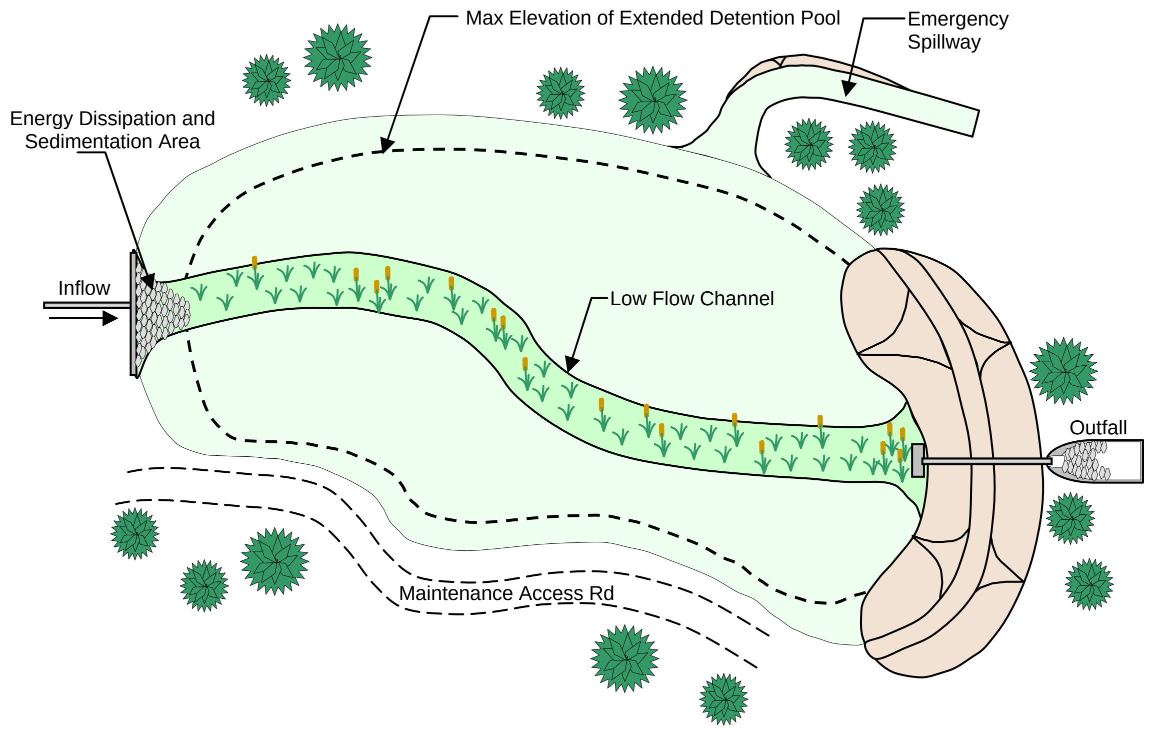
(Adapted from drainage areas, treatment areas, and WQ basin locations provided by Fuscoe Engineering)

March 2005

P:\GIS\Irvine\MtPark\projects\MtPark\Mar(05)\(Fig_5-1).mxd

GeoSyntec Consultants

Plan View



Profile

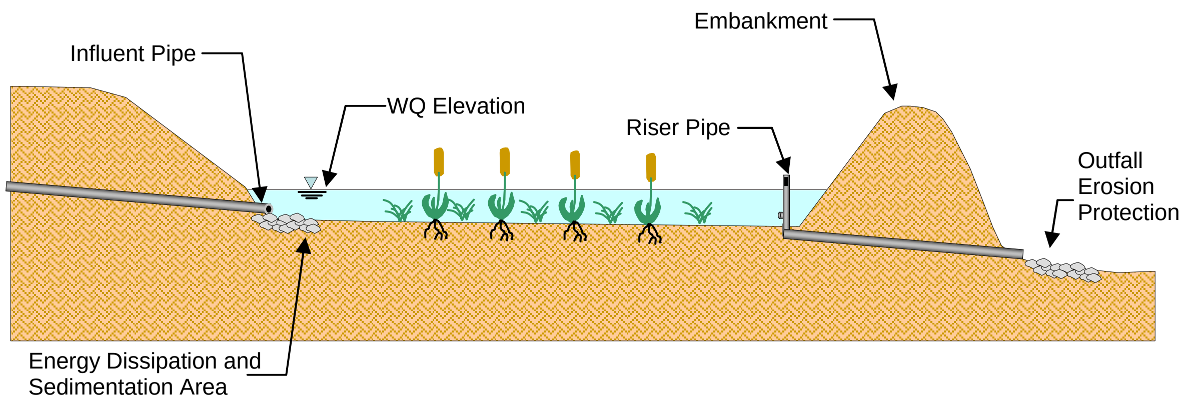


Figure 5-2
Conceptual Illustration of an Extended Detention Basin

February 2005

GeoSyntec Consultants

Table 5-1: Treatment Control BMP Selection Matrix[1,2]

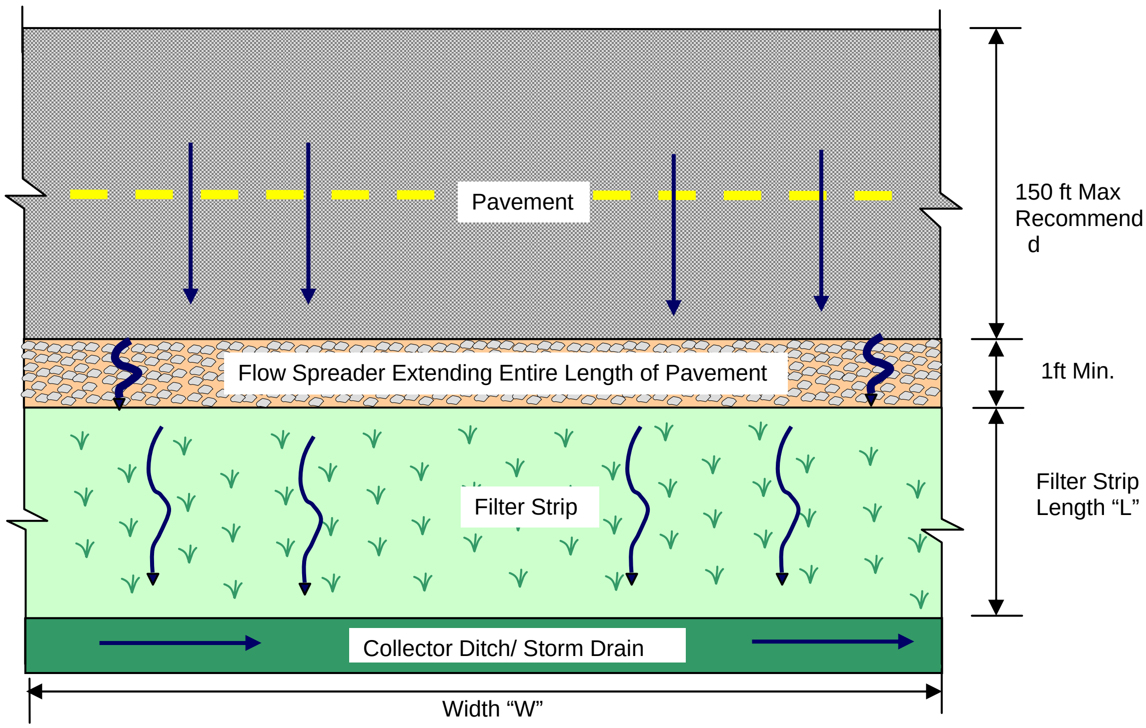
Pollutant of Concern	Treatment Control BMP Categories					
	Biofilters[3]	Detention Basins[3]	Infiltration Basins	Wetponds or Wetlands[3]	Filtration	Hydrodynamic Separator Systems
Sediment/Turbidity	H/M	M	H/M	H/M	H/M	H/M (L for Turbidity)
Nutrients	L	M	H/M	H/M	L/M	L
Trace Metals	M	M	H	H	H	L
Pathogens	U	U	H/M	U	H/M	L
Petroleum Hydrocarbons	H/M	M	U	U	H/M	L/M
Pesticides	U	U	U	U	U	L
Trash & Debris	L	M	U	U	H/M	H/M

[1]DAMP Table 7-II-6, except for the Trace Metals treatment performance, which was taken from the California Stormwater Best Management Practices Handbook for New Development and Redevelopment (CASQA, 2003)
[2]H, M, L, and U indicate high, medium, low, and unknown removal efficiencies, respectively. The effectiveness of the selected treatment BMPs is described in detail in Appendix B, section B.4.4.
[3]The Project will include Treatment Control BMPs in these three categories. Wetland vegetation will be included in the low-flow portion of the extended detention basins.

Per the MS4 permit, the water quality basins within the Project will be designed to contain a "water quality pool" sized to meet the maximized stormwater capture volume for the area, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998). The mean depth of storms greater than or equal to 0.1 inches depth (a 6 hour dry period is used to define storms) measured at Prado Dam used to size the detention facilities is 0.75 inches. The water quality pool is designed to drain in 36 hours. Table 5-2 lists the water quality basin sizes to be incorporated into the developed portion of the Project.

According to the proposed grading plan, approximately 4.1 acres of roadway will be located downgradient of the proposed water quality basins and therefore will not drain to the basins. Runoff from this roadway area will be treated with filter strips (a type of biofilter) designed per the MS4 permit and DAMP/LIP requirements. Runoff from the water tank area located in Development Area 7 will also be treated using a filter strip or a bioswale designed per MS4 requirements. A conceptual illustration of a filter strip is provided in Figure 5-3.

Plan View



Profile

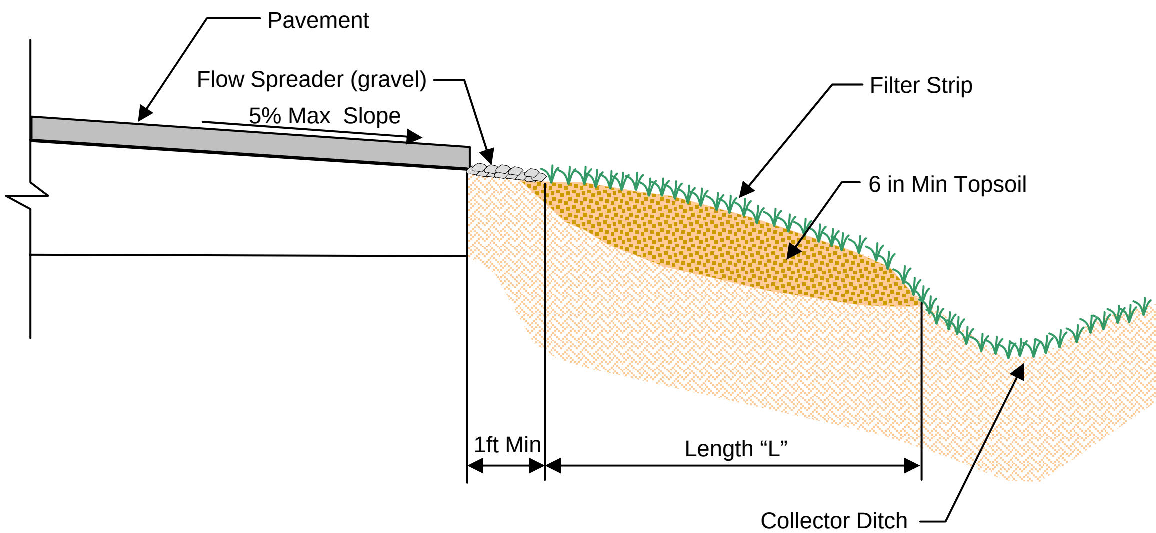


Figure 5-3
Conceptual Illustration of a Filter Strip

February 2005	GeoSyntec Consultants

Table 5-2: Size Estimates for Water Quality Basins

Water Quality Basin Name	Tributary Area (acres)	Percent Imperviousness (percent)	WEF Rv[1]	Water Quality Basin Volume (acre-ft)[2]
1	95.6	32.2	0.24	2.5
2	45.4	30.7	0.23	1.2
3a	19.2	42.3	0.29	0.6
3b	33.8	39.4	0.28	1.0
3c	2.5	72.0	0.51	0.14
4a	35.0	52.7	0.36	1.4
4b	38.8	47.8	0.33	1.4
5a	147	65.9	0.46	7.4
5b	90.8	53.4	0.36	3.6

1 – Runoff coefficient estimate from the WEF Manual of Practice maximized stormwater capture volume.
2 – Detention basin sizing based on WEF Method with mean storm depth of 0.75 inches and 36 hour drain time.

Development Area 3 includes an elementary school site and an adjacent community park. Modeling results presented in Chapter 6 assume that an extended detention water quality basin sized per the MS4 permit and the DAMP, or a different BMP achieving equivalent treatment, will be provided for this area. BMP selection for the school and park will be finalized at the time of Project WQMP preparation for the school/park project subject to the requirement that the final treatment BMP selected for this area shall meet or exceed the treatment performance assumed in this report for the pollutants of concern.

Off-site project features include drainage improvements within Featherly Regional Park; realignment and improvements to Gypsum Canyon Road between Santa Ana Canyon Road and Featherly Regional Park; improvements to Santa Ana Canyon Road immediately west of Gypsum Canyon Road and the entry to the project site; removal of pavement and installation of median improvements at the eastern terminus of Weir Canyon Road at the western project site boundary; roadway improvements at the current terminus of Oak Canyon Road; and remedial fill slopes north of Development Area 5 (within SR-91 right-of-way). Of these off-site project features, the realignment and improvements to Gypsum Canyon Road and the improvements to Santa Ana Canyon Road will add more than 5,000 square feet of new impervious surface area in the post-developed condition and therefore will require runoff treatment.

The treatment control BMPs provided for the realignment and improvements to Gypsum Canyon Road and the improvements to Santa Ana Canyon Road will be sized to include the drainage from the existing impervious area within the impacted area as well as from the new impervious area as required by the DAMP/LIP, as the new impervious surface will result in an increase of more than 50 percent of the existing impervious surface area. Modeling results presented in Chapter 6 assume that biofiltration (either filter strips or bioswales) or BMPs achieving equivalent treatment would be provided for these off-site project features. BMP selection for the off-site features will be finalized at the time of WQMP preparation in coordination with Caltrans or the City of Anaheim, who would assume ownership. The final treatment BMPs selected for these areas shall meet or exceed the treatment performance assumed in this report for the pollutants of concern.

In summary, the combination of proposed site design, source control, and treatment controls have been selected to address all of the pollutants of concern from each source area and to protect beneficial uses of receiving waters.

6 WATER QUALITY MODELING APPROACH

6.1 Model Description

A water quality model was used to estimate pollutant loads and concentrations for certain pollutants of concern for pre-development conditions, post-development conditions, and post-development conditions with PDFs for each stage of the Project. The model is one of the few models that takes into account the observed variability in stormwater hydrology and water quality. This is accomplished by characterizing the probability distribution of observed rainfall event depths, the probability distribution of event mean concentrations, and the probability distribution of the number of storm events per year. These distributions are then sampled randomly using a Monte Carlo Approach to develop estimates of mean annual loads and concentrations.

A detailed description of the water quality model is presented in Appendix B. The following summarizes major features of the water quality model:

- *Rainfall Data*: The water quality model estimates the volume of runoff from storm events. The storm events were determined from 52 years (1949 - 2000) of hourly rainfall data measured at the NCDC Prado Dam rain gauge that incorporates a wide range of storm events. The rainfall analysis that is incorporated in the water quality model requires rainfall measurements at 1 hour intervals and a long period of record that is at least 20 to 30 years in length.

- *Land Use Runoff Water Quality*: The water quality model estimates the concentration of pollutants in runoff from storm events based on existing and proposed land uses. The pollutant concentrations for various land uses, in the form of Event Mean Concentrations (EMCs), were estimated from data collected in Los Angeles County. The Los Angeles County database was chosen for use in the model because: (1) it is an extensive database that is quite comprehensive, (2) it contains monitoring data from land use specific drainage areas, and (3) the data is representative of the semi-arid conditions in southern California. Due to a lack of sand and gravel mine runoff data, highway construction site runoff monitoring data from a four-year study at 27 sites conducted by the California Department of Transportation (Caltrans, 2002) was used in the model to approximate

TSS concentration in existing quarry runoff; while the remaining parameters were modeled using open space data.

- *Pollutant Load*: The pollutant load associated with each storm is estimated as the product of the storm event runoff times the event mean concentration. For each year in the simulation, the individual storm event loads are summed to estimate the annual load. The mean annual load is then the average of all the annual loads.

- *PDFs Modeled*: The modeling only considers structural treatment PDFs and does not take into account the extensive suite of site design and source control PDFs (e.g., catch basin inserts) which also would improve water quality. In this respect, the modeling results are conservative, i.e., tend to overestimate pollutant loads and concentrations.

- *Treatment Effectiveness*: The water quality model estimates mean pollutant concentrations and loads in stormwater following treatment in the water quality basins. The amount of stormwater runoff that is captured by the treatment BMPs was calculated for each storm event, taking into consideration the intensity of rainfall, duration of the storm, and duration between storm events. The mean effluent water quality for treatment BMPs was based on the International Stormwater BMP Database (ASCE/EPA, 2004). The International Stormwater BMP Database was used because it is a robust, peer reviewed database that contains a wide range of BMP effectiveness studies that are reflective of diverse land uses. An analysis of the monitored inflow and outflow data contained in the International Stormwater BMP Database showed a volume reduction on the order of 30 percent for dry extended detention basins and 38 percent for biofilters. Based on this analysis, a conservative estimate of approximately 20% of the Project's inflow to the water quality basins and biofilters will infiltrate and/or evapotranspire.

- *Bypass Flows*: The water quality model takes into account conditions when the treatment facility is full and flows bypass the facilities.

- *Representativeness to Local Conditions*: The water quality model utilizes runoff water quality data obtained from tributary areas that have a predominant land use, and as measured prior to discharge into a receiving water body. Currently such data are available from stormwater programs in LA County, San Diego County, and Ventura County, although the amount of data available from San Diego County and Ventura County is small in comparison with the LA County database. Such data is often referred to as "end-of-pipe" data to distinguish it from data obtained in urban streams, for example. The water quality model does not use Orange County stormwater monitoring data because it is collected in-stream and therefore reflects mixed land uses and generally quite large tributary areas. The Orange County data also reflect the effects of sediment resuspension which, depending on the flows, can elevate sediment concentrations and affect the distribution between dissolved and particulate associated pollutants. A comparison between the urban land use water quality data used in the model and the instream water quality data collected by Orange County indicates that the land use specific water quality data used in the model tends to bracket that collected by Orange County, which is reasonable given that the Orange County data reflects mixed land uses. This comparison indicates that the data used in the model is reasonable for replicating the effects of urbanization and agriculture in Orange County. However, the LA County data does not necessarily reflect the effects of local geology which may be important in establishing the pre-development water quality condition. In such cases, this limitation is identified in the report.

6.2 Pollutants Modeled

The appropriate form of data used to address water quality are flow composite storm event samples, which are measures of the average water quality during the event. To obtain such data usually requires automatic samplers that collect data at a frequency that is proportionate to flow rate. The pollutants for which there are sufficient flow composite sampling data in the Los Angeles County database are:

- Total Suspended Solids (sediment)
- Total Phosphorus
- Nitrate Nitrogen
- Total Kjeldahl Nitrogen
- Dissolved Copper
- Total Lead
- Dissolved Zinc

The other pollutants of concern - pathogens, hydrocarbons, pesticides, and trash and debris, are not amenable to this type of sampling either because of short holding times (e.g., pathogens), difficulties in obtaining a representative sample (e.g., hydrocarbons), low detection levels (e.g., pesticides), or cost. These pollutants were addressed qualitatively using literature information and best professional judgment due to the lack of statistically reliable monitoring data for these pollutants (see Section 6.3 below).

6.3 Pollutants Addressed Without Modeling

The following pollutants of concern were addressed based on literature information and professional judgment because available data were not deemed sufficient for modeling:

- Turbidity
- Pathogens (Bacteria, Viruses, and Protozoa)
- Hydrocarbons (Oil and Grease, Polycyclic Aromatic Hydrocarbons)
- Pesticides
- Trash and Debris

Human pathogens are usually not directly measured in stormwater monitoring programs because of the difficulty and expense involved; rather, indicator bacteria such as fecal coliform or certain strains of *E. Coli* are measured. Unfortunately, these indicators are not very reliable measures of the presence of pathogens in stormwater, in part because stormwater tends to mobilize pollutants from many sources, some of which contain non-pathogenic bacteria. For this reason, and because holding times for bacterial samples are necessarily short, most stormwater programs do not collect flow-weighted composite samples that potentially could produce more reliable statistical estimates of concentrations. Fecal coliform or *E. Coli* are typically measured with grab samples, making it difficult to develop reliable EMCs. Total coliform and fecal bacteria (fecal coliforms, fecal streptococcus, and fecal enterococcus) were detected in stormwater samples tested in Los Angeles County at highly variable densities (or most probable number, MPN) ranging between several hundred to several million cells per 100 ml (OCPFRD, 2003).

Hydrocarbons are difficult to measure because of laboratory interference effects and sample collection issues (hydrocarbons tend to coat sample bottles). Hydrocarbons are typically measured with single grab samples, making it difficult to develop reliable EMCs.

Pesticides in urban runoff are often at concentrations that are below detection limits for most commercial laboratories and therefore there are limited statistically reliable data available on pesticides in urban runoff. Pesticides were not detected in Los Angeles County monitoring data for land use-based samples, except for diazinon and glyphosate which were detected in less than 15 percent and 7 percent of samples, respectively (OCPFRD, 2003).

Trash and debris sampling is not typically included in routine stormwater monitoring programs. Several studies conducted in the Los Angeles River basin have attempted to quantify trash generated from discrete areas, but the data represent relatively small areas or relatively short periods, or both.

7 WATER QUALITY IMPACT ASSESSMENT

In this section, impacts for each pollutant are evaluated in relation to the following significance criteria: (1) comparison of post-development versus pre-development water quality loads and concentrations, and (2) MS4 Permit requirements for new development as defined in the DAMP. Following this evaluation, predicted runoff pollutant concentrations in the post-development with PDFs condition are compared with benchmark receiving water quality criteria as provided in the Basin Plan and the CTR. The water quality criteria are considered benchmarks for comparison purposes only, as such water quality criteria apply within receiving waters as opposed to directly to runoff discharges. The modeled pollutant impact assessment is presented in Section 7.1 and the quantitative analyses of the remaining pollutants of concern follows in Section 7.2. Analyses of dry weather impacts and compliance with construction-related requirements of the General Construction Permit follow the constituent-by-constituent impact assessment. Also included is a discussion of other considerations, including operation and maintenance, vector control, and bioaccumulation of pollutants.

7.1 Impact Assessment for Modeled Pollutants of Concern

Results from the water quality model for significance criteria (1) are reported in a series of tables organized by constituent. There are two tables for each constituent (there is only one table for runoff volume), one showing predicted mean annual pollutant loads (lbs/yr) and one showing predicted mean annual concentrations. Projections are made for two conditions: (1) existing condition and (2) developed condition with the PDFs, for the drainage areas that contain the disturbance area that flow to Gypsum Canyon Creek (sub-drainage areas I, F, and E), for the West drainage area (drainage area W), and for the total modeled area (sub-drainage areas I, F, and E and drainage area W).

Note that only development areas of the Project were modeled for water quality purposes. The areas that were not modeled within the Project boundary are the areas that will be preserved as open space. Although the absolute value of the loads from the entire Project area (inclusive of open space) are not provided, the predicted *change* in pollutant loads is representative of the entire Project area because the loads from the open space areas remain unchanged. In general, the pollutant concentrations are not representative of the runoff from the entire Project area, as the predicted pollutant concentrations are lower from open space than from the other land uses for all of the pollutants of concern except for TSS, which is higher from open space. The concentrations presented in this section for nutrients and trace metals are therefore conservative (i.e., higher than would actually occur after mixing with runoff from open areas). Also note that the modeling results account for pollutant reductions in the treatment PDFs only and do not account for the pollutant reductions that will occur due to the site design and source control PDFs, making reported loads and concentrations conservative.

The effects of runoff on receiving water quality depend on the receiving water type. Where there are discharges to reservoirs or lakes where, because of quiescent conditions, pollutants tend to settle, accumulate, and perhaps be recycled, pollutant loads are important. By contrast, where discharges are to streams as with the Project, pollutants tend to be mixed and transported by high flows, and therefore the change in pollutant concentration is a more important measure of impact than changes in loads.

Following the tables comparing post-development and pre-development water quality loads and concentrations for each constituent (except runoff volume) is a table comparing the post-development with PDFs runoff quality to the benchmark water quality objectives and criteria. Water quality measured in the Santa Ana River is also included on these tables to provide comparison to the modeled developed condition with PDFs runoff quality.

7.1.1 Stormwater Runoff Volumes

Table 7-1 shows the predicted changes in stormwater runoff mean annual volumes. Mean annual runoff volumes are expected to increase substantially with development. The increase can be explained by the change in percent imperviousness associated with urbanization. As shown in Appendix B, Table B-3, the percent imperviousness for open space is zero percent (a conservative figure that doesn’t account for certain impervious features in open space, such as roads and rock outcrops) and for parks is 15 percent, in contrast to a value of 40 percent to 55 percent for single family residential (depending on density) and 80 percent for multi-family residential. Runoff volume is directly proportional to percent imperviousness.

Table 7-1: Predicted Mean Annual Stormwater Runoff Volumes

Drainage Area	Average Annual Runoff Volume (acre-ft)		
	Existing	Developed with PDFs	Change
Drainage Areas I, F, & E	101	254	153
Drainage Area W	15	35	20
Off-site Project Features	4	5	1
Total Modeled Area	120	294	174

Project PDFs include site design, source control and treatment control BMPs in compliance with the requirements of the MS4 Permit and the DAMP/LIP. Most of the site design PDFs, especially the minimization of impervious area and the conservation of approximately 2,163 acres of natural areas within the project site, reduce the impacts of the proposed development on increases in stormwater runoff volume. The treatment control BMPs will allow for some runoff volume reduction as well. Based on BMP monitoring data in the International Stormwater BMP Database, a 20 percent reduction in stormwater runoff volume was assumed to occur in the water quality basins.

The effects of increased runoff volumes on drainage, flooding, and stream channel erosion are addressed in the Runoff Management Plan Volume I (Fuscoe Engineering, 2005).

7.1.2 Total Suspended Solids

Table 7-2 shows the predicted average annual total suspended solids (TSS) loads. Average annual TSS concentration results are shown in Table 7-3. Post-development TSS concentrations are predicted to be much less than pre-development concentrations as urbanized landscaping, impervious surfaces, and PDFs will tend to reduce sediment delivery compared to exiting conditions, especially for the quarry area.

Table 7-2: Predicted Average Annual TSS Loads

Drainage Area	Average Annual TSS Loads (tons)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	36	26	-10
Drainage Area W	4.8	4.6	-0.2
Off-site Project Features	0.2	0.2	0
Total Modeled Area	41	30	-11

Table 7-3. Predicted Average Annual TSS Concentrations

Drainage Area	Average Annual TSS Concentrations (mg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	261	74	-187
Drainage Area W	239	97	-142
Off-site Project Features	40	23	-17
Total Modeled Area	251	76	-175

Project PDFs include site design, source control and treatment control BMPs in compliance with the requirements of the MS4 Permit and the DAMP/LIP, but only treatment control BMPs have been modeled. Site design PDFs include the preservation of large amounts of natural areas, which will continue to provide higher levels of sediment to receiving waters than the permanently stabilized development areas. The treatment control water quality basins will effectively reduce TSS in the runoff from the proposed development.

The predicted average annual TSS concentration in stormwater runoff from the total modeled area with PDFs is compared to water quality criteria and the range of observed concentrations in the Santa Ana River in Table 7-4. The predicted concentration declines with development and is within the range of observed concentrations in Santa Ana River Reach 2, which is not presently impaired with regard to TSS, sediment, or turbidity. Therefore, the stormwater runoff from the Project should not cause a nuisance or adversely affect beneficial uses in the receiving waters.

Table 7-4: Comparison of Predicted TSS Concentrations with Water Quality Criteria and Observed Concentrations in Santa Ana River Reach 2

Predicted Average Annual TSS Concentration: Total Modeled Area[1] (mg/L)	Santa Ana Basin Plan Water Quality Objectives	California Toxics Rule Criteria	Range of Observed[2] Concentrations in Santa Ana River Reach 2 (mg/L)
76	TSS levels shall not cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors	NA	7.5 - 140

[1]Modeled concentration for total modeled area, developed condition with PDFs.
[2]Includes both dry and wet weather data.
NA – not applicable

Based on the above impact analysis, the effect of the Project on TSS loads and concentrations will be less than significant.

7.1.3 Nutrients

Post-development nitrogen concentrations are particularly important for the inorganic species of nitrogen, namely ammonia, nitrite, and nitrate, as these species are more available for photosynthesis by algae and other plants, which can lead to low dissolved oxygen conditions. Of these species, nitrogen is usually most prevalent in the nitrate form. Table 7-5 shows that mean annual nitrate-nitrogen loads are predicted to increase when compared to existing loads from the modeled area, although the model results predict a decrease in nitrate-N concentrations in the post-developed condition (Table 7-6). This is due to the increase in runoff volume in the post-developed condition.

Mean annual total Kjeldahl nitrogen (ammonia nitrogen plus organic nitrogen) (TKN) loads and mean annual TKN concentrations (Table 7-7 and Table 7-8) are predicted to increase in the post-developed condition with PDFs.

Table 7-9 and Table 7-10 show the mean annual total phosphorus loads and concentrations for each of the drainage areas, as well as the total modeled area, respectively. The loads and concentrations in the post-developed condition with PDFs are predicted to increase when compared to existing loads and concentrations.

Various factors can affect phosphorous loads. For example, urbanization would tend to reduce natural sources; however pet wastes, landscape fertilization, and other human activities can increase phosphorous loadings. Examination of the LA County data (Los Angeles County, 2000) and the Caltrans data (Caltrans, 2002) indicates that total phosphorus concentrations are significantly higher in runoff from the quarry (mean of 2.6 mg/L) than high density residential areas (mean of 0.39 mg/L), which is in turn higher than that from vacant areas (mean of 0.16 mg/L). The LA County data for vacant areas are used to represent open space runoff and the Caltrans construction runoff data are used to represent quarry runoff in the water quality model.

Project PDFs include site design, source control and treatment control BMPs in compliance with the requirements of the MS4 Permit and the DAMP/LIP, but only treatment control BMPs were included in the model. Site design PDFs will minimize increases in nutrients through the preservation of natural areas and the use of native or drought tolerant plants in development area plant palettes. Source control PDFs that target nutrients include educational materials on the proper handling of fertilizers and pet waste management, common area landscape management consistent with DAMP Section 5.5 and the LIP, and the use of efficient irrigation systems in common areas. The treatment control water quality basins will also reduce nutrients in the runoff from the proposed development.

Table 7-5: Predicted Average Annual Nitrate Loads

Drainage Area	Average Annual Nitrate-Nitrogen Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	269	420	151
Drainage Area W	46	63	17
Off-site Project Features	3.5	3.8	0.3
Total Modeled Area	319	486	167

Table 7-6: Predicted Average Annual Nitrate Concentrations

Drainage Area	Average Annual Nitrate-Nitrogen Concentrations (mg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	1.0	0.6	-0.4
Drainage Area W	1.2	0.7	-0.5
Off-site Project Features	0.3	0.3	0.0
Total Modeled Area	1.0	0.6	-0.4

Table 7-7: Predicted Average Annual TKN Loads

Drainage Area	Average Annual TKN Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	273	991	718
Drainage Area W	39	133	94
Off-site Project Features	12	15	3
Total Modeled Area	324	1138	814

Table 7-8: Predicted Average Annual TKN Concentrations

Drainage Area	Average Annual TKN Concentrations (mg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	1.0	1.4	0.4
Drainage Area W	1.0	1.4	0.4
Off-site Project Features	1.1	1.0	-0.1
Total Modeled Area	1.0	1.4	0.4

Table 7-9: Predicted Average Annual Total Phosphorus Loads

Drainage Area	Average Annual Total Phosphorus Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	47	155	108
Drainage Area W	5.5	21	15.5
Off-site Project Features	3.4	3.8	0.4
Total Modeled Area	56	181	125

Table 7-10: Predicted Average Annual Total Phosphorus Concentrations

Drainage Area	Average Annual Total Phosphorus Concentrations (mg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	0.2	0.2	0.0
Drainage Area W	0.1	0.2	0.1
Off-site Project Features	0.3	0.3	0.0
Total Modeled Area	0.2	0.2	0.0

Nitrate-nitrogen concentrations predicted by the model are within the low end of the range of concentrations measured in Santa Ana River Reach 2 (Table 7-11). Predicted nitrate-nitrogen concentrations are well below the drinking water quality criteria of 10 mg/L as N. (Note that this criteria is referenced as a benchmark for comparative purposes only and does not apply to Santa Ana River Reach 2, as this reach is exempted from the municipal drinking water beneficial use). Predicted total phosphorus concentrations are below the range of measured orthophosphate concentrations, which represents the readily bioavailable portion of total phosphorus.

TKN consists of dissolved and particulate organic nitrogen and inorganic nitrogen in the form of ammonia (NH_3-N). Ammonia is a relatively bioavailable form of nitrogen but tends to be a small fraction of TKN in urban runoff. For example, data from mixed and multifamily residential areas in Los Angeles County indicate that NH_3-N is about 20 percent of TKN. The remaining approximately 80 percent of TKN is dissolved or particulate organic nitrogen and may include plant and animal proteins and animal urine and fecal matter. The organic portion of TKN is generally considered less bioavailable than the inorganic forms of nitrogen, and therefore the significance of the increase in TKN loading is dependent on the extent to which this form of nitrogen accumulates in the sediments and is either sequestered there or is transformed into a more bioavailable form and recycled back into the water column. Since the receiving waters are streams, significant accumulation of TKN is not expected to occur in the sediments. TKN concentrations predicted by the model are in the middle of the range of concentrations measured in Santa Ana River Reach 2.

Elevated loads of nutrients in the Project runoff are caused by the increase in runoff volume in combination with the runoff concentrations. However, nutrient concentration in the receiving water is the most import indicator for the Project, given that the Project's receiving waters are streams (moving waters) as opposed to lakes or other more static water bodies. Laboratory flume experiments demonstrate that changes in nutrient concentrations can affect the species composition of algae as well as total biomass produced (Cushing and Allan, 2001). Since the predicted nutrient concentrations are within or below the observed range of nutrient concentrations in the Santa Ana River and these concentrations are not currently causing impairment due to algae growth, the predicted nutrient concentrations in runoff from the proposed development with PDFs should also not contribute to excessive algal growth and therefore will not lower the dissolved oxygen concentration in the receiving waters.

Table 7-11: Comparison of Predicted Nutrient Concentrations with Water Quality Criteria and Observed Concentrations in Santa Ana River Reach 2

Nutrient	Modeled Average Annual Concentration: Total Modeled Area[1] (mg/L)	Santa Ana Basin Plan Water Quality Objectives[2]	Range of Observed Concentrations[3] in Santa Ana Reach 2 (mg/L)
Nitrate-N	0.6	Narrative objective for algae in the Basin Plan: "Waste discharges shall not contribute to excessive algal growth in inland surface receiving waters."	0.5 – 14
TKN	1.4		0.02 – 2.2
Total Phosphorus	0.2		NA[4]

[1]Modeled concentration for total development area, developed conditions with PDFs.
[2]There are no CTR criteria for Nutrients. The algae water quality objective is included because excessive nutrients can contribute to excessive algal growth.
[3]Includes both dry and wet weather data.
[4]Not available. Observed concentrations for orthophosphate ranged from 0.3 – 1.7 mg/L as P.

Based on the comprehensive site design, source control, and treatment control strategy and the comparison with available in-stream monitoring data, potential impacts associated with nutrients are predicted to be less than significant.

7.1.4 Copper, Lead, & Zinc

Projected loads and concentrations for the trace metals copper, lead, and zinc are presented in through Tables 7-12 through 7-17. Where possible, the projections are for the dissolved form of the metal, as it is the dissolved form to which the CTR criteria apply. However, due to consistently low concentrations of dissolved lead in the available stormwater runoff data, it was not possible to develop reliable EMC parameters for most land uses for modeling the dissolved fraction of lead. This constituent was therefore modeled as the total recoverable metal. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, and mercury, are typically not detected in urban runoff or are detected at very low levels (LA County, 2000).

Post-development dissolved copper, lead, and zinc loads are projected to increase compared to pre-development conditions, mainly due to the increase in runoff volume. Post-development dissolved copper and lead concentrations are predicted to increase compared to pre-development conditions, while total zinc concentrations are predicted to decrease for the total modeled area. Total zinc concentration is predicted to decrease for the Gypsum Canyon Creek local watershed and the off-site features, to increase for Drainage Area W, and to decrease overall. This result can be explained by the assumed effluent value for the biofiltration that will be used to treat roadways that do not drain to a water quality treatment basin within Sub-drainage Areas I, F, and E and the off-site project features. The assumed biofiltration effluent value, based on the mean value of available effluent monitoring data for bioswales in the ASCE International Stormwater BMP Database, is 32.7 mg/L, while the assumed effluent value for water quality basins is 53.8 mg/L. The assumed biofiltration effluent value is very close to the open space EMC model input for dissolved zinc (22 mg/L), so areas treated with biofiltration will exhibit zinc concentrations that are closer to existing condition concentrations than areas treated with water quality basins.

Project PDFs include site design, source control and treatment control BMPs in compliance with the requirements of the MS4 Permit and the DAMP/LIP. Specific site design PDFs that will minimize increases in trace metals include directing drainage from impervious areas to landscaped areas or bioretention facilities and the selection of building material for roof gutters and downspouts that do not include copper or zinc. Source control PDFs that target metals include education for property owners, BMP maintenance, and street sweeping private streets and parking lots.

Table 7-12: Predicted Average Annual Dissolved Copper Loads

Drainage Area	Average Annual Dissolved Copper Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	1.8	6.0	4.2
Drainage Area W	0.1	0.8	0.7
Off-site Project Features	0.3	0.1	-0.2
Total Modeled Area	2.2	6.9	4.7

Table 7-13: Predicted Average Annual Dissolved Copper Concentrations

Drainage Area	Average Annual Dissolved Copper Concentrations (μg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	6.7	8.7	2.0
Drainage Area W	2.0	8.1	6.1
Off-site Project Features	24	6.2	-17.8
Total Modeled Area	6.8	8.6	1.8

Table 7-14: Predicted Average Annual Total Recoverable Lead Loads

Drainage Area	Average Annual Total Lead Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	1.0	3.5	2.5
Drainage Area W	0.1	0.5	0.4
Off-site Project Features	0.1	0.1	0.0
Total Modeled Area	1.2	4.1	2.9

Table 7-15: Predicted Average Annual Total Recoverable Lead Concentrations

Drainage Area	Average Annual Total Lead Concentrations (µg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	3.7	5.1	1.4
Drainage Area W	3.3	5.3	2.0
Off-site Project Features	5.4	5.0	-0.4
Total Modeled Area	3.7	5.2	1.5

Table 7-16: Predicted Average Annual Dissolved Zinc Loads

Drainage Area	Average Annual Dissolve Zinc Loads (lbs)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	14	34	20
Drainage Area W	1.3	3.9	2.6
Off-site Project Features	1.5	0.5	-1.0
Total Modeled Area	17	38	21

Table 7-17: Predicted Average Annual Dissolved Zinc Concentrations

Drainage Area	Average Annual Dissolved Zinc Concentrations (µg/L)		
	Existing	Developed with PDFs	Change
Sub-drainage Areas I, F, & E	52	49	-3
Drainage Area W	32	41	9
Off-site Project Features	126	33	-93
Total Modeled Area	52	47	-5

Although the trace metal loadings and concentrations (aside from dissolved zinc) are predicted to increase overall, the comparison of the post-developed with PDFs condition to the Basin Plan site-specific objectives and the CTR values shows that all of the trace metal concentrations are below the water quality objectives and criteria (Table 7-18). The Basin Plan site-specific objectives and the CTR criteria are based on hardness values observed in the receiving water. The 10th percentile hardness value (221 mg/L as $CaCO_3$) was used as a conservative estimate that excludes the lowest outlier values; the mean observed hardness value was 253 mg/L as $CaCO_3$. Toxicity testing performed as part of the Santa Ana River Use-Attainability Analysis

(UAA) demonstrated that concentrations of dissolved copper of 37 µg/L and dissolved lead of 28 µg/L are non-toxic in Santa Ana River Water (SARWQCB, 1995). Dissolved lead was calculated by applying a partitioning coefficient (f_d) of 0.35 to modeled total lead concentration. The f_d value was determined by comparing total and dissolved lead concentrations for each land use (LA County, 2000; NSQD, 2003). The predicted concentrations for dissolved copper and dissolved lead from the proposed development with PDFs are well below the benchmark Basin Plan values.

Predicted trace metals concentrations are within the range of observed values in Santa Ana River Reach 2 (Table 7-18).

Similarly to nutrients, increases in trace metal loadings are not of great concern in the receiving water aside from their effect on in-stream concentration due to the flowing nature of the receiving water. Trace metals are not expected to accumulate in the receiving waters due to the flushing effect of high flows in stream systems.

Based on the comprehensive site design, source control, and treatment strategy and the comparison with the water quality benchmark values, the Project is not expected to have significant impacts resulting from trace metals.

Table 7-18: Comparison of Predicted Trace Metals Concentrations with Water Quality Criteria and Observed Concentrations in Santa Ana River Reach 2

Trace Metal	Predicted Average Annual Concentration: Total Modeled Area[1] (µg/L)	Basin Plan Site-Specific Objective[2] (µg/L)	California Toxics Rule Criteria[3] (µg/L)	Range of Observed Concentrations[4] in Santa Ana River Reach 2 (µg/L)
Dissolved Copper	8.6	19.8	28.4	2 – 35
Dissolved Lead	1.8[5]	4.6	152	0.1 – 1.7
Dissolved Zinc	47	NA	230	5 – 70[6]

[1]Modeled concentration for total modeled area, developed conditions with PDFs.
[2]Hardness = 221 mg/L as $CaCO^3$, based on 10^{th} percentile SAR monitoring data. These criteria are very conservative; concentrations of dissolved copper of 37 µg/L and dissolved lead of 28 µg/L are non-toxic in Santa Ana River Water (SARWQCB, 1995).
[3]Hardness = 221 mg/L, based on 10^{th} percentile of SAR monitoring data. Lead criteria is for total recoverable lead. These criteria are more recent standards than the Basin Plan objectives and are currently used by the SARWQCB in lieu of the site specific objectives.
[4]Includes both dry and wet weather data.
[5]Dissolved lead was calculated by applying a partitioning coefficient (f_d) of 0.35 to modeled total lead concentration. The f_d value was determined by comparing total and dissolved lead concentrations for each land use (LA County, 2000; NSQD, 2003).
[6]Observed values are as total zinc.
NA – not applicable.

7.2 Impact Assessment for Pollutants and Basin Plan Criteria Addressed Without Modeling

7.2.1 Turbidity

Turbidity is a measure of suspended matter that interferes with the passage of light through the water or in which visual depth is restricted (Sawyer et al, 1994). The turbidity may be caused by a wide variety of suspended materials, which range in size from colloidal to coarse dispersions, depending upon the degree of turbulence. In lakes or other waters existing under relatively quiescent conditions, most of the turbidity will be due to colloidal and extremely fine dispersions. In rivers under flood conditions, most of the turbidity will be due to relatively coarse dispersions.

Turbidity may be caused by a wide variety of materials. Erosion of clay and silt soils may contribute to in-stream turbidity. Organic materials reaching rivers serve as food for bacteria, and the resulting bacterial growth and other microorganisms that feed upon the bacteria produce additional turbidity. Nutrients in runoff may stimulate the growth of algae, which also contribute to turbidity.

Discharges of turbid runoff of primarily of concern during the construction phase of development. Construction-related impacts are addressed in Section 7.6 below. The Construction Stormwater Pollution Prevention Plan must contain sediment and erosion control BMPs pursuant to the General Construction Activities permit, and those BMPs will control sediment and erosion along with other pollutants per the BAT/BCT standards. Additionally, fertilizer control and non-visible pollutant monitoring and trash control BMPs in the SWPPP will combine to help control turbidity.

In the post-development condition, placement of impervious surfaces will serve to stabilize soils and to reduce the amount of erosion that may occur from the Project area, especially from the existing quarry area, during storm events and will therefore decrease turbidity in the runoff from the Project area. Project PDFs include source control (such as common area landscape management and common area litter control) and treatment control BMPs in compliance with the requirements of the MS4 Permit and the DAMP that will prevent or reduce the release of organic materials and nutrients to receiving waters. Based on implementation of the Project PDFs and the construction-related controls outlined in Section 7.6, runoff discharges from the Project should not cause increases in turbidity which would result in adverse affects to beneficial uses in the receiving waters. Based on these considerations, the impacts of the Project on turbidity is considered less than significant.

7.2.2 Pathogens

Pathogens are viruses, bacteria, and protozoa that can cause illness in humans. Identifying pathogens in water is difficult as the number of pathogens is exceedingly small requiring sampling and filtering large volumes of water. Traditionally, water managers have relied on measuring "pathogen indicators", such as total and fecal coliform, as an indirect measure of the presence of pathogens. Although such indicators were considered reliable for sewage samples, indicator organisms are not necessarily reliable indicators of viable pathogenic viruses, bacteria, or protozoa in stormwater because coliform bacteria, in addition to being found in the digestive systems of warm-blooded animals, are also found in plants and soil. Moreover, certain pathogen indicators can multiply in the field if the substrate, temperature, moisture, and nutrient conditions are suitable. In a review of the Los Angeles Basin Plan Administrative Record, Paulsen and List summarized the debate over the use of pathogenic indicators and pointed out that scientific studies show no correlation between pathogens and therefore may not indicate a significant potential for causing human illness (Paulsen and List, 2003, provided in Appendix D). In a recent field study conducted by Schroeder et. al., pathogens (in the form of viruses, bacteria, or protozoa) were found to occur in 12 of 97 samples taken, but the samples that contained pathogens did not correlate with the concentrations of indicator organisms (Schroeder et. al. 2002).

There are numerous sources of pathogen indicators, including birds and other wildlife, domesticated animals and pets, and plant matter and soils. Human-related sources may include poorly functioning septic systems, cross-connections between sewer and storm drains, and the utilization of outdoor areas for human waste disposal by people without access to indoor sanitary facilities.

There are extensive studies in which samples have been collected and analyzed for bacteria. Almost all of these data do not distinguish bacteria that may result from new development versus bacteria from other sources. Runoff from new development is just one of many potential sources of bacteria in urban runoff. Urban runoff reflects both anthropogenic and natural sources, and consists of runoff from existing development, new development, and open space or vacant land. The large majority of existing development areas that contribute runoff into the monitored channels of Orange County and other areas do not have the myriad of project design features that have been incorporated into the proposed project, see further discussions below. Consequently, it is likely that runoff from the proposed project will not contain the same elevated levels of bacteria found in other urban runoff studies.

Available studies do not uniformly suggest that development increases indicator bacteria in runoff. For example, the City of San Diego currently monitors 20 shoreline stations within Mission Bay. Analysis of the 7,300 samples collected between 1987 and 1994 indicated that the highest geometric mean densities of total coliform, fecal coliform, and enterococcus occurred from December through March, which are historically the wettest months of the year in San Diego (Schiff and Kinney, 2000). Differences in mean densities between winter and summer months ranged over two orders of magnitude. The data also indicated that geometric densities for total coliform, fecal coliform, and enterococcus were always higher in wet weather samples than in dry weather samples. In a related study, 22 out of the 89 storm drain outfalls that discharge into Mission Bay were sampled during wet and dry weather. Only half of the storm drains contained measurable densities of indicator bacteria during dry weather while all 22 storm drains exceed water quality objectives during wet weather. The data also showed that indicator bacteria densities were as high from open space at the head of the watershed as at the mouth of the bay, indicating similar indicator bacteria contributions from urban and non-urban sources (Schiff and Kinney, 2000). In addition to the Mission Bay data, the USEPA has compiled an extensive stormwater database with data from 65 programs in 17 states throughout the United States (Pitt et al, 2003). The data indicate that median fecal coliform concentrations range from about 4,500 to 7,700 MPN/100mL for a range of commercial and residential land uses (land areas generally not having the type of source and treatment controls incorporated into the proposed project and thus not indicative of runoff from the proposed project), compared to a median value of around 3,000 MPN/100 mL for open space and vacant land. These data indicate that wildlife, plants and/or soils can be a very important source of pathogens and/or pathogen indicators such as fecal coliform. The Project, by converting some open land use to urban land use, would potentially reduce the pathogen contribution associated with such open space, including some terrestrial wildlife, plant matter, and soils. Additionally, another study, conducted by PBS&J in coastal watersheds near Laguna Beach in Orange County (PBS&J, 1999) found that indicator bacteria concentrations in receiving waters downstream from developed/urban watersheds were essentially the same concentrations as in receiving waters downstream from undeveloped watersheds. These studies support the conclusion that the development of the proposed project is not expected to result in appreciably higher indicator bacteria levels in receiving waters relative to undeveloped conditions.

This conclusion that urban development is no different than undeveloped areas in producing elevated bacteria levels is also supported by studies on runoff from areas in Northern Coastal Orange County, Southern Orange County, Los Angeles and San Diego. Studies by Schiff et al. and Grant et al. indicate that runoff from urban areas may not be the sole or even primary source of elevated bacteria in receiving waters, but that such elevated levels may be caused by non-human sources, such as terrestrial wildlife and birds or even local sediments (Schiff & Kinney, 2001 (evaluating Mission Bay in San Diego) and Grant et al., 2001 (evaluating Huntington Beach in Orange County)) Furthermore, data collected from undeveloped watersheds or watersheds with little development indicate that bacterial standards are often exceeded (Moore, 2001 and LADPW, 2001). For example, data obtained by the Serrano Water District in Santiago Creek Reach 3 (upstream of Irvine Lake) on 3/17/03 shows a total coliform concentration of 80,000 MPN/100 mL (compared to MUN water quality criteria of 100 MPN/100 mL) and a corresponding concentration of fecal coliform of 700 MPN/100 mL (compared to REC 1 water quality criteria of 400 MPN/100 mL). Santiago Creek Reach 3 is located in the general vicinity of the Project, although in a different watershed. The Santiago Creek watershed is largely undeveloped.

With particular regard to dry weather flows from urban areas, information from the MEC studies in Mission Bay (MEC, Mission Bay Clean Beaches Initiative Final Report (2004)) and Grant studies supports the idea that the project will not significantly impact bacteria levels in receiving waters. The MEC study indicates that even with diversion of dry weather urban flows during the summer dry season, indicator bacteria samples in receiving waters still were not at acceptable regulatory levels. Moreover, the Grant study found that significant bacterial die off occurred before dry weather flows reached receiving waters, leading the authors to conclude that other sources (including avian sources) were the predominant source of bacteria to Huntington Beach State Park beaches and that dry weather flows were less significant than other sources of bacteria to the receiving waters. For the proposed project, significant efforts have been made to reduce dry weather flows through project design features such as efficient irrigation systems, use of natural landscaping palettes, and infiltration/evaporation in treatment control facilities, making it unlikely that dry weather flows will persist as far as receiving waters. Even in the unlikely event that dry weather flows from the proposed project areas were to reach receiving waters, based upon the Grant and Schiff studies, it is not likely that such dry weather flows would noticeably increase bacteria concentrations in the receiving waters.

Based on findings of these studies, it is possible that predominant sources of bacteria in the project's receiving waters (in either existing conditions or proposed project conditions) may be soils, birds, or other wildlife found either within or on the waterbodies themselves or in the watersheds tributary to the receiving waters. These studies also suggest that any levels of bacteria already present in receiving waters in the current existing condition will not be altered substantially by the development of the proposed project. Also, as discussed in greater detail below, non-human sources of bacterial indicators may not reflect human health concerns pertinent to contact recreation use designations of local receiving waters.

Regarding the use of fecal coliform as a bacterial indicator, the fecal coliform standards contained in the Santa Ana Basin Plan were recommended in 1968 and were based upon epidemiological studies conducted in 1948, 1949, and 1950. Several studies conducted since 1968 have questioned these criteria, recognizing that high levels of pathogen indicators due to natural sources of pollution do occur, and recommended use of alternatives (EPA, 1986; EPA, 1972). Subsequent studies initiated by the USEPA were conducted at sites contaminated either with pollution from multiple or single point sources and found that fecal coliform densities showed "little or no correlation" to gastrointestinal illness rates in swimmers (Dufour, 1984). Thus, EPA in 1986 proposed criteria for contact recreation based upon *E. coli* and/or enterococci rather than fecal coliform (EPA, 1986)

Bacterial indicators in receiving water samples are not always an adequate proxy for determining significant impact. Because measurements of indicator bacteria are not direct measurements of pathogens (and associated human health risk), many epidemiological studies have found conflicting results, and often fail to indicate a consistent relationship between a given bacteria indicator and a human-related illness (e.g., gastrointestinal illness). (Fleisher, et al., 1996). Furthermore, a comprehensive survey of the epidemiological literature found that viral indicators were significantly stronger predictors of gastrointestinal illness than bacteria indicators (Wade, et al., 2003). Several additional studies also indicate that public health risk (relevant to human-contact recreational uses) does not correlate with elevated levels of bacterial indicators in receiving waters, even in waters impacted by urban runoff (Schroeder, 2002). The Schroeder study analyzed highway runoff and found no correlation between the measured indicator organisms and the presence of pathogens. Similarly, a study of both pathogens and indicator bacteria in Southern California coastal waters impacted by urban runoff indicated that exceedances of bacteria indicators did not correlate with the presence of human adenoviruses and thus may not have indicated a human health risk (S. Jiang, et al., 2001). The USEPA also has indicated that non-human sources of fecal contamination need not be considered in determinations of water quality standard attainment (EPA, 2004); meaning that if non-human bacteria sources are shown to be minimal and exposure to such sources based on epidemiological studies do not appear to result in human health risks, bacteria standards may be interpreted to relate only to human-derived bacteria. The World Health Organization (WHO) has adopted a similar approach, recognizing that “due to the ‘species barrier,’ the density of pathogens of public health importance is generally assumed to be less in aggregate in animal excreta than in human excreta which may therefore represent a significantly lower risk to human health” (WHO, 2003). Based on the information discussed above, the reliance on bacterial indicators to gauge potential impacts human health-related beneficial uses in the project’s receiving waters would not be prudent.

It is recognized that natural levels of bacteria are present in the project area receiving waters and that control of such natural sources of bacteria is neither required nor desired by regulatory authorities. Both the San Diego and Los Angeles Regional Water Quality Control Boards have made provisions for background sources of bacteria from undeveloped portions of watersheds in their Bacteria Total Maximum Daily Loads (LA RWQCB, 2002; San Diego RWQCB, 2004). To illustrate, the Los Angeles RWQCB stated that it was not their intent to “require treatment of natural sources of bacteria from undeveloped areas” as removal of such natural sources of bacteria from receiving waters “could adversely affect valuable aquatic life and wildlife beneficial uses supported by natural water bodies in the Region.” Thus, the project design features for the proposed project have appropriately focused on the control of potential anthropogenic bacteria sources.

The primary sources of fecal coliforms from the Project would likely be pet wastes, and wildlife or vectors living in the storm drain itself. Other sources of pathogens and pathogen indicators, such as cross connections between sanitary and storm sewers, and other human-derived bacteria, are unlikely given the new systems to be installed with the project, modern sanitary sewer installation methods, and inspection and maintenance practices.

The levels of bacteria in runoff from the proposed project will be reduced by virtue of:

- Source Controls, and
- Water Quality Basins

The most effective means of controlling pet wastes as a source of pathogens is through source control, specifically education of pet owners, and providing products and disposal containers that encourage and facilitate cleaning up after pets. Storm drain cleaning practices help to remove pathogens that may have accumulated in the storm drain system. These and other litter control BMPs are described in Section 5 Project Design Features.

There is some data on the effectiveness of water quality basins to treat pathogen indicators. However the treatment processes known to be occurring in the water quality basins involve sunlight (ultraviolet light) degradation, sedimentation of bacteria attached to particulates, and infiltration , all of which reduce pathogen levels. A study of microbial removals in various BMPs conducted in Florida indicated that shallow wet basins with a five day drain time achieved about a 98 percent removal efficiency for fecal coliform (Kurz, 1999). The water quality basins proposed for the Project will drain in two days or less, therefore the expected pathogen removal would be somewhat less than 98 percent. According to the California State Stormwater BMP Handbook for New Development and Redevelopment, extended detention basins are considered to have a “medium” removal effectiveness. The Center for Watershed Protection maintains a National Pollutant Removal Performance Database that indicates that removal performance for various types of water quality basins ranges between 70 to 80 percent (CWP, 2000). The database indicated a removal of about 78 percent for dry extended detention basins. Data on wetponds (similar to the proposed design of the water quality basins) from the International Best Management Practice Database demonstrate an almost 80 percent reduction in median fecal coliform concentrations when comparing inlet to outlet concentrations (Strecker, et al., 2004). In addition, some PDFs, including the water quality basins, bioretention areas, and site design features, will also have the effect of reducing the volume of stormwater and dry weather runoff from the proposed project area, thereby reducing any associated bacteria. In summary, the PDFs will include source and treatment type controls which in combination will reduce pathogen indicator levels in runoff from the proposed project.

In summary, the proposed project, consistent with the DAMP/LIP requirements, includes a comprehensive set of source and treatment control PDFs selected to manage pathogen indicators. With this series of PDFs, the Project would not result in appreciable changes in pathogen levels in the receiving waters compared to existing conditions, and potential water quality impacts related to pathogens are considered less than significant.

7.2.3 Hydrocarbons

Various forms of hydrocarbons (oil and grease) are common constituents associated with urban runoff; however, these constituents are difficult to measure and are typically measured with grab samples, making it difficult to develop reliable EMCs for modeling. Based on this consideration, hydrocarbons were not modeled but are addressed qualitatively.

Hydrocarbons are a broad class of compounds, most of which are non-toxic. Hydrocarbons are hydrophobic (low solubility in water), have the potential to volatilize, and most forms are biodegradable. A subset of hydrocarbons, Polynuclear Aromatic Hydrocarbons (PAHs) can be toxic depending on the concentration levels, exposure history, and sensitivity of the receptor organisms. Of particular concern are those PAH compounds associated with transportation-related combustion sources.

The concentration of hydrocarbons is expected to increase slightly under post-development project conditions with treatment of stormwater runoff in the PDFs. This predicted increase results from the increase in roadways, driveways, parking areas, and vehicle use in the Project area associated with the proposed residential development. The Project PDFs are expected to prevent appreciable increases in hydrocarbon concentrations from occurring through removal of this pollutant. Source control PDFs that address petroleum hydrocarbons include educational materials on used oil programs, carpooling, and public transportation alternatives to driving; BMP maintenance; and street sweeping private streets and parking lots. Catch basin inserts with hydrocarbon absorption mats will be provided for the fire station and vehicle maintenance will be performed indoors. Although vehicle emissions and leaks are the primary source of hydrocarbons in urban areas, it is anticipated that vehicles in the proposed development will in general be well maintained and newer models which will help to limit emissions and leaks. Lastly, the vegetation and soils within the treatment control PDFs, including biofilters, will adsorb the low levels of emulsified oils in stormwater runoff, preventing visible film in the discharge or the coating of objects in the receiving water.

The majority of PAHs in stormwater adsorb to the organic carbon fraction of particulates in the runoff, including soot carbon generated from vehicle exhaust (Ribes et al, 2003). For example, a stormwater runoff study by Marslek et. al. (1997) found that the dissolved phase PAHs represented less than 11 percent of the total concentration of PAHs. Consequently, the water quality basins and vegetated swales proposed as PDFs, which are designed to treat pollutants through settling and infiltration, will be effective at treating PAHs.

Los Angeles County conducted PAH analyses on 27 stormwater samples from a variety of land uses in the period 1994-2000 (Los Angeles County, 2000). For those land uses where sufficient samples were taken and were above detection levels to estimate statistics, the mean concentrations of individual PAH compounds ranged from 0.04 to 0.83 µg/L. The reported means were less than acute toxicity criteria available from the literature (Suter and Tsao, 1996). Moreover, the Los Angeles County data do not account for any treatment, whereas the treatment in the Project’s PDFs should result in a reduction in hydrocarbon concentrations inclusive of PAHs. This makes it very unlikely that impacts will occur to the receiving water due to hydrocarbon loads or concentrations. On this basis, the effect of the Project on petroleum hydrocarbon levels in local water bodies is considered less than significant.

7.2.4 Pesticides

Pesticides can be of concern where past farming practices involved the application of persistent organochlorine pesticides, including DDT. Past land use in the Project area consist primarily of gravel mining and did not include farming so would not likely have involved intensive pesticide applications. The focus therefore is on the post-development condition, where pesticides will be applied to common landscaped areas and residential lawns and gardens. Pesticides that have been commonly found in urban streams include the organophosphate pesticides chlorpyrifos and diazinon (Katznelson and Mumley, 1997). However, only 0 to 13% of the samples in the LA County database had detectable levels of diazinon (depending on the land use) while chlorpyrifos were below detection limits for all land uses in all samples taken between 1994 and 2000 (LA County, 2000). Other pesticides presented in the database were seldom measured above detection limits. Furthermore, these data represent flows from areas without treatment controls, unlike the proposed Project, which does incorporate treatment control project design features.

EPA has recently banned the pesticides diazinon and chlorpyrifos for most urban applications (USEPA, 2002). EPA phased out the sale of chlorpyrifos in 2001 and the applications of diazinon to lawns, gardens, and turf was discontinued in December 2003. Per the EPA mandate, these pesticides will not be used for landscape maintenance in the post-development conditions of the Project.

Source control measures such as education programs for owners, occupants, and employees in the proper application, storage, and disposal of pesticides are the most promising strategies for controlling the pesticides that will be used post-development. Structural controls are typically not as effective due to the persistent nature of many pesticides; also these compounds generally exhibit varied potential for biodegradation. However, most pesticides are relatively insoluble in water and therefore tend to adsorb to the surfaces of sediment, which will settle out of the water column in the water quality basins and biofiltration areas. Sedimentation therefore should achieve some removal of pesticides from stormwater in the PDFs as TSS is reduced, as indicated in Section 7.1.2.

While pesticides are subject to degradation, they vary in how long they maintain their ability to eradicate pests. Some break down almost immediately into nontoxic by-products, while others can remain active for longer periods of time. While pesticides that degrade rapidly are less likely to adversely affect non-targeted organisms, in some instances it may be more advantageous to apply longer lasting pesticides if it results in fewer applications or smaller amounts of pesticide use. Careful consideration will be made as to the appropriate type of pesticides for use on and around non-single family home areas of the project site. While some increase in pesticide use is likely to occur as the result of development due to maintenance of landscaped areas, particularly in the residential portions of the development, careful selection, storage and application of these chemicals for use in common areas will help prevent significant water quality impacts from occurring. Additionally, removal of sediments in the PDFs will also remove sediment-adsorbed pesticides. Based on the incorporation of site design, source control, and treatment control BMPs recommended by the DAMP/LIP and included as PDFs, potential impacts associated with pesticides will be less than significant.

7.2.5 Trash and Debris

Urban development tends to generate significant amounts of trash and debris. Trash refers to any human-derived materials including paper, plastics, metals, glass and cloth. Debris is defined as any organic material transported by stormwater, including leaves, twigs, and grass clippings (DLWC, 1996). Debris can be associated with the natural condition. Trash and debris is often characterized as material retained on a 5-mm mesh screen. It contributes to the degradation of receiving waters by imposing an oxygen demand, attracting pests, disturbing physical habitats, clogging storm drains and conveyance culverts and mobilizing nutrients, pathogens, metals, and other pollutants that may be attached to the surface. Sources of trash in developed areas can be both accidental and intentional. During wet weather events, gross debris deposited on paved surfaces can be transported to storm drains, where it can be eventually discharged to receiving waters. Trash and debris can also be mobilized by wind and transported directly into waterways. Trash and debris can impose an oxygen demand on the water body as organic matter decomposes.

Urbanization could significantly increase trash and debris loads if left unchecked. However, the Project PDFs, including source control and treatment BMPs recommended by the DAMP, will minimize the adverse impacts of trash and debris. Source controls such as street sweeping, public education, fines for littering, and storm drain stenciling can be effective in reducing the amount of trash and debris that is available for mobilization during wet and dry weather events. Common area litter control will include a litter patrol, covered trash receptacles, emptying of trash receptacles in a timely fashion, and noting trash violations by tenants/homeowners or businesses and reporting the violations to the owner/HOA for investigation. Catch basin inserts will be provided for parking lots. The water quality basins will have trash racks to prevent entry of larger materials into the structural BMPs in order keep maintenance costs in check (i.e., trash is easier to remove trash from racks as opposed to the water quality basins themselves). The Project's PDFs will remove or prevent the release of floating materials, including solids, liquids, foam, or scum, from runoff discharges and will prevent impacts on dissolved oxygen in the receiving water due to decomposing debris. Based on these considerations, trash and debris is not expected to significantly impact the receiving waters of the Project.

7.3 <u>Summary for Pollutants of Concern</u>

With the exception of TSS, loads of modeled constituents are predicted to increase under proposed conditions when compared to existing conditions. The increase in pollutant loads is primarily the result of the predicted increases in stormwater runoff volumes resulting from increases in impervious area with development. Increases in pollutant loads in streams are important impacts only in that they affect in-stream pollutant concentrations. Mean concentrations are predicted to decrease for total suspended solids, nitrates, and dissolved zinc. The modeled concentrations in runoff from developed areas with PDFs are below all benchmark water quality objectives and criteria for the receiving waters.

Concentrations of hydrocarbons and pesticides are expected to increase, while concentrations of pathogens and trash and debris may increase under proposed conditions when compared to existing conditions, but none of the qualitatively assessed constituents are expected to significantly impact receiving waters due to the implementation of the Project PDFs in compliance with the MS4 Permit and the DAMP/LIP. Therefore potential impacts from the Project on receiving water quality are not expected to be significant.

7.4 MS4 Permit Requirements for New Development as Defined in the DAMP/LIP

Project PDFs include site design, source control, and treatment control BMPs in compliance with the requirements of the Orange County NPDES Permit (Order No. R8-2002-0010) and the City of Anaheim LIP. As described in the Regulatory Setting (Section 3), the MS4 Permit requires that discharges from MS4s shall not cause or contribute to exceedances of receiving water quality standards, and also contains MEP, BAT and BCT technology standards.

The principal objective of Site Design BMPs is to prevent pollution of stormwater by minimizing the introduction of pollutants and conditions of concern that may result in significant impacts generated from site runoff to the stormwater conveyance system. One approach to achieve this objective is to reduce stormwater runoff flows and volumes and reduce pollutants through appropriate Site Design BMPs. The City of Anaheim LIP requires that Site Design BMPs be considered for all projects. Site Design BMPs included in the Project are listed in Table 7-19.

Table 7-19: Implementation of Site Design BMPs

CITY OF ORANGE LIP SITE DESIGN BMP TECHNIQUES	PROJECT PDF
1. Minimize Impervious Area/Maximize Permeability (C-Factor Reduction).	• Minimize impervious areas by incorporating landscaped areas over substantial portions of the Project. Single family residential landscape areas will be determined by zoning agreements, village setback/parkway standards, and design objectives. • Utilize vegetated areas, e.g., setbacks, end islands, and median strips, for biofiltration and bioretention of nuisance and storm runoff flows from parking lots. • Increase building density (number of stories above or below ground,; build up rather than out). • Construct streets, sidewalks, and parking lot aisles to the minimum widths specified in the City Land Use Code and in compliance with regulations for the Americans with Disabilities Act and safety requirements for fire and emergency vehicle access. Incorporate landscaped buffer areas between sidewalks and streets in compliance with the City Land Use Code.

CITY OF ORANGE LIP SITE DESIGN BMP TECHNIQUES	PROJECT PDF
2. Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction).	• Minimize directly connected impervious area by draining parking lots to landscaped areas or bioretention facilities to promote filtration and infiltration of stormwater, if landscaping slopes are less than 2 percent and the project is not adjacent to steep slopes; or treat with catch basin inserts. • Use natural drainage systems to the maximum extent practicable or create drainages (e.g., vegetated swales) that mimic natural conveyances and allow for stormwater infiltration as well as pollutant removal. • Maximize canopy interception and water conservation by preserving existing native trees and shrubs in natural open space areas and including native or drought tolerant plants in development plant palettes per project WQMP.
3. Create Reduced or "Zero Discharge" Areas (Runoff Volume and Pollutant Reduction).	• Select building material for roof gutters and downspouts that do not include copper or zinc. • Construct onsite detention facilities to increase opportunities for settling of pollutants and infiltration. Bioretention areas, multiple extended detention basins, and vegetated swales will promote reduced runoff volumes. • Protect slopes: minimize erosion potential with vegetative cover, route flows safely from or away from steep and or sensitive slopes, stabilize disturbed slopes. • Protect channels: control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems, stabilize channel crossings, ensure that increases in runoff velocity and frequency caused by the Project do not erode the channel, install energy dissipaters, such as riprap, at the outlets of storm drains or conveyances.
4. Conserve Natural Areas (C-Factor Reduction).	• Preserve existing riparian areas along Santiago Creek. • Preserve 519 acres of open space within the development area (vegetated slopes). • Preserve 2,163 acres of open space within the Project boundary outside of the development (preserved open space). • Concentrate or cluster development on the least environmentally sensitive portions the Project site while leaving the remaining land in a natural, undisturbed condition.

The City of Anaheim LIP requires Priority Projects to implement all Source Control BMPs (routine non-structural and routine structural) unless not applicable to the project. Routine structural Source Control BMPs are low-technology practices designed to prevent pollutants from contacting stormwater runoff or to prevent discharge of contaminated runoff to the storm drainage system. Routine non-structural Source Control PDFs included in the Project are listed in Table 7-20. Routine structural Source Control PDFs are listed in Table 7-21.

Table 7-20: Routine Non-Structural Source Control PDFs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
NI	Education for Property Owners, Tenants, and Occupants	X		
N2	Activity Restrictions	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance (How development will comply)		X	No industrial/commercial development
N6	Local Water Quality Permit Compliance		X	No fuel dispensing areas
N7	Spill Contingency Plan		X	No industrial/commercial development
N8	Underground Storage Tank Compliance		X	No underground storage tanks
N9	Hazardous Materials Disclosure Compliance		X	No industrial/commercial development
N10	Uniform Fire Code Implementation		X	No industrial/commercial development
N11	Common Area Litter Control	X		
N12	Employee Training		X	No industrial/commercial development
N13	Housekeeping of Loading Docks		X	No industrial/commercial development
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		
N17	Retail Gasoline Outlets		X	No retail gasoline outlets

Table 7-21: Routine Structural Source Control PDFs

Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Provide Storm Drain System Stenciling and Signage	X		
Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction		X	No industrial/commercial development
Design Trash Storage Areas to Reduce Pollutant Introduction	X		
Use Efficient Irrigation Systems and Landscape Design	X		
Protect Slopes and Channels	X		
Requirements Applicable to Individual Project Features			
Loading Dock Areas		X	No industrial/commercial development and no retail gasoline outlets
Maintenance Bays		X	
Vehicle Wash Areas		X	
Outdoor Processing Areas		X	
Equipment Wash Areas		X	
Fueling Areas		X	
Hillside Landscaping	X		
Wash Water Controls for Food Preparation Areas		X	No outdoor food preparation areas
Community Car Wash Racks		X	No multi-family housing

Treatment control PDFs include nine water quality basins that will treat runoff from all urban areas of the Project. Sizing criteria contained in the MS4 Permit and the DAMP will be met for all treatment control BMPs. For the analysis contained herein, the water quality basins were sized using the method 2 from the MS4 Permit and DAMP, which is stated as:

> "The volume of annual runoff produced by the 85th percentile, 24-hour rainfall event, determined as the maximized capture stormwater volume for the area, from the formula

> recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998)."

This criterion was used because it specifically takes into account drain time, which is an important factor that affects the level of treatment, and is considered to be one of the more conservative options in that it results in somewhat larger basin sizes.

Biofiltration BMP sizes were assumed for modeling purposes to be consistent with Option 2, which is stated as:

> "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."

This method was chosen because it will provide for treatment of a larger runoff volume. Appendix C provides further detail on the sizing criteria contained in the MS4 Permit and the DAMP/LIP.

In summary, the proposed site design, source control, and treatment control PDFs have been selected for each drainage area based on:

- effectiveness for addressing pollutants of concern in runoff from the Project, resulting in insignificant water quality impacts,
- sizing and outlet design consistent with the DAMP requirements,
- additional design guidance consistent with the California BMP Handbook: New Development and Redevelopment, other literature, and best professional judgment,
- hydrologic and water quality modeling to verify performance,
- meeting mean annual percent capture criteria contained in the California BMP New Development Manual, and
- providing specific O&M requirements to inspect and maintain the facilities.

On this basis, the proposed PDFs meet the MS4 Permit requirements for new development.

7.5 Dry Weather Impacts

The above discussion focused on the changes in water quality during storm events. However, water quality effects during dry weather conditions also are important, especially given that much of the dry weather flows in this region are of anthropogenic origin. As stated on page 74 of the ROMP, the water quality basins will capture and contain all dry-weather flows. Infiltration and evapotranspiration within the PDFs will adequately reduce the potential for dry-weather flow discharges from the Project, and therefore potential impacts to habitat due to dry-weather flows are considered insignificant. The following discussion addresses water quality in the dry weather flows into the PDFs.

Dry weather flows are typically low in sediment because the flows are relatively low and coarse suspended sediment tends to settle out or is filtered out by vegetation. As a consequence, pollutants that tend to be associated with suspended solids (e.g., phosphorus, some bacteria, some trace metals, and some pesticides) are typically found in very low concentrations in dry weather flows. The focus of this discussion is therefore on constituents that tend to be dissolved, e.g., nitrate and trace metals, or constituents that are so small as to be effectively transported, e.g., pathogens and oil and grease.

In order to minimize the potential generation and transport of dissolved constituents, landscaping in public and common areas will utilize drought tolerant vegetation that requires little watering and chemical application. Landscape watering in common areas will be controlled utilizing evapotranspiration sensors to minimize excess watering. In addition, educational programs and distribution of materials (source controls) will emphasize appropriate car and equipment washing locations (on pervious surfaces) and techniques (minimizing usage of soap and water), encourage low impact landscaping and appropriate watering techniques, and discourage driveway and sidewalk washing. Fertilizer and pesticide usage in common areas, the recreation center, the fire station, and other public areas will be consistent with County Management Guidelines for Use of Fertilizers (DAMP Section 5.5) or the City equivalent. Illegal dumping will be discouraged by stenciling storm drain inlets and posting signs that illustrate the connection between the storm drain system and the receiving waters and natural systems downstream.

The water quality basins will also incorporate wetland vegetation in a low flow channel along the bottom of the basin for the treatment of dry weather flows and small storm events. Water cleansing is a natural function of wetland vegetation, offering a range of treatment mechanisms. Sedimentation of particulates is the major removal mechanism. However the performance is enhanced as plant materials allow pollutants to come in contact with vegetation and soils containing bacteria that metabolize and transform pollutants, especially nutrients and trace metals. Plants also take up nutrients in their root system. Some pathogens would be removed through ultraviolet light degradation. Any oil and grease will be effectively adsorbed by the vegetation and soil within the low flow wetland vegetation. Dry weather flows and small storm flows will infiltrate into the bottom of the basin after receiving treatment in the low flow wetland vegetation. The water quality basins will not be designed to have open pools of standing water.

The Orange County Public Health Laboratory conducted a monitoring study in 1998 in the San Juan Creek watershed to help determine the sources of pathogen indicators during dry weather conditions (Moore et al, 2002). Monitoring stations were located in the ocean, in creeks in the San Juan Creek watershed, and in storm drains. One finding of the study was that "the highest concentrations of fecal coliforms and *Enterococcus* were found in the storm drains as compared to the creeks and ocean sampling sites. Samples taken from creek sites distant to human habitat also had low to moderate levels of bacteria, suggestive of fecal contamination by non-human sources." The principal anthropogenic sources of pathogens into dry weather flows is leaking septic systems, cross-connections between sanitary sewers and storm drains, or leakage from the sanitary sewer system into groundwater, which feeds the dry and non-storm flows. However, the

Mountain Park Development Project will be new development with new storm drains and sanitary sewer systems, which is expected to have minimal, if any, leakage.

On this basis, the impact of the Project on dry weather water quality is considered less than significant.

7.6 Construction Related Impacts

The potential impacts of construction activities, construction materials, and non-stormwater runoff on water quality focus primarily on sediment (TSS and turbidity). Construction-related activities that are primarily responsible for sediment releases are related to exposing soils to potential mobilization by rainfall/runoff and wind. Such activities include removal of vegetation from the site, grading of the site, and trenching for infrastructure improvements. Environmental factors that affect erosion include topographic, soil, and rainfall characteristics. Non sediment-related pollutants that are also of concern during construction relate to construction materials and non-stormwater flows and include waste construction materials; chemicals, liquid products, and petroleum products used in building construction or the maintenance of heavy equipment; and concrete-related waste streams.

Construction impacts will be minimized through compliance with the General Construction Permit. This permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP), which must include erosion and sediment control BMPs that will meet or exceed measures required by the General Construction Permit, as well as BMPs that control the other potential construction-related pollutants. A SWPPP will be developed as required by, and in compliance with, the General Construction Permit and City of Anaheim Standard Conditions. Erosion control BMPs are designed to prevent erosion, whereas sediment controls are designed to trap sediment once it has been mobilized. The General Permit requires the SWPPP to include a menu of BMPs to be selected and implemented based on the phase of construction and the weather conditions. BMPs to be included in this menu include, among others: slope stabilization using rock or vegetation, re-vegetation, hydro-seeding or using tackifiers on exposed areas, installation of energy dissipators, drop structures, catch basin inlet protection, construction materials management, and cover and containment of construction materials and wastes. This permit requires BMP selection, implementation, and maintenance during the construction phase of development.

The construction phase of the Project will involve implementation of BMPs consistent with Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT), as required by the Construction General Permit, Section 8 of the DAMP, and the general waste discharge requirements in the DeMinimus Dewatering General Permit. The Project will reduce or prevent erosion and sediment transport and transport of other potential pollutants from the project site during the construction phase through implementation of BMPs meeting BAT/BCT in order to prevent or minimize environmental impacts and to ensure that discharges during the construction phase of the Project will not cause or contribute to any exceedance of water quality standards in the receiving waters.

Construction on the project site may require dewatering. For example, dewatering may be needed if water has been standing on-site and needs to be removed for construction, vector control or other reasons. Further, dewatering may be necessary if groundwater is encountered during grading, or to allow discharges associated with testing of water lines, sprinkler systems and other facilities.

In general, the General Construction Activity Permit authorizes construction dewatering activities and other construction related non-stormwater discharges as long as they (a) comply with Section A.9 of the General Permit; (b) do not cause or contribute to violation of any water quality standards, (c) do not violate any other provisions of the General Permit, (d) do not require a non-stormwater permit as issued by some RWQCBs, and (e) are not prohibited by a Basin Plan provision. Full compliance with applicable local, state and federal water quality standards by the applicant would assure that potential impacts from dewatering discharges are not significant.

For the Mountain Park Development Project, an additional project design feature will be implemented to protect receiving waters from dewatering and construction related non-stormwater discharges. Such discharges will be implemented in compliance with the General Waste Discharge Requirements issued by the Santa Ana Regional Water Quality Control Board under Order No. 2003-0061, NPDES No. CAG998001 (WDRs). These WDRs include provisions requiring notification, testing and reporting of construction related non-stormwater discharges associated with dewatering and other construction activities. Compliance with these WDRs constitutes a PDF for the Project, further assuring that the impacts of these discharges are not significant.

On this basis, the impact of construction-related runoff from the Project is considered less than significant.

7.7 Other Considerations

7.7.1 Operation and Maintenance

Home Owners Associations (HOAs) will be responsible for the inspection and maintenance of structural BMPs within their boundaries. Operation and maintenance (O&M) activities for the treatment control BMP PDFs would include the following:

- Site Inspections
- Trash & Debris Removal
- Irrigation System Inspection & Adjustment
- Minor Vegetation Removal/Thinning
- Snag Removal
- Integrated Pest/Plan Management

The treatment basins will periodically require major maintenance and possibly repairs to ensure that the PDFs operate at their maximum efficiency and treatment capacity. Major activities include:

- Structural Modifications / Repairs
- Major Vegetation Removal & Planting
- Major Sediment Removal

O&M activities that could harm sensitive species or disturb avian species during nesting season would be avoided. No significant flooding/drying, sediment or vegetation removal, or major construction activities would be performed during the breeding and nesting season.

7.7.2 Vector Control

Although standing water is not expected to remain in the water quality basins for more than 36 to 48 hours, the low flow wetland vegetation in the low flow channels of the water quality basins may attract nuisance insects or animals, including mosquitoes, flies, rodents and waterfowl (a nuisance in excessive numbers only). The potential for public health effects from these insects or animals is considered to be relatively low, based on experience at existing water quality treatment wetlands where vector control plans are implemented.

The primary vector issue for wetland vegetation in the low flow channels of the water quality basins is mosquitoes. A number of abatement measures are proposed to minimize mosquito habitat and mosquito populations including habitat reduction (design limitations on standing water) and biochemical pesticides (i.e., the bacteria Bacillus sphaericus [Bs] and Bacillus thuringiensis israeliensus [Bti]). If these primary methods of control are unsuccessful in maintaining vector populations below nuisance levels, additional measures will be taken and could include: increased biochemical pesticide application, trapping and killing pests, chemical pesticide application; and temporary flooding or drying (draining) the treatment basin.

While vector control of other pests is important, such as for flies, rodents and over-abundant waterfowl, the potential for public health effects from these pests is generally regarded to be low. Controlling these pests is relatively easy and the likelihood of vector-borne outbreaks associated with these pests is considered minimal.

7.7.3 Pollutant Bioaccumulation

Certain pollutants have the potential to accumulate in extended detention basin wetland vegetation and sediment, increasing the risk of exposure to wildlife and the food chain. Factors that would affect the extent of bioaccumulation, if any, would include:

- The bioavailability of the pollutant
- Conditions in the sediments (e.g., pH, acid-volatile sulfide concentration, organic content) that affect the form and bioavailability of the pollutant;

- The efficiency by which pollutants in the soils enters the plant community, and the utilization of the plants as a food source by the waterfowl.
- The type of habitat, organisms attracted to that habitat, and their feeding habits; and
- Design and maintenance considerations

The potential for bioaccumulation impacts from the proposed detention facilities will be minimized through the design of the treatment facilities. Each water quality basin will contain a an energy dissipation and sedimentation area designed to capture coarse solids and associated pollutants, and designed to facilitate routine removal of sediments. Such procedures will limit the accumulation of pollutants in the soils and the potential for those pollutants to enter the food chain. The extent of the wetland vegetation also will be limited to the low flow portion in the bottom of the water quality basins, and the design would not include open water areas. Therefore, the wetland vegetation will not likely attract large numbers of waterfowl.

In the literature, the primary pollutants that are of concern with regard to bioaccumulation are mercury and selenium, as opposed to copper, lead, and zinc. However, selenium is not of concern in this watershed because there are not high levels of selenium in the underlying soils. Accordingly, bioaccumulation of selenium is not an issue. Similarly, mercury is not expected to be present in these watersheds, so bioaccumulation of mercury is also not an issue.

On this basis, the potential for bioaccumulation and adverse effects on waterfowl and other species is considered less than significant.

8 APPROACH FOR DEVELOPING PROJECT-SPECIFIC WQMP

The information in this report will serve as the technical basis for the Project WQMP for the Mountain Park Project. A final Project WQMP will be prepared for each Development Area or Tract in conjunction with the rough grading plan or final subdivision map, whichever occurs first. The Project WQMP shall demonstrate compliance with the implementation plans under the MS4 Permit, namely the DAMP/LIP.

The following steps will be taken to complete the Project WQMP:

- *Site assessment*: Document site specifics such as location, size, intended land uses, drainage, conditions of the surrounding areas, etc.

- *Identification of pollutants and hydrologic conditions of concern*: Pollutants of concern identified in this report will be used to develop a project-specific WQMP.

- *Incorporation of Site Design BMPs, as Appropriate*: By reference to this study, identify design principles suited to the development project that will reduce stormwater runoff volumes, prevent or limit the generation of pollutants, and preserve natural areas and protect slopes and channels of the project area.

- *Incorporation of Source Control BMPs*: By reference to this study, implement all appropriate source control measures in order to prevent or limit the generation of pollutants on the project site and mobilization and transport of pollutants.

- *Selection of regional or project–based approach to Treatment Control BMPs*: By reference to this study, determine whether onsite treatment controls or participation in a regional program will be the selected method of improving the water quality of discharges from the project site.

- *Selection, sizing, and incorporation of Treatment Control BMPs*: By reference to this study, incorporate on-site or contribute to regional controls that will provide treatment to stormwater runoff from the project site.

- *Provide proof of ongoing stormwater BMP maintenance*: By reference to this study, prepare an O&M Plan and ensure a mechanism is in place that will provide ongoing long-term maintenance of all structural and non-structural BMPs.

9 CONCLUSIONS

This report addressed the potential effects of the proposed Mountain Park Development Project on water quality in Gypsum Canyon Creek and the Santa Ana River. The following are the conclusions regarding the significance of impacts for the pollutants of concern under wet and dry weather conditions.

- *Sediments*: MS4 Permit, General Construction Permit and DAMP compliant BMPs will be incorporated into the Project to address sediment in both the construction phase and post-development. Mean total suspended solids concentrations are predicted to be less in the post-development condition than in the existing conditions. Turbidity in stormwater runoff will be controlled through implementation of a Construction SWPPP and will be permanently reduced through the stabilization of erodible soils with development. On this basis, the impact of the Project on sediments is considered less than significant.

- *Nutrients (Nitrogen and Phosphorous)*: MS4 Permit, General Construction Permit, and DAMP compliant BMPs will be incorporated into the Project to address nutrients in both the construction phase and post-development. Nitrate-nitrogen concentrations are predicted to decrease in the post-developed condition. Despite the predicted increases in nutrient loads, the post-developed concentrations are within the range of observed values in Santa Ana River Reach 2 and are therefore not expected to cause algae growth in the river. On this basis, the impact of the Project on nutrients is considered less than significant.

- *Trace Metals*: MS4 Permit, General Construction Permit, and DAMP compliant BMPs will be incorporated into the Project to address trace metals in both the construction phase and post-development. The mean concentration of dissolved zinc is predicted to decrease relative to predicted concentrations under existing conditions; while concentrations and loads of dissolved copper and total recoverable lead and loads of dissolved zinc are predicted to increase. Mean concentrations of copper, lead, and zinc are below benchmark Basin Plan objectives and CTR criteria and are within the range observed in Santa Ana River Reach 2. On this basis, the impact of the Project on trace metals is considered less than significant.

- *Pathogens*: Pathogen sources include both natural and anthropogenic sources. The natural sources include bird and mammal excrement. Anthropogenic sources include leaking septic and sewer systems and pet wastes. A reduction in open space within the Project area will reduce the bacteria produced by wildlife. The Project will not include septic systems and the sewer system will be designed to current standards which minimizes the potential for leaks. Thus pet wastes are the primary source of concern. The PDFs will include source controls and treatment controls which in combination should help to reduce pathogen indicator levels in stormwater runoff. On this basis, the Project impacts on pathogen and pathogen indicators is considered less than significant.

- *Hydrocarbons*: Hydrocarbon concentrations will likely increase with development because of vehicular emissions and leaks. In stormwater runoff hydrocarbons are often associated with soot particles that can combine with other solids in the runoff. Such materials are subject to treatment in the proposed water quality basins and vegetated swales. Source control BMPs incorporated in compliance with the MS4 Permit, the General Construction Permit, and the DAMP will also minimize the presence of hydrocarbons in runoff. On this basis, the impact of the Project on hydrocarbons is considered less than significant.

- *Pesticides*: Pesticides in runoff are likely to increase with development as a result of landscape applications. Proposed pesticide management practices including source control, removal with sediments in water quality basins, and advanced irrigation controls in compliance with the requirements of the MS4 Permit and the DAMP will minimize the presence of pesticides in runoff. On this basis, the impact of the Project on pesticides is considered less than significant.

- *Trash and debris*: Trash and debris in runoff are likely to increase with development if left unchecked. However, the Project PDFs, including source control and treatment BMPs incorporated in compliance with the MS4 Permit and the DAMP, will minimize the adverse impacts of trash and debris. Source controls such as street sweeping, public education, fines for littering, covered trash receptacles, and storm drain stenciling are effective in reducing the amount of trash and debris that is available for mobilization during wet weather. Trash and debris will be captured on trash racks and in the treatment control PDFs. Trash and debris is not expected to significantly impact receiving waters due to the implementation of the Project PDFs.

10 REFERENCES

ASCE/EPA, 2004. International Stormwater Best Management Practices (BMP) Database. Developed by the Urban Water Resources Research Council (UWRRC) of ASCE under a cooperative agreement with the U.S. Environmental Protection Agency. Provided online at: http://www.bmpdatabase.org.

California Department of Transportation, 2002. "Caltrans Construction Sites Runoff Characterization Study, Monitoring Seasons 1998-2002," CTSW-RT-02-055.

Cushing and Allan, 2001. Streams Their Ecology and Life. Colver E. Cushing and J. David Allen. Academic Press, 2001.

CWP, 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices, 2nd Edition. Prepared by the Center for Watershed Protection for the US EPA Office of Science and Technology in association with Tetra Tech, Inc. June 2000.

Dufour, A.P., 1984. Health Effects Criteria for Fresh Recreational Waters (EPA 600/1-84-004).

Fleisher, J. M. et al., 1996. Marine Waters Contaminated With Domestic Sewage: Nonenteric Illnesses Associated With Bather Exposure In The United Kingdom, 86 Am. J. Pub. Health, 1228–34.

Fuscoe Engineering, 2005. Runoff Management Plan, Volume I. Prepared for The Irvine Company, February 2005.

Gerba, C.P., J.A. Thurston, J.A. Falabi, P.M.Watt, and M.M. Karpiscek, 1999. Optimization of Artificial Wetland Design for Removal of Indicator Microorganisms and Pathogenic Protozoa, Wat. Sci. Tech. Vol. 40, No. 4-5, pp. 363-368.

Grant, S.B. et al., 2001. Generation of Enterococci Bacteria in a Coastal Saltwater Marsh and Its Impact on Surf Zone Water Quality. 35 Environmental Science & Technology, pp. 2407-16.

Jiang, S. et al., 2001. Human Adenoviruses and Coliphages in Urban Runoff-Impacted Coastal Waters of Southern California, 67 Applied and Environmental Microbiology, 179.

Kadlec, R.H. and R.L. Knight 1996. *Treatment Wetlands – Theory and Implementation*, CRC Lewis Publishers.

Katznelson, R. and T. Mumley, 1997. Diazinon in Surface Waters in the San Francisco Bay Area: Occurrence and Potential Impact. Prepared for California State Water Resources Control Board, and Alameda County Clean Water Program.

Kurz, 1999. Removal of Microbial Indicators from Stormwater Using San Filtration, Wet Detention, and Alum Treatment Best Management Practices. Sixth Biennial Stormwater Research & Watershed Management Conference. September 1999.

LADPW, 2001. Comment Letter from the County of Los Angeles Department of Public Works to the Los Angeles Regional Water Quality Control Board, September 18, 2001.

Los Angeles County, 2000. Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report, Department of Public Works, Alhambra, California, September 2000.

LARWQCB, 2002. Wet-Weather Bacteria TMDL for Santa Monica Bay Beaches, Res. No. 2002-022, Attachment A.

Metcalf and Eddy, 1979. Wastewater Engineering: Treatment, Disposal, and Reuse. Second Edition. McGraw Hill Book Company, 1979.

Moore, Douglas, D. Ferguson, and E.J. Gonzalez, 2002. San Juan Creek Watershed Bacterial Study, Final Report. Study funded by California Regional Water Quality Control Board, San Diego Region, Agreement #9-182-190-0 issued to County of Orange Public Facilities and Resources Department. Study Conducted by Orange County Public Health Laboratory.

Orange County Public Facilities Resources Department (OCPFRD), 2003. Drainage Area Management Plan (DAMP). September 2003. A Cooperative Project of the County of Orange, the Cities of Orange County, and the Orange County Flood Control District.

Paulsen, Susan and J. List, 2003. A Review of the Los Angeles Basin Plan Administrative Record, Environmental Defense Sciences. February 2003.

PBS&J, 1999. Evaluation of Bacteriological Impacts to Runoff and Coastal Waters from the Crystal Cove Development, prepared for the Irvine Company. November 1999.

Ribes, Sandra, B. Van Drooge, J. Dachs, O. Gustafsson, and J.O. Grimalt, Influence of Soot Carbon on the Soil-Air Partitioning of Polycyclic Aromatic Hydrocarbons, Environmental Science and Technology 37, pp. 2675-2680.

San Diego RWQCB, 2004. Bacteria-Impaired Waters TMDL Project I For Beaches and Creeks in the San Diego Region, Technical Draft.

Santa Ana Regional Water Quality Control Board (SARWQCB), 1995. Water Quality Control Plan, Santa Ana River Basin (8).

Santa Ana Regional Water Quality Control Board (SARWQCB), 2002. Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and The Incorporated Cities of Orange County Within the Santa Ana Region Areawide Urban Storm Water Runoff Orange County (ORDER NO. R8-2002-0010, NPDES No. CAS618030).

Santa Ana Regional Water Quality Control Board (SARWQCB), 2004. Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate an Updated Total Dissolved Solids (TDS) and Nitrogen Management Plan for the Santa Ana Region Including Revised Groundwater Subbasin Boundaries, Revised TDS and Nitrate-Nitrogen Quality Objectives for Groundwater, Revised TDS and Nitrogen Wasteload Allocations, and Revised Reach Designations, TDS and Nitrogen Objectives and Beneficial Uses for Specific Surface Waters (RESOLUTION NO. R8-2004-0001). February 5, 2004.

San Diego Regional Water Quality Control Board (SARWQCB), 2004. Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks in the San Diego Region, Technical Draft, jointly prepared by California Regional Water Quality Control Board, San Diego Region; United States Environmental Protection Agency, and Tetra Tech, Inc.

Sawyer at al, 1994. Chemistry for Environmental Engineering, Fourth Edition. Clair Sawyer, Perry McCarty, and Gene Parkin. McGraw-Hill, Inc., 1994.

Schiff, K.C, and P. Kinney, 2000. "Tracking Sources of Bacterial Contamination in Stormwater Discharges from Mission Bay, California," Southern California Coastal Water Research Project- Annual Report 1999-2000. Provided online at: ftp://ftp.sccwrp.org/pub/download/PDFs/1999ANNUALREPORT/07_ar06.pdf

Schroeder, E.D., W.M. Stallard, D.E. Thompson, F.J. Loge, M.A. Deshusses, H.J. Cox, 2002. Management of Pathogens Associated with Storm Drain Discharge, Center for Environmental and Water Resources Engineering, Dept. of Civil and Environmental Engineering, University of California, Davis prepared for Division of Environmental Analysis, California Department of Transportation. May 2002.

Strecker, et al., 2004. Analyses of the Expanded EPA/ASCE International BMP Database and Potential Implications for BMP Design, World Water and Environment Congress Proceedings (June 27-July 1, 2004)

Suter, G.W. II and C.L. Tsao, 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision, Prepared by Risk Assessment Program, Health Sciences Research Division, Oak Ridge, Tennessee for Department of Energy. ES/ER/TM-96/R2.

US Army Corps of Engineers, 1998. Project Information for LAD Reservoirs – Prado Dam. Website: http://www.spl.usace.army.mil/resreg/htdocs/prdo.html.

U.S. EPA California Toxics Rule (CTR), 40 C.F.R. §131.38.

U.S. EPA. 1972. Comm. on Water Quality Criteria, Nat'l. Academy of Sci.-Nat'l Academy of Engineering, Water Quality Criteria (USEPA R3-73-033).

U.S. EPA, 1986. Ambient Water Quality Criteria for Bacteria—1986, at 1–3 (USEPA 440/5-84-001).

U.S. EPA, 2004. Water Quality Standards for Coastal and Great Lakes Recreation Waters, 69 Fed. Reg. 67218.

Wade, T.J. et al., 2003. Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A Systematic Review and Meta-Analysis. 111 Environmental Health Perspectives, pp. 1102–09.

Water Environment Federation Manual of Practice No. 23/ASCE Manual of Practice No. 87, Urban Runoff Quality Management, 1998.

APPENDIX A

POLLUTANTS OF CONCERN AND SIGNIFICANCE CRITERIA TABLE FOR THE MOUNTAIN PARK DEVELOPMENT PROJECT

Pollutant of Concern (1)	Rationale for Selection as Pollutants of Concern	Significance Criteria
Sediment: Total Suspended Solids (TSS)	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant generated by detached and attached residential development, hillside development > 10,000 ft^2, and roads, and as a potential pollutant from parking lots. 2. Common in urban runoff.	1. Narrative objective in the Basin Plan: TSS levels shall not “cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.” 2. Basin Plan objective for turbidity: “Increases in turbidity which result from controllable water quality factors shall comply with the following: Natural Turbidity — Max Increase 0-50 NTU — 20% 50-100 NTU — 10 NTU >100 NTU — 10% All inland surface waters of the region shall be free of changes in turbidity which adversely affect beneficial uses.”
Nutrients: Nitrate Nitrogen, Total Kjeldahl Nitrogen, and Total Phosphorus	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant generated by detached and attached residential development, and hillside development > 10,000 ft^2, and as a potential pollutant from roads and parking lots if landscaping is present. 2. Common pollutant in urban runoff arising from fertilization of urban landscaping.	1. Narrative objective for algae in the Basin Plan: “Waste discharges shall not contribute to excessive algal growth in inland surface receiving waters.” 2. Basin Plan standards for nitrogen are tied either to drinking water designation (MUN) or tied to specifically named waterbodies. The SAR Reach 2 is excepted from the MUN beneficial use designation and Gypsum Cyn Creek is not listed in the Basin Plan. Thus, there are no applicable numeric objectives in the Basin Plan for nitrate. Although not applicable, the primary drinking water standard for nitrate is 10 mg/L (as N). Basin Plan objective for dissolved oxygen: “The dissolved oxygen content of surface waters shall not be depressed below 5 mg/L for waters designated as WARM as a result of controllable water quality factors. In addition, waste discharges shall not cause the median dissolved oxygen concentration to fall below 85% of saturation or the 95^{th} percentile concentration to fall below 75% of saturation within a 30-day period.”

Pollutant of Concern [1]	Rationale for Selection as Pollutants of Concern	Significance Criteria
Trace metals: Copper, Lead, and Zinc	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant from roads and parking lots. 2. Basin Plan requirement that discharges into receiving waters shall not cause or contribute to toxicity. 3. Urban development can increase potential sources of these metals due to the presence of vehicles.	1. Narrative objective in the Basin Plan: Toxic substances shall not be discharged to levels that will adversely affect beneficial uses. 2. The Basin Plan contains Site-Specific Water Quality Objectives for cadmium, copper, and lead in the SAR which are expressed for dissolved metal concentrations and are determined on the basis of hardness in the receiving water. 3. The CTR criteria are the applicable water quality objectives for protection of aquatic life. The CTR criteria are expressed for acute and chronic (4-day average) conditions; however, only acute conditions are applicable for stormwater discharges because the duration of stormwater discharge is typically less than 4 days. 4. CTR criteria are expressed for dissolved metal concentrations and are determined on the basis of hardness in the receiving water. In application of criteria to the Project, local hardness data will be used to determine most appropriate criteria.
Pathogens (Fecal Coliform, Viruses, and Protozoa)	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant from detached residential development and hillside development and a potential pollutant from attached residential development, parking lots, and roadways. 2. Fecal coliform is common in urban runoff due to the presence of pets and wildlife. Can also be present due to sanitary sewer leaks or cross connections. 3. Fecal coliform is a frequently monitored indicator organism of human pathogens. 4. Human related activities can increase fecal coliform concentrations. 5. Concentrations of fecal coliform in stormwater can be elevated, often due in part to the presence of coliform bacteria from natural sources.	1. Basin Plan objectives are based on the designated uses of the water body. The SAR Reach 2 is excepted from the MUN use, but is listed with a REC1 beneficial use. The REC1 standard for fecal coliform states that the log mean concentration must be less than 200 MPN organisms/100mL for 5 or more samples in a 30-day period, and no more than 10 percent of the samples may exceed 400 organisms/100mL in any 30-day period. 2. There are no designated uses in the Basin Plan for Gypsum Canyon Creek.

Pollutant of Concern [(1)]	**Rationale for Selection as Pollutants of Concern**	**Significance Criteria**
Petroleum Hydrocarbons: Oil & Grease and Polycyclic Aromatic Hydrocarbons (PAHs)	1. Listed in the DAMP (OCPFC, 2003) as an anticipated pollutant generated by detached residential development, hillside development > 10,000 ft^2, roads, and parking lots, and as a potential pollutant from attached residential development if uncovered parking is present. 2. Petroleum hydrocarbons are ubiquitous, and used in a wide variety of applications. Potential sources are generally expected to increase with urban development. 3. A source of PAHs is automobile exhaust. Therefore, development would generally be expected to increase levels of PAHs. 4. Oil & Grease are high molecular weight organic compounds such as motor oil, cooking fat, and waxes. Sources of these compounds are expected to increase with development.	1. CTR objectives available for some organic compounds. 2. PAHs are a class of compounds. CTR values for individual PAHs are available for protection of human health only. There are no regulatory standards for the protection of aquatic health. 3. Narrative objective in the Basin Plan for oil & grease: "waste discharges shall not result in deposition of oil, grease, wax, or other materials in concentrations which result in a visible film or in coating objects in the water, or which cause a nuisance or adversely affect beneficial uses."
Pesticides	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant from detached and attached residential development, hillside development > 10,000 ft^2, and a potential pollutant from parking lots and roadways if landscaping is present. 2. Pesticides loads may be present in runoff from developed areas due to pesticide use for urban landscaping.	1. Narrative objective in the Basin Plan: "Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health. The concentrations of toxic pollutants in the water column, sediments, or biota shall not adversely affect beneficial uses." 2. CTR lists numeric objectives for some, but not all pesticides. There are no CTR criteria for diazinon and chlorpyrifos, but these substances are now banned from most urban uses.

Pollutant of Concern [1]	Rationale for Selection as Pollutants of Concern	Significance Criteria
Trash and Debris	1. Listed in the DAMP (OCPFD, 2003) as an anticipated pollutant generated from all land uses. 2. Common in urban runoff.	1. Basin Plan narrative floatables objective: "waste discharges shall not contain floating materials, including solids, liquids, foam or scum, which cause a nuisance or adversely affect beneficial uses." 2. Basin Plan objective for dissolved oxygen: "The dissolved oxygen content of surface waters shall not be depressed below 5 mg/L for waters designated as WARM as a result of controllable water quality factors. In addition, waste discharges shall not cause the median dissolved oxygen concentration to fall below 85% of saturation or the 95th percentile concentration to fall below 75% of saturation within a 30-day period."

(1) Pollutants of concern are those pollutants that are anticipated or potentially could be generated by the Project, based on the proposed land uses, that have been identified by regulatory agencies as potentially impairing beneficial uses in the receiving water bodies or that could adversely affect receiving water quality.

APPENDIX B

WATER QUALITY MODELING METHODOLOGY

B.1 Water Quality Model

A water quality model was developed to assess the potential impact of development on water quality and to evaluate the effectiveness of the water quality basins that will treat stormwater runoff as part of the Project stormwater treatment system. Three different conditions were evaluated with the water quality model:

1. Pre-development

2. Post-development without treatment

3. Post-development with extended detention basins (water quality basins) and biofiltration

Measured runoff volumes and water quality characteristics of stormwater are highly variable. To account for this variability, a statistical modeling approach was used to estimate the volume of stormwater, the concentration of pollutants in stormwater, and the overall pollutant load (total mass of pollutants) in stormwater runoff. A statistical description of stormwater provides an indication of the average characteristics and variability of the water quality parameters of stormwater, and the probability of compliance with regulatory criteria. It does not forecast runoff characteristics or regulatory compliance for specific storms or monitoring periods.

The statistical model is based on relatively simple expressions describing rainfall/runoff relationships and estimated concentrations in stormwater runoff. The volume of stormwater runoff is estimated using the Rational formula, an empirical expression that relates runoff volume to the rainfall depth and the broad basin characteristics. The pollutant concentration in stormwater runoff is represented by an expected average pollutant concentration, called the event mean concentrations (EMC). The EMCs are estimated from available monitoring data from, and are strongly dependent on, the land-use type.

A Monte Carlo simulation method was used to develop the statistical description for water quality of stormwater. In this approach, the stormwater characteristics from a single arbitrary rainfall event are first estimated. The rainfall depth of an arbitrary event was determined by randomly sampling from the historical rainfall information. Similarly, an arbitrary EMC was determined by randomly sampling from the distribution of EMCs in a manner that preserves the mean and standard deviation of the monitoring information. The randomly determined rainfall volume and EMC were used to determine runoff volume, pollutant concentration, and pollutant load of a single arbitrary storm event. This procedure was then repeated thousands of times ($\approx$20,000), recording the volume, EMC and load from each random storm event. The statistics of these recorded results provides a description of the average characteristics and variability of the volume and water quality of stormwater runoff.

The procedures followed in the Water Quality Model are as follows:

1. Develop a statistical description of storm events and pollutant concentration in storm runoff, as necessary.

2. Estimate the volume of storm runoff from a random storm event for each land use area.

3. Estimate a random pollutant concentration in storm runoff for each land-use area.

4. Calculate the total runoff volume, pollutant load, and concentration in runoff from the modeled portion of the Project.

5. Estimate a random number of storms per year based on available historical records. To estimate a single random annual load, repeat steps 2-4 by the random number of storms per year, summing the loads from each random storm event.

6. Repeat steps 2-5 a total of 20,000 times for each pollutant modeled, recording the estimated pollutant concentration and annual load for each iteration.

7. Develop a statistical representation of the recorded stormwater loads and concentrations.

Each of these seven steps is described below.

Step 1 – Statistical Representation of Storm Events and Runoff Concentration

Storm Depth
Rainfall analysis was conducted with data from the National Climatic Data Center (NCDC) Prado Dam rain gage (Station ID #047123), approximately 2.5 miles northwest of the project site. This site was selected because it has a long period of record (1948 – present), is very close to the project site, and is comparable in elevation. Hourly rainfall data from the Prado Dam gage (National Climatic Data Center station # 047123) was analyzed using EPA's Synoptic Rainfall Analysis Program (SYNOP). SYNOP subdivides the rainfall record into discrete events separated by a dry inter-event period, which in this case was set to a minimum of 6 hours. Small rainfall events whose depth was less than or equal to 0.10 inches were deleted from the record as such events tend to produce little if any runoff. For the Prado Dam Gage, a total of 784 storm events were segregated from the continuous data.

An arbitrary storm depth was determined by randomly sampling from the 784 storms in the period of record. The historical record of storm depths was sampled such that each storm had an equal chance of being selected.

Number of Storms per Year

The number of storm events per year was calculated for a total of 52 years in the available period of record from 1949 – 2001. Of these, all of the years had a complete or nearly complete record. The modeled average number of storm events per year (> 0.1 inches) was 15.68, with a standard deviation of 5.67. Figure B-1 illustrates a frequency histogram of the number of storm events per year at the Prado Dam gage. The number of storm events per year was assumed to be normally distributed.

In the simulation, the number of storms per year was determined by randomly sampling from the normal distribution (~N (15.68, 5.67) and rounding to the nearest whole number. If the arbitrary number of storms per year was negative, then the normal distribution was re-sampled until a positive number was obtained.

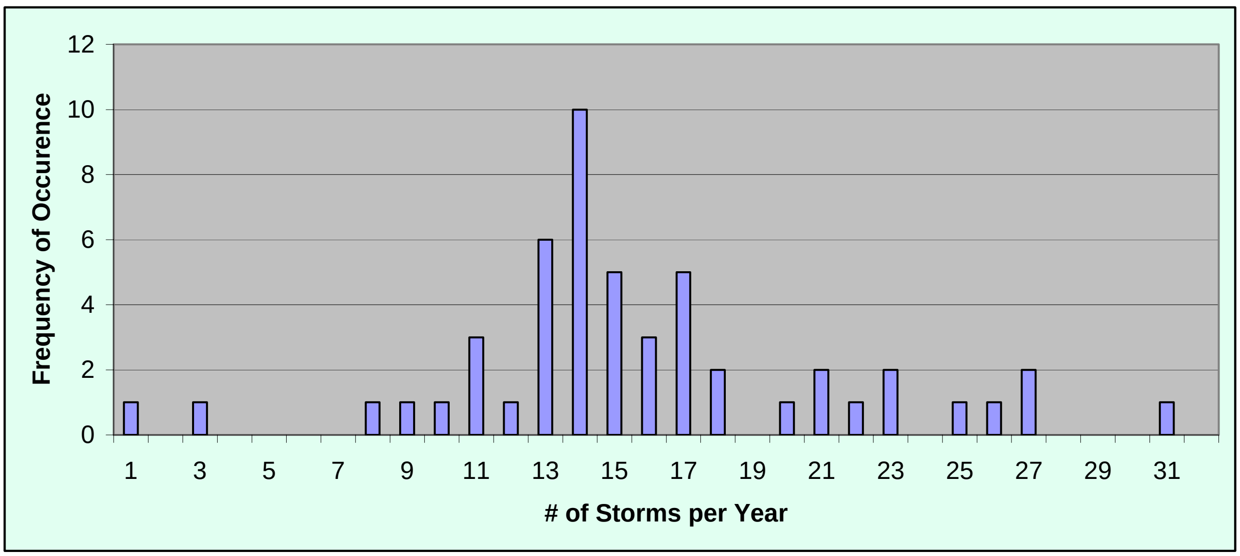


Figure B-1: Distribution of Storms per Year at the Prado Dam Gage.

Runoff Concentration

The distribution of land use-based pollutant concentration in storm runoff was obtained from targeted monitoring data collected in Los Angeles. Because only summary statistics were employed, we assumed that the pollutant concentrations from all land-use areas are log-normally distributed. This assumption was evaluated by Los Angeles County using the Shapiro-Wilk Normality Test (LA County, 2000). For most cases the monitoring data were lognormally distributed, although in some instances the data were better fit with a normal distribution or were neither normally nor lognormally distributed. Due to a lack of sand and gravel mine runoff data, highway construction site runoff monitoring data from a four-year study at 27 sites conducted by the California Department of Transportation (Caltrans, 2002) was used in the model to approximate TSS concentration in existing quarry runoff; while the remaining parameters were modeled using open space data. On-site features such as the fire station/ trail head, community center, a sewer lift station, 2 pump stations and 3 water tanks were modeled using the National Storm Water Quality Database (NSQD).

Step 2 – Estimate the Volume of Storm Runoff from a Random Storm Event.

Runoff volume was estimated with the Rational formula:

$$V = R_v P A \qquad (1)$$

where:

- V = the stormwater runoff volume (ft^3/year)
- P = the rainfall depth of the storm (ft)
- A = the drainage area (ft^2)
- R_v = the mean volumetric runoff coefficient, a unit-less value that is a function of the imperviousness of the drainage.

Runoff coefficients were evaluated as a function of the percent imperviousness of the tributary drainage area. Various equations have been developed to describe the relationship between percent imperviousness and runoff coefficients. The following equations were evaluated to find the most appropriate relationship given the project site location and associated land uses:

- $R_v = 0.9 * I_p + 0.05$ (Schueler, T.R. 1987) (2)
- $R_v = 0.7 * I_p + 0.1$ (FWHA, 1990) (3)
- $R_v = (0.858 * I_p^{\ 3}) + (0.78 * I_p^{\ 2}) + (0.774 * I_p) + 0.04$ (WEF, 1998) (4)
- $R_v = 0.8 * I_p + 0.1$ (LA County, 1991) (5)

where:

I_p is the fraction of the tributary drainage area that is impervious to infiltration of rainfall. The impervious fraction is a function of land-use.

Equation 5 was chosen as the most representative of this project's site location and associated land uses.

For catchments that contain multiple land-use types, the total stormwater runoff volume is determined as the sum of runoff from each land-use type:

$$V_{total} = \sum_{lu} V_{lu} = R_{vlu} P A_{lu} \qquad (6)$$

where *lu* designates the land-use type. It is assumed that rain falls uniformly over all land-uses in the catchment.

The steps used to calculate the volume of runoff from a random storm event were:

Step 2a Obtain a rainfall depth by randomly sampling from the 784 historical storm events.

Step 2b For each land-use area calculate a runoff volume using equation (1). The same rainfall depth is applied to each land-use area.

Step 2c Sum the runoff volumes from each land-use area to obtain the total runoff from the watershed for a particular storm event (equation 6).

Step 3 – Estimate a Pollutant Concentration in Storm Runoff from Each Land Use Area

The pollutant concentration in storm runoff from each land-use area was estimated by randomly sampling from the associated concentration distributions (lognormal) obtained from LA County, Caltrans, and the National Stormwater Quality Database monitoring data. The runoff concentration from each land-use area was evaluated with the expression:

$$C_{land-use} = \exp\left(\mu_{\ln x} + \sigma_{\ln x} R_N\right) \tag{7}$$

where:

$\mu_{\ln x}$ = the log-normal mean
$\sigma_{\ln x}$ = the log-normal standard deviation
R_N = a standard normal random variable

Step 4 – Calculate the Total Runoff Volume, Pollutant Load, and Pollutant Concentration in a Random Storm Event

Step 4A - The total runoff volume in the watershed was calculated with equation (7) as discussed in Step 2:

$$V_{total} = V_{land-use1} + V_{land-use2} + \ldots + V_{land-usei} \tag{8}$$

where the same random rainfall event was used to calculate runoff volume in each of the land-use areas.

Step 4B - The total pollutant load was calculated by:

$$L_{total} = V_{land-use1}C_{land-use1} + \ldots + V_{land-usei}C_{land-usei} \quad (9)$$

where the runoff from each individual land-use area was calculated with equation (1) discussed in step 2, and the concentration in each individual land-use area was calculated with equation (8) discussed in step 3.

In cases where treatment controls were modeled, additional calculations were used to determine the loads from individual land-use areas. A percent capture calculated for each storm event was applied to the runoff volume. The BMP effluent concentration was then modified in accordance with the BMP effectiveness. Different expressions are used for the structural BMPs comprising the stormwater treatment system depending on the available data (effluent concentrations or percent removal); effluent concentrations were used for modeling the water quality basins comprising the stormwater treatment system for the Project.

$$L_{land-use} = \left[Cap_{\%} \times V_{land-use} \times C_{eff}\right] + \left[\left(1 - Cap_{\%}\right) \times V_{land-use} \times C_{land-use}\right] \quad (10)$$

where:

$Cap_{\%}$ = the percent capture of the BMP. For the modeled BMPs the $Cap_{percent}$ is volume-based.

C_{eff} = the effluent concentration from the BMP. For water quality basins, C_{eff} was set equal to a constant effluent concentration determined from the ASCE database.

Step 4C - The average pollutant concentration in runoff from the entire watershed from a single storm event was calculated by dividing the total watershed load by the total watershed runoff volume:

$$C_{total} = L_{total} / V_{total} \quad (11)$$

where the runoff from individual land-uses is calculated from step 2 and the concentration in individual land-uses in calculated by step 3.

Step 5 – Calculate a Random Total Annual Pollutant Load

The annual pollutant load is simply the sum of pollutant loads generated from all storms in a given year. Thus, to compute an annual pollutant load, the number of storms in a random year must first be determined. This was accomplished by randomly sampling from the distribution using the expression:

$$\mathrm{N}_{\mathrm{storms}} = 15.68 + 5.67R_N \quad (12)$$

where:

R_N = a standard normal variant with a mean of 0 and a standard deviation of 1

The number of storms was rounded to the nearest whole number, and in cases where a negative number of storms was obtained, the distribution was re-sampled.

Next, steps 2-4 were repeated N_{storms} times, recording the total pollutant load from each random storm event. Finally, the individual storm loads were summed to obtain the total annual pollutant load.

Step 6 & 7 – Determine Distribution of Storm Concentration and Annual Loads

Steps 2-5 were repeated a total of 20,000 times, recording the pollutant concentration and annual load from each iteration. The resultant distributions can be used to present frequency distribution for pollutant concentrations or loads using statistics calculated from the 20,000 Monte-Carlo iterations.

B.2 Estimate the Effectiveness of the Proposed Water Quality Basins

The SYNOP program has the ability to provide descriptive statistics of storm events, based upon analysis of hourly rainfall records (Prado Dam Station ID #047123). Included in these statistics is the dry time between storms. This information, along with the storm depths and drainage rates of the water quality basins, was used to estimate the capture efficiency of the water quality basins for each storm in the period of record for use as inputs in the water quality model. The percent capture calculations for the water quality basins were made with the following steps.

Step 1 – Estimate Runoff Volumes for Each Storm in the Period of Record Modeled

The runoff volume for each storm in the period of record (784 storms) was calculated for the tributary area draining to the detention basin.

Step 2 – Determine Detention Basin Storage Capacity

Next, the available storage capacity of the water quality basins was calculated for each storm. If the time from the preceding storm was equal to or larger than 36 hours, the draw down time for the water quality basins, then the BMP was considered empty at the time of the storm.

If the time between storms was less than 36 hours, then the capture volume was calculated to account for the size of the previous storm and the dry period between storms. This is done to account for insufficient time for the water quality basins to completely empty before the next storm arrived. If the volume of stormwater runoff to the BMP from the previous storm was larger than the storage capacity of the BMP, then the BMP was assumed to have filled completely and the initial storage capacity in equation 1 is zero.

If the runoff volume (for a storm occurring less than 36 hours prior to the storm of interest) was less than the storage capacity of the BMP, then the difference between the storage capacity of the BMP and the runoff volume from the previous storm was considered available to capture runoff from the next storm. This volume is then added to the storage capacity created from draw down during the time between storms as shown in equation 1.

$$SC = ISC + [V \times DD \times T] \qquad (13)$$

Where:

SC = the storage capacity (ft^3) in a detention basin available to capture runoff at the beginning of a storm

ISC = the remaining storage volume after previous event (ft^3), initial storage capacity for storm of interest

V = the detention basin volume (ft^3)

DD = the draw down rate of detention basin in percent per hour (hr^{-1}), 2.78 percent per hour for a 36 hour draw down time

T = the storm duration (hr)

The above equation accounts for storage capacity that is created during draw down of the detention basin while a storm occurs. That is, during long duration storms more runoff can be processed through the detention basin than for a short storm of comparable rainfall intensities and runoff rates.

Step 3 – Determine the Percent Capture for Each Detention Basin

The storage capacity estimated from step 2 is compared to the runoff volume estimate from step 1. If the storage capacity exceeds the storm runoff volume then the storm is considered to be completely (100 percent) captured. If the storage capacity is less than the runoff volume a volume of runoff equal to the storage capacity is considered treated by the detention basin. The percent capture for each storm estimated for the water quality basins is used in the Monte-Carlo model to calculate pollutant removals in the modeled BMPs.

B.3 Estimate the Effectiveness of the Proposed Bioswales

Due to the proposed grading plan, approximately 4.1 acres of roadway will be located downgradient of the proposed water quality basins and therefore will not drain to the basins. This roadway area will be treated with filter strips (a type of biofilter) designed per the MS4 permit and DAMP requirements. The water tank located in Development Area 7 will also be treated using a filter strip or a bioswale designed per MS4 requirements. A conceptual illustration of a filter strip is provided in Figure 5-3.

The filter strips were sized according to the California Stormwater BMP Handbook Flow Approach, which requires treatment of 2 times the 85% hourly rainfall intensity. Sizing methodologies for the filter strips are presented in Appendix C. The sizing parameters of the filter strips and land use data were input into a hydrologic model along with the historic rainfall record to determine the percentage of the runoff that would be treated by the bioswales. The treatment efficiency was applied to the modeled runoff volume from the proposed development to determine the total treated volume and total bypassed volume. Bypassed volumes were assumed to be untreated. Treated volumes were assigned effluent pollutant EMCs for biofilters as identified in the ASCE National Stormwater BMP Database

B.4 Model Input Parameters

The concentrations of stormwater runoff and resulting pollutant loads can be difficult to quantify. Many parameters that can affect pollutant loads and concentrations vary between locations where stormwater monitoring has been conducted. Examples include source concentrations, topography, soil type, and rainfall characteristics all of which can influence the buildup and mobilization of pollutants. The following model parameters represent the best data currently available for representation of existing and developed site conditions in the water quality model.

B.4.1 Rainfall & Storm Characteristics

Rainfall analysis was conducted using SYNOP to estimate the percent capture for volume and flow-based BMPs for each of the 804 storms used as model input. Additional information on SYNOP is provided in previous sections of this report. Descriptive statistics for the modeled storms are presented in Table B-1 below.

Table B-1: Storm Statistics for the Prado Dam Rain Gauge

Parameter	Storm Events >0.1”(in)
Mean	0.75
Median	0.46
85^{th} Percentile	1.39

B.4.2 Land Use Data

Land use data for existing and development conditions were provided by Fuscoe Engineering and are presented in Table B-2. Table B-3 presents the percent imperviousness values that were provided by Fuscoe Engineering and used in the water quality model.

Within the modeled area, approximately 59 percent will be man-made or natural slopes and the remainder will be developed into single family residential, multi-family residential, school, park, and roadway land uses (Table 2-1). Approximately 538 acres of the modeled area will drain to treatment control PDFs, including approximately 198 acres of single family residential housing that varies in density from 3 dwellings units per acre to 10 dwelling units per acre, 139 acres of condominiums designated as multi-family residential, a 10-acre school, 15.5 acres of park, 40 acres of roadways, 122 acres of vegetated man-made and natural slopes, a 3.2 acre fire station/ trail head, a 3-acre community center, a 0.02-acre sewer lift station, two 0.02-acre pump stations, and three water tanks totaling 6.5 acres. The remaining approximately 553 acres within the modeled area are vegetated man-made and natural slopes that will not train to treatment control PDFs. Sub-drainage Area F includes 43 acres associated with existing SR 241 that are outside of the Project boundary, but have been included in the model; 25 acres of this area are roadway and 18 acres are undeveloped slopes.

Table B-2: Modeled Area Land Uses and Areas

Drainage Area ID[1]	Land Use Areas (acres)													
	Pre-Development				Post-Development									Total
	Open Space	Quarry	Road	Total	Areas with Treatment							Areas w/out Treatment		
					SFR	MFR	School	Park	Road	Slopes[9]	Other[10]	Slopes[9]	Road	
Gypsum Canyon Creek Local Watershed[2]														
I[3]	44.2	160	0.8	205	26.1	139.1	-	-	13.2	49.3	8.52	37.9	-	274.1
F[4]	289	-	25[5]	314	60.4	-	-	-	8.9	8.2	-	228	25[5]	330.5
E[6]	289	-	-	289	82.5	-	-	-	10.2	48.6	2.4	166.9	-	310.6
Sub-Total	**622.2**	**160**	**25.8**	**808**	**169**	**139.1**	**-**	**-**	**32.3**	**106.1**	**10.9**	**432.8**	**25**	**915.2**
West Drainage Area[7]														
W[8]	146	-	-	146	29.2	-	10	15.5	7.7	16.2	1.8	86.4	-	166.8
Total Study Area	**768.2**	**160**	**25.8**	**954**	**198.2**	**139.1**	**10**	**15.5**	**40**	**122.3**	**12.7**	**519.2**	**25**	**1082**

[1]Drainage Area ID sourced from Runoff Management Plan Volume I, Figure 2.5.1 Proposed Hydrology Map (Fuscoe Engineering, 2004).
[2] Only includes the portions of the Gypsum Watershed that are within Sub-drainage Areas I, F, and E.
[3] Includes Development Area 5.
[4] Includes Development Area 4.
[5]Sub-drainage Area F includes 43 acres associated with existing SR 241 that are outside of the Project boundary, but have been included in the model; 25 acres of this area are roadway and 18 acres are undeveloped slopes.
[6]Includes Development Areas 1 and 2.
[7] Only includes the portions of the West Drainage Area that are within Drainage Area W.
[8] Includes Sub-drainage Areas 3 and 7.
[9]Slopes include man-made and natural slopes that are vegetated.
[10]'Other' includes a 3-acre community center, a sewer lift station, two pump stations, a 3.2-acre fire station/ trail head, and three water tanks.

Table B-3: Percent Imperviousness as a Function of Land Use

Land Use Type	Percent Imperviousness[1]
Natural Slope	0
Man-made Slope	15
Single Family Residential (3-5 du/ac)	40
Single Family Residential (5-7 du/ac)	50
Single Family Residential (7-10 du/ac)	55
Multi Family Residential	80
School	40
Park	15
Roadway	90
Ramp	100
Water Tank	90
Community Center	80
Fire Station/ Trail Head	80
Pump Station/ Sewer Lift Station	80

[1]Percent imperviousness values provided by Fuscoe Engineering

B.4.3 EMC Data

LA County EMC Data

For this modeling effort, recent regional EMC data from LA County were applied (LA County, 2000). These data were used because of the relatively close location to the development site and because the monitored land uses were representative of the proposed development in the Project. Only data from developed land uses that were similar to the uses anticipated for the Project were selected to the extent possible (i.e., data from stormwater monitoring of a commercial site by LA County is used to represent stormwater concentrations from commercial areas within the proposed development).

The Los Angeles County Stormwater Monitoring Program was initiated with the goal of providing technical data and information to support effective watershed stormwater quality management programs in Los Angeles County. Specific objectives of the Project included monitoring and assessing pollutant concentrations from specific land uses and watershed areas. In order to achieve this objective, the County undertook an extensive stormwater sampling project that included 7 land use stations and 5 mass emission stations, which were tested for 82 water quality parameters. These data were published in two reports: (LA County, 1999; LA County, 2000). The land use stations available through monitoring conducted by LA County which were used to develop water quality modeling parameters are listed in Table B-4 below.

Table B-4: LA County Land Use Monitoring Stations Used for Water Quality Modeling

Station Name	Station	Modeled Land Use	Site Description	Years Monitoring Conducted
Sawpit Creek	S11	Open Space (Vacant)	Located in Los Angeles River watershed in City of Monrovia. The monitoring station is Sawpit Creek, downstream of Monrovia Creek. Sawpit Creek is a natural watercourse at this location. Catchment area is approximately 3300 acres.	1996-2000
Project 620	S18	Single Family Residential	Located in the Los Angeles River watershed in the City of Glendale. The monitoring station is at the intersection of Glenwood Road and Cleveland Avenue. Land use is predominantly high-density, single-family residential. Catchment area is approximately 120 acres.	1996-2000
Dominguez Channel	S23	Freeway (Roads)	Located within the Dominguez Channel/Los Angeles Harbor watershed in Lennox, near LAX. The monitoring station is near the intersection of 116th Street and Isis Avenue. Land use is predominantly transportation and includes areas of LAX and Interstate 105.	1996-2000
Project 474	S25	Education	Located in Los Angeles River watershed in the Northridge section of the City of Los Angeles. The monitoring station is located along Lindley Avenue, one block south of Nordoff Street. The station monitors runoff from the California State University of Northridge. Catchment area is approximately 262 acres.	1997-2000
Project 404	S26	Multi-Family Residential	Located in Los Angeles River watershed in City of Arcadia. The monitoring station is located along Duarte Road, between Holly Ave and La Cadena Ave. Catchment area is approximately 214 acres.	1997-2000

Source: (LA County, 2000)

Data analysis conducted by Los Angeles County substituted values equal to half the laboratory detection limit in order to estimate descriptive statistics (e.g. mean and standard deviation) for event mean concentrations (EMCs) for each monitored pollutant at each land use monitoring station. In an effort to derive more robust estimates of EMCs for the modeled pollutants and land uses, the raw monitoring data was obtained from the Los Angeles Department of Public Works. A maximum likelihood estimator method was used to analyze the monitoring data. This method ranks the log transformed data above the detection limit and extrapolates to estimate probable values of data below the detection limit. These values are then used with the detect data to estimate the descriptive statistics. The majority of pollutants from the monitored land uses are best characterized with a lognormal distribution, which was used to generate random EMC values in the water quality model. Tables B-5 and B-6 present the monitoring data used in the model for each land use type.

Caltrans EMC Data

Due to a lack of data on sand and gravel quarry runoff, an alternative source of data was needed. The quarry currently utilizes a series of water quality basins for treatment. Because of this, EMC data used to approximate the quarry effluent quality should approximate the effluent discharge from the water quality basins. Another alternative would be to approximate raw stormwater runoff from the quarry and then utilize the treatment options in the water quality model. To approximate runoff from the existing sand and gravel quarry, monitoring data from highway construction site runoff was used to model TSS. This was thought to be an appropriate substitution due to the significant soil disturbance observed in both cases.

In 1998, California Department of Transportation (Caltrans) initiated a four-year study at 27 highway construction sites throughout the state of California (Caltrans, 2002). The purpose of the study was to develop a baseline set of construction site stormwater quality concentrations. During the four rainy seasons beginning in 1998-1999 and ending in 2001-2002, 120 storm events were monitored. Manual sampling was performed to collect flow-weighted composite samples. Flow rates were measured using portable flow/velocity meters equipped with data loggers. The monitored storm events were separated by a 24-hr dry period. Sampling was attempted if the rainfall was predicted to produce at least 0.3-in of rainfall. The sites chosen for sampling had to meet the following criteria:

- The majority of the stormwater runoff should flow to a centralized location
- Sampling locations should provide accurate flow measurements
- Construction sites must be active
- There should be minimal contribution of off-site runoff

The sampling locations were located downstream of the temporary BMPs used at the site. Because the monitoring data was collected downstream of temporary BMPs, the data should approximate the effluent pollutant concentration of discharge from the quarry detention basins.

Tables B-5 and B-6 provide the detection limits, percent detects and the mean EMCs for the Caltrans monitoring study.

NSQD: NPDES Phase 1 Data

In 2001, the University of Alabama and the Center for Watershed Protection were awarded an EPA grant to collect and evaluate stormwater monitoring data from a representative number of NPDES MS4 stormwater permit holders. Monitoring data was collected from more than 200 municipalities located throughout the country and compiled into a single database known as the National Stormwater Quality Database (NSQD). To date, approximately 3,770 separate events collected and analyzed by 66 different factions from 17 states have been incorporated into the NSQD. The database is separated into 11 land use categories: residential, commercial, industrial, institutional, freeways, open space and 5 mixed land uses.

The Project includes a fire station/ trail head, a sewer lift station, two pump stations, three water tanks, and a community center. Due to a lack of monitoring data for these land use types in the LA County database, the NSQD was evaluated to find a more appropriate dataset. The NSQD includes monitoring data collected from areas of mixed land uses such as residential, institutional, and open space areas. Water quality data from these composite areas was considered to be an appropriate approximation of the runoff water quality for these small pockets of development that receive little vehicular traffic. The NSQD was queried according to land use type to obtain monitoring data from open space areas mixed with residential or institutional areas. A total of 51 events were extracted from the database and used in the model.

The dataset for mixed land use did not include dissolved metal concentrations. The dissolved fraction of total copper and zinc was approximated by examining land use areas in the database that included concentrations for both the total and dissolved phases of these metals. Examination of these land use areas revealed that approximately 40% of the total copper and 50% of the total zinc was in the dissolved form. Tables B-5 and B-6 summarize the monitoring data used in the model.

Table B-5: Monitoring Data Detection Limits and percent of Detects for Modeled Parameters & Land Uses

	TSS	**Total P**	**Nitrate-N**	**TKN**	**Diss Cu**	**Tot Pb**	**Diss Zn**
Detection Limit	2 mg/L	0.05 mg/L	0.1 mg/L	0.1 mg/L	5 ug/L	5 ug/L	50 ug/L
Transportation[1]	100 %	99%	80%	100%	100%	42%	92%
MF Residential[1]	98%	97%	74%	100%	57%	26%	57%
Educational[1]	100%	100%	76%	100%	81%	24%	59%
HDSF Residential[1]	98%	100%	70%	100%	60%	45%	15%
Vacant[1]	98%	48%	98%	100%	2%	8%	4%
Quarry/ Construction[2]	100%	48%	98%	100%	2%	8%	4%
Mixed Land Use[3]	100%	98%	93%	91%	83% [4]	89%	96%[5]

Notes:

1: Data was obtained from Los Angeles County

2: TSS data obtained from Caltrans Highway Construction Site Runoff

3: Data was obtained from NSQD

4: Indicates the percent of detects for total copper. Dissolved copper was not monitored for mixed open space

5: Indicates the percent of detects for total zinc. Dissolved zinc was not monitored for mixed open space

Table B-6: Estimated Arithmetic Mean EMC Values for Modeled Parameters & Land Uses

Land Use	TSS	Total P	Nitrate-N	TKN	Diss Cu	Tot Pb	Diss Zn
Transportation[1]	39.4	0.295	0.29	1.05	24.3	3.52	129
MF Residential[1]	40.3	0.236	1.37	1.81	6.36	3.25	60.7
Educational[1]	93.6	0.301	0.58	1.59	9.90	2.92	66.5
HDSF Residential[1]	128	0.407	0.77	2.99	9.51	8.76	30.5
Vacant[1]	224	0.124	1.16	0.976	1.00	3.21	36.7
Quarry/ Construction[2]	608	0.124	1.16	0.976	1.00	3.21	21.9
Mixed Land Use[3]	102.8	0.260	0.734	1.130	8.4	8.4	70.3

Notes:

1: Data was obtained from Los Angeles County

2: TSS data obtained from Caltrans Highway Construction Site Runoff

3: Data was obtained from NSQD

B.4.4 BMP Performance Data

Various data sources were examined to estimate the anticipated performance of the proposed BMPs, including the American Society of Civil Engineers (ASCE) and EPA database recently compiled by ASCE's Urban Runoff Research Council (Strecker et al., 2001). The ASCE International Stormwater Best Management Practices Database (UWRRC, 2000) is the most recent and robust database available to analyze the effects of a variety of BMPs on stormwater quality (available at http://www.bmpdatabase.org). The ASCE database is comprised of studies that have monitored the effectiveness of a variety of BMPs in treating water quality pollutants. Typical information included in each study is a description of the BMP, the drainage area with dominant land uses, influent concentrations, effluent concentrations, and removal efficiencies. BMP treatment efficiencies for the water quality basins are based upon the BMP water quality monitoring data included in the ASCE database shown below (Table B-7).

Table B-7: BMP Performance –Modeled Effluent Concentration for Stormwater Treatment in Treatment Control BMPs[1]

BMP	Effluent Quality of Modeled Constituent						
	TSS	Total P	Nitrate-N	TKN	Diss Cu	Tot Pb	Diss Zn
Units	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L
Water quality basins	40.8	0.30	0.77	1.87	16.4	24.6	53.8
Biofiltration	26.0	0.44	0.589	1.64	6.1	16.2	32.7

1 – Performance based on median value of available ASCE database monitoring data

The water balance for the water quality basins and the modeled herein assumes that approximately 20 percent of the inflow to the basins and filter strips (modeled as biofiltration) will infiltrate and/or evapotranspire. This is based on observed reduction in effluent versus influent on the order of 30 percent for basins and 38% for bioswales in the American Society of Civil Engineers (ASCE) and EPA database recently compiled by ASCE's Urban Runoff Research Council (Strecker et al., 2001). A value of 20 percent was used in this study to be conservative.

B.5 Model Reliability

Factors that affect model reliability include variability in environmental conditions and model error. To account for environmental variability, a statistical modeling approach was used that takes into account the observed variability in precipitation from storm to storm and from year to year. The model also takes into account the observed variability in water quality from storm to storm, and for different types of land uses. One way to express this variability is the coefficient of variation (COV) which is the ratio of the standard deviation of the variable to the mean value. Based on the statistical model, COVs ranged from 0.46 to 0.75 for pollutant loads of nitrate-nitrogen, TKN, dissolved copper, total lead and dissolved zinc. COVs ranged from 0.47 to 1.21 for total phosphorous and from 0.46 to 2.54 for TSS. This variability is typical of stormwater runoff.

Model error relates to the ability of the model to properly simulate the processes that affect stormwater runoff, concentrations, and loads. Ideally model error is measured through calibration, but calibration is not feasible when considering a future condition. We are fairly confident that the model is a reasonable reflection of stormwater processes because the model relies largely on measured regional, albeit not local, data. For example, the runoff water quality data are obtained from a comprehensive monitoring program conducted by LA County that has measured runoff concentrations from a variety of land use catchments and for a statistically reliable number of storm events. Comparisons with instream data collected by Orange County, which reflects a mix of land uses, have indicated reasonable agreement. On this basis we feel the statistical model is adequate for projecting the effects of the Project on water quality, and is appropriate for CEQA analysis.

B.6 References

Caltrans- California Department of Transportation, 2002. "Caltrans Construction Sites Runoff Characterization Study, Monitoring Seasons 1998-2002," CTSW-RT-02-055.

Federal Highway Administration, 1990. Pollutant Loadings and Impacts from Stormwater Runoff, Volume III: Analytical Investigations and Research Report. Prepared by Woodward-Clyde Consultants: E.D. Driscoll, P.E. Shelley, and E.W. Strecker. FHWA-RD-88-008.

Los Angeles County (LA County), 1991. Los Angeles County Hydrology Manual, Department of Public Works, Alhambra, California, December

Los Angeles County (LA County), 1999. Los Angeles County 1998-1999 Stormwater Monitoring Report.

Los Angeles County (LA County), 2000. Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report.

Schueler, T.R., 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Publication No. 87703, Metropolitan Washington Council of Governments, Washington, DC.

Strecker, E., Quigley, M.M., Urbonas, B.R., Jones, J.E., and Clary, J.K. 2001. Determining Urban Stormwater BMP Effectiveness, Journal of Water Resources Planning and Management May/June 2001.

Urban Water Resources Research Council (UWRRC), 2000. "National Stormwater Best Management Practices Database," developed b the ASCE and the USEPA

Water Environment Federation (WEF), 1998. WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, Urban Runoff Quality Management, 1998.

APPENDIX C

SIZING CRITERIA FOR TREATMENT BMPS

C.1 <u>Sizing Methods for Treatment BMPs</u>

There are two categories of treatment BMPs: volume-based and flow-based.

Volume-based BMPs must be designed to infiltrate or treat the runoff volume generated from one of the following scenarios (OCPFRD, 2003):

- The volume of runoff produced from a 24-hr, 85^{th} percentile storm event, as determined from the local historical rainfall record.
- The volume of annual runoff produced by the 85^{th} percentile, 24-hr rainfall event, determined as the maximized capture stormwater volume for the area, from the formula recommended in (WEF, 1998).
- The volume of annual runoff based on unit basin storage volume, to achieve 80 percent or more volume treatment by the method recommended in (SWQTF, 1993).
- The volume of runoff, as determined from the local historical rainfall record, that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85^{th} percentile, 24-hour runoff event.

Flow-based BMPs must be designed to infiltrate or treat the maximum flow rate generated from one of the following scenarios (OCPFRD, 2003):

- The maximum flow rate of runoff produced from a rainfall intensity of 0.2-in of rainfall per hour for each hour of a storm event.
- The maximum flow rate of runoff produced by the 85^{th} percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two.
- The maximum flow rate of runoff, as determined from the local historical rainfall record, that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85^{th} percentile hourly rainfall intensity multiplied by a factor of two.

C.2 Sizing Methodology for Volume-based Controls

The volume-based controls modeled for this Project were sized to treat the volume of annual runoff produced by the 85th percentile, 24-hr rainfall event, determined as the maximized capture stormwater volume for the area, from the formula recommended in (WEF, 1998). The URQM method was chosen to size the water quality basins because it requires treatment of a larger runoff volume, thus providing more extensive treatment. This is because the capture volume method is based on a continuous simulation model using actual rainfall data and accounts for drawn down affects in the detention basin.

The URQM method estimates the “maximized stormwater quality capture volume” using the equation in *Urban Runoff Quality Management* (WEF, 1998). The method is based on a combination of modeling and regression analysis conducted using long term rainfall records from Prado Dam.

The equations used in this method are:

$$P_o = (a \cdot R_v) \cdot P_6 \qquad (1)$$

$$R_v = 0.858i^3 - 0.78i^2 + 0.774i + 0.04 \qquad (2)$$

where:

P_o = maximized detention storage volume-based on the volume capture ratio as its basis (watershed inches);
a = regression constant from least-squares analysis (unitless);
R_v = watershed runoff coefficient (unitless);
P_6 = mean storm precipitation volume (watershed inches); and
i = watershed impervious ratio (range: 0-1)

Parameter *a* reflects the effect of drain time on storage, and equals 1.963 for drain time of 48 hours, 1.582 for a drain time of 24 hours, and 1.312 for a drain time of 12 hours. However, the proposed BMPs for the Project were designed for a draw down time of 36 hours. The regression constant for a 36-hour draw down time was determined by using the equation of the regression that relates draw down times of 48, 24 and 12 hour draw down times to there respective regression constants. A constant of 1.77 was used in basin sizing calculations.

Equation 2 was derived by examining relationships between mean precipitation depths and runoff volumes from more than 60 urban watersheds (Urbonas, 1990). This resulted in a third-order regression equation relating percent imperviousness to runoff coefficients.

EPA's Synoptic Rainfall Analysis Program (SYNOP) was applied to determine the mean precipitation. In this method, the rainfall record is subdivided into discrete events separated by a dry inter-event period (e.g., 6 hours). Small rainfall events defined as events whose depth was less than or equal to 0.10 inches were deleted from the record since such events tend to produce little, if any, runoff. This approach to defining minimum storm events that produce runoff is consistent with the URQM Method. The mean storm precipitation volume was determined to be 0.75 inches

The volumes of the treatment BMPs were determined by the following equation:

$$V = \frac{P_0}{12(in/ft)} * A \qquad (3)$$

where:

V = the required volume of the BMP (acre-ft)
A = the tributary area (acres)

Table C-1 presents the input data used to size the water quality basins and calculated detention volumes used in the model.

Table C-1: Sizing Estimates for Modeled Water Quality Basins

WQ Basin ID	Tributary Area-A (acres)	Percent Imperviousness (%)	Runoff Coefficients-Rv (unitless)	Required Volume (acre-ft)
1	95.6	32.2	0.24	2.5
2	45.4	30.7	0.23	1.2
3a	19.2	42.3	0.29	0.6
3b	33.8	39.4	0.28	1.0
3c	2.5	72.0	0.51	0.14
4a	35.0	52.7	0.36	1.4
4b	38.8	47.8	0.33	1.4
5a	147	65.9	0.46	7.4
5b	90.8	53.4	0.36	3.6

C.3 Sizing Methodology for Flow-based Controls

The biofiltration BMPs modeled for this Project were sized to 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. The factor of two is intended to account for the fact that rainfall intensities increase for shorter duration events, and that intensities estimated from hourly data tend to under predict flow rates in small catchments where the time of concentration is less than 1 hour.

The 85th percentile hourly rainfall intensity was determined by first ranking the average hourly rainfall intensities for each storm event in the historical rainfall record. The ranked data was then used to plot a Cumulative Distribution Function (CDF) of rainfall intensities. The 85th percentile was extracted from the resulting CDF curve. Figure C-1 presents the CDF curve generated from the historical rainfall record measured at the Prado Dam gage (Station ID #047123).

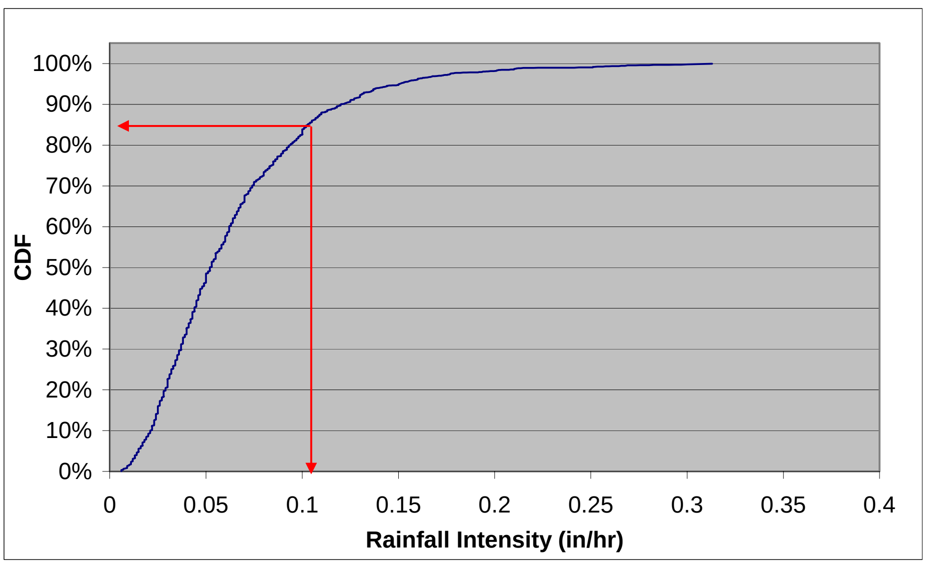


Figure C-1: Cumulative Distribution Function of Hourly Rainfall Intensity for the Prado Dam Gage

As seen in the above figure, the 85th percentile rainfall intensity is approximately 0.103 inches/hour. This value was then multiplied by 2, yielding a design rainfall intensity of 0.21 inches/hour. The design rainfall intensity can then be converted to a design flow rate using the Rational method:

$$Q = R_v iA \qquad (4)$$

Where:

Q = design flow, (cfs)

R_v = runoff coefficient, (unitless)
i = design rainfall intensity, (in/hr)
A = watershed area, (acres)

Runoff coefficients were calculated using the equation described in the Los Angeles County Hydrology Manual (LA County, 1991) (see Appendix B, section B1):

$$R_v = 0.8 * I_p + 0.1 \quad (5)$$

The design flow rate calculated from equation 4 indicates the maximum flow rate that the biofiltration BMP must accommodate to provide adequate water quality treatment.

C.4 References

California Stormwater Quality Task Force (SWQTF), 1993. *California Stormwater Best Management Practices Handbook – Industrial/ Commercial*

Los Angeles County, 1991. Los Angeles County Hydrology Manual, Department of Public Works, Alhambra, California, December

Orange County Public Facilities Resources Department (OCPFRD), 2003. Drainage Area Management Plan (DAMP). September 2003. A Cooperative Project of the County of Orange, The Cities of Orange County, and Orange County Flood Control District.

Urbonas, B.R., 1990. "Optimization of Stormwater Quality Capture Volume" Urban Stormwater Quality Enhancement - Source Control, Retrofitting and Combined Sewer Technology. ASCE, New York, N.Y.

Water Environment Federation (WEF), 1998. WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, Urban Runoff Quality Management, 1998.

APPENDIX D

"A REVIEW OF THE LOS ANGELES BASIN PLAN ADMINISTRATIVE RECORD"
PREPARED BY SUSAN C. PAULSEN AND E. JOHN LIST, ENVIRONMENTAL DEFENSE SCIENCES

A REVIEW OF THE LOS ANGELES BASIN PLAN ADMINISTRATIVE RECORD

Prepared by

Susan C. Paulsen, Ph.D.
E. John List, Ph.D., P.E.

Environmental Defense Sciences
723 East Green Street
Pasadena, California 91101

February 2003

TABLE OF CONTENTS

FOREWORD

This study was supported by:

Alliance for Water Quality
Associated General Contractors (AGC)
Building Industry Association of Southern California (BIA)
California Contract Cities Association
Coalition for Practical Regulation (CPR)*
Construction Industry Coalition on Water Quality (CICWQ)
County Sanitation Districts of Los Angeles County (LACSD)
Engineering Contractors Association
Gateway Chambers Alliance
Gateway Cities Council of Governments
Los Angeles Chamber of Commerce
Los Angeles County Department of Public Works (LACDPW)
Los Angeles/Orange Counties Building & Construction Trades Council
Southern California Contractors Association
Western States Petroleum Association

Environmental Defense Sciences is a group of experienced environmental scientists and engineers who provide scientific investigations for environmental issues arising from national environmental laws, such as the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), the Toxic Substances Control Act (TSCA), the Resources Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response and Cleanup Liability Act (CERCLA). In order to provide the greatest expertise across the broad range of issues encountered in addressing complex environmental problems, Environmental Defense Sciences depends extensively on independent consultants, many of whom are respected scientists on the research faculty of universities throughout the US.

* The Coalition for Practical Regulation represents the Cities of Arcadia, Artesia, Baldwin Park, Bell, Bellflower, Bell Gardens, Bradbury, Cerritos, Commerce, Compton, Covina, Diamond Bar, Downey, Gardena, Hawaiian Gardens, Industry, Irwindale, La Canada Flintridge, La Mirada, Lakewood, Lawndale, Monrovia, Montebello, Monterey Park, Norwalk, Palos Verdes Estates, Paramount, Pico Rivera, Pomona, Rancho Palos Verdes, Rosemead, Santa Fe Springs, San Gabriel, Sierra Madre, Signal Hill, South El Monte, South Gate, Temple City, Vernon, Walnut, West Covina and Whittier.

EXECUTIVE SUMMARY

This report provides a detailed analysis of the administrative record as provided to date of the Water Quality Control Plan (Basin Plan) for the Los Angeles Region. The administrative record as reviewed consisted of thirty-six boxes of materials provided by the Regional Water Quality Control Board Los Angeles Region, the State Water Resources Control Board, and the U.S. Environmental Protection Agency. This study was undertaken over the past year to review national and state water quality regulations and policy documents, and to assess regulatory compliance actions within the Los Angeles Region for conformity with these policies and regulations. In particular, this study evaluated the designation of beneficial uses, the establishment of water quality objectives, and the implementation of the Basin Plan in the NPDES permitting process, the TMDL process, and other regulatory actions.

This review confirms that many concerns about water quality regulation on a national level are relevant and valid within the Los Angeles Region. The issues raised in this report have, in many cases, been raised repeatedly and have remained largely unaddressed since the development of the first Los Angeles Basin Plan in 1975. Many Basin Plan elements are found to lack a solid technical and scientific foundation and were not necessarily adopted in a manner that achieves the highest level of *reasonable* water quality protection consistent with California's Porter-Cologne Act. In addition, the existing Basin Plan regulatory framework and process frequently fail to identify and address the true sources of water quality degradation and impairment. Unless remedied, the deficiencies identified in this report render the Basin Plan vulnerable to significant legal and technical challenge and may result in the expenditure of public funds in exchange for little improvement in water quality.

Four priority areas for Basin Plan reform are identified in this report, including the following:

1. *Incorporation of the Porter-Cologne Section 13241 and 13242 Requirements.* The administrative record reflects substantial public concern that Basin Plan criteria and associated implementation programs have not been developed with adequate reference to the factors required by Porter-Cologne Sections 13241 and 13242. Section 13241 provides a framework for attaining the highest quality of water which is reasonable in consideration of economics, housing, and water quality conditions that could reasonably be achieved, among other factors, while Section 13242 provides implementation guidelines. Compliance with these sections is required by California law and is essential to assure that public resources are allocated in a sensible, reasonable manner and to build and maintain support for water quality protection. Existing and future Basin Plan water quality standards and programs of implementation should be explicitly assessed in accordance with the provisions of Sections 13241 and 13242 prior to implementation in waste discharge requirements and TMDLs. Where the cost or

other statutory factor impacts, such as housing, are likely to be significant, the RWQCB should provide a detailed rationale for any regulatory programs it wishes to pursue. Evaluation of these factors is especially important prior to the application of water quality standards to nonpoint sources, as the Porter-Cologne factors were not evaluated for nonpoint sources when water quality standards were established.

2. *Development and Implementation of Water Quality Objectives.* The administrative record shows that certain water quality objectives have been adopted in the Basin Plan that will require significant expenditures and controls, even though natural, ambient conditions contribute to or cause regulatory exceedances, and even though risk of harm is minimal under certain conditions. Significant issues include the Basin Plan bacterial, sediment, and mineral quality objectives. Water quality objectives that are known or likely to be influenced by natural or ambient conditions should be reassessed, consistent with Porter-Cologne Section 13241, to determine the extent to which regulation of human activities can measurably and usefully foster reasonable water quality protection. In addition, water quality objectives should be reassessed to ensure that they are based upon a sound scientific foundation and clearly defined in terms of frequency, magnitude, and duration.

3. *Correction and Revision of Beneficial Use Designations.* To a significant extent, the Los Angeles Basin Plan contains beneficial use designations that do not reflect actual or probable future beneficial uses and/or reflect uses that are illogical and contradictory. The criteria and framework used to create and apply beneficial use designations is often unclear. Examples include municipal and drinking water supply ("MUN") designations, recreational ("REC") use designations for limited or no-access flood control channels, and "potential" uses. New designations or water body categories, such as for flood control or effluent-dominated waters, should be added to reflect the actual, intended purpose of many regional water bodies. Where natural sources prevent attainment of water quality criteria, or where conflicts exist between the applicable beneficial uses and water quality criteria, seasonal or tiered uses and/or site-specific objectives should be created.

4. *Revision of the "Tributary Rule."* As reflected in the administrative record, the Basin Plan tributary rule has recently been interpreted to include even minor, ephemeral drainages and storm flow channels, and the beneficial uses of any water body identified in the Plan are applied to its tributary streams. This policy has been adopted with virtually no consideration of the Porter-Cologne statutory factors and with little reference to applicable precedent. Further, a strict interpretation of the tributary rule may be unnecessary, especially in cases where dilution occurs or where pollutants are removed or modified during transport. The tributary rule should be revised to reasonably protect designated beneficial uses without extending, at enormous potential expense, regulatory requirements to each and every ephemeral drainage and stormwater conveyance pipe in the Los Angeles watershed.

OVERVIEW

This report evaluates the technical and scientific basis of water quality regulations contained in the Water Quality Control Plan (Basin Plan) developed and administered by the Los Angeles Regional Water Quality Control Board (RWQCB) for the Los Angeles Region. This evaluation is based upon the administrative record compiled by the RWQCB, the SWRCB, and the U.S. EPA and provided to date. The analysis concludes that many Basin Plan elements lack adequate technical foundation and were not adopted in conformance with the California Porter-Cologne Act (Porter-Cologne). Several Basin Plan use designations and water quality objectives do not adequately consider economics, housing, hydrology, water quality conditions that could reasonably be achieved, or other factors mandated by the Act, fail to consider the full range of natural and ambient conditions, and result in unreasonable and contradictory regulatory priorities. As a result, the Basin Plan conflicts with the Porter-Cologne Act's stated objective of achieving the maximum "reasonable" protection of California water quality.

Section I of this report discusses the federal statutory basis for water quality regulation and summarizes recent scientific assessments of U.S. Clean Water Act policies and related programs. It focuses on the results of an important National Research Council critique of federal water quality regulation.

Section II reviews the state statutory basis for water quality regulation within California, including requirements that must be considered in adopting and implementing water quality standards.

Section III summarizes the results of a review of the administrative record supporting the Basin Plan as identified by the State Water Resources Control Board, the Los Angeles Regional Water Quality Control Board, and the United States Environmental Protection Agency. Part A shows that the Basin Plan does not adequately consider the mandatory factors and that the Basin Plan does not comply with the requirements listed in Porter-Cologne Sections 13241 and 13242. Part B identifies areas in which the Basin Plan fails to fully take into account natural processes and fails to provide sufficient rationale for the development of certain water quality objectives. Part C demonstrates that several Basin Plan beneficial use designations are illogical or unreasonable given applicable federal and state standards. Part D analyzes technical problems with the Basin Plan "tributary rule," a policy that potentially extends beneficial use designations appropriate for one water body to virtually all upstream water sources as well. Finally, Part E provides a brief listing of additional Basin Planning issues raised by stakeholders in the administrative record but not addressed in detail in this report.

Section IV presents the report's conclusions and recommendations for addressing the most significant Basin Plan areas of concern.

I. FEDERAL WATER QUALITY REGULATION

Water quality has been regulated in the United States for over one hundred years. The earliest regulations were established to promote navigability and to protect public health. Over time, water quality regulations have been promulgated to promote other goals (e.g., that waters should be “fishable” and “swimmable” wherever attainable, as specified by the Clean Water Act) and to attain the goals of restoring and maintaining the “chemical, physical, and biological integrity of the Nation’s waters.” Recent water quality legislation includes the Federal Water Pollution Control Act Amendments of 1972, the Clean Water Act (CWA) of 1977, and the Water Quality Act of 1987.

Federal law and regulations contain two strategies for managing water quality. The first, a technology-based approach, requires point source dischargers (e.g., wastewater treatment plants, industrial dischargers) to meet imposed concentration standards for certain pollutants within the effluent or within a zone of initial dilution in the receiving waters (i.e., effluent-based standards) as specified in National Pollutant Discharge Elimination System (NPDES) permits. The second is a water-quality based approach, which relies upon evaluating ambient water quality and limiting the quantity of “polluting” discharges to levels that do not adversely affect designated beneficial uses.

From the 1970s until relatively recently, most effort and funding on both federal and state levels addressed water quality improvement by controlling point source discharges. Early on, this effort placed high priority on technology-based control efforts. Some corrective actions were also implemented for certain specific nonpoint source pollution problems, generally by requiring “Best Management Practices,” or BMPs. Although this approach has been largely successful in controlling point source discharges, nonpoint sources have experienced minimal regulation and in some cases may contribute to exceedances of water quality criteria established for receiving waters.

Beneficial uses and water quality objectives are the basis of water quality regulation. Together, designated beneficial uses (i.e., the desired uses to be attained by a specific water body, such as recreation or drinking water) and water quality criteria or objectives[1] (i.e., allowable concentrations of chemicals and other constituents that protect the designated beneficial uses) are known as water quality “standards.” Designation of beneficial uses requires both a technical analysis and a policy decision. Both state and federal law intend that the selection of beneficial uses and water quality objectives should be made with consideration of the condition of a water body, the advantages of achieving a given designated use, and the costs of achieving a designated use. Water quality criteria represent the condition of the water body that is required to support a designated beneficial use. Water quality criteria may be either narrative or numerical, but ideally provide a measurable indicator that can be used to assess whether the beneficial uses can be attained.

[1] Note that federal water quality regulations refer to “water quality criteria,” while State of California regulations refer to “water quality objectives.” In practical use, these terms are interchangeable.

Section 305(b) of the Clean Water Act requires each state to prepare a biennial water quality assessment report. These reports, commonly referred to as 305(b) reports, must include:

A. a description of the water quality of all navigable waters in such State during the preceding year, taking into account seasonal, tidal, and other variations;

B. an analysis of the extent to which all navigable waters provide fishable/swimmable uses;

C. an analysis of the extent to which elimination of the discharge of pollutants and a level of water quality that provides for fishable/swimmable uses have been or will be achieved by the requirements of the Clean Water Act, together with recommendations for additional action necessary to achieve these objectives;

D. an estimate of i) the environmental impact; ii) the *economic and social costs* necessary to achieve the objective of the Clean Water Act; iii) the *economic and social benefits* of such achievement; and iv) an estimate of the date of such achievement; (emphasis added) and

E. a description of the nature and extent of nonpoint sources of pollutants, and recommendations as to the programs that must be undertaken to control each category of sources, including an *estimate of the costs* of implementing such programs. (emphasis added)

Section 303(d) of the Clean Water Act attempts to meld both the technology-based and water quality-based approaches to managing water quality. As part of the water-quality based approach, EPA and the states are currently implementing a Total Maximum Daily Load (TMDL) program, which aims to meet water quality standards by addressing both point and nonpoint sources of pollution. Federal TMDL regulations promulgated in 1992 require states to develop a list of water bodies for which water quality standards are not being met (the "303(d) list"). A TMDL is then required that specifies the amount of a particular pollutant that may be present in a water body, allocates the existing and "acceptable" pollutant loads among sources, and provides the basis for attaining and maintaining water quality standards.

In many states, TMDL program requirements have been imposed via consent decrees or court orders, which require completion of large numbers of TMDLs according to specified schedules, which are often very restrictive. Often, as identified in a recent NRC report (discussed below), a scientific or technical basis for imposing TMDLs is lacking. Many states do not have the financial and personnel resources to assess waters and adequately complete TMDLs. Also, because TMDLs are founded upon the water quality standards identified by the relevant regulatory agencies, deficiencies in either beneficial use designations or water quality objectives necessarily result in deficiencies in the TMDL process and in water quality regulation in general. This problem may be further exacerbated when consent decree time schedules preclude the establishment of a sound scientific and technical foundation for the TMDL.

For a variety of reasons, including the TMDL process, increasingly stringent NPDES permit terms, and a significant rise in third party litigation, the scope and cost of water quality regulations have dramatically expanded in recent years. A growing number of affected municipalities, private businesses and scientific observers have become increasingly concerned that the results are neither as economically efficient, nor as technically proficient, as they could be. In particular, many doubt that water quality regulations are being applied and enforced in a manner that achieves the greatest impact to, and improvements in, water quality.

Congress responded to these concerns in 2000 by suspending the EPA's implementation of newly promulgated federal TMDL regulations and requesting that the NRC examine the scientific basis for the TMDL program. The NRC published its findings in a report entitled *Assessing the TMDL Approach to Water Quality Management* (National Academy Press, Washington, D.C., 2001). The report made several important findings, including the following:

1. The TMDL program should focus on improving the condition of water bodies by measuring attainment of designated uses, rather than focusing upon administrative outcomes (e.g., achieving permit requirements).

2. The program should encompass all stressors, including both pollutants and pollution. Thus, the program should recognize activities that can "overcome the effects of 'pollution' and bring about waterbody restoration – such as habitat restoration and channel modification."

3. Scientific uncertainty cannot be avoided in water quality programs, and water quality regulation should recognize this inherent uncertainty by means of flexible, adjustable implementation programs.

The NRC report also contains several recommendations to improve the use of scientific information in water quality regulation. The recommended changes are designed to enable the incorporation and refinement of best available scientific information in the TMDL processes:

1. States must develop appropriate beneficial use designations and refine these designations prior to TMDL development. The NRC recommended that use attainability analyses be considered for all water bodies prior to the development of TMDLs.

2. States should create a "two-tiered" 303(d) list (listing of impaired water bodies). The NRC found that many water bodies were placed on state's 303(d) lists without adequate scientific basis, including inadequate ambient water quality data, inadequate water quality standards, and inadequate assessment and analysis. The NRC recommended that two lists be compiled: a primary, or action list, for which adequate data and information are available to justify a TMDL, and a preliminary, or "watch" list, designed to list waters for which adequate data are not yet available.

3. TMDL implementation plans should be adaptive, whereby the goals of the TMDL are periodically assessed and scientific data should be used to revise the plan if necessary.

Finally, the NRC recommended that water quality criteria be formulated so that they are reasonably measurable, that they incorporate magnitude, duration, and frequency elements, and that they recognize the natural variability that may occur, especially from high and low flow conditions.

This report follows the NRC's approach to evaluate the effectiveness of water quality regulations and their implementation within the Los Angeles Region of California.

II. STATE WATER QUALITY REGULATION

The Porter-Cologne Water Quality Control Act (Porter-Cologne) authorizes the California State Water Resources Control Board (SWRCB) and nine California Regional Water Quality Control Boards (RWQCBs) to implement the federal Clean Water Act and state water quality regulations. Article 3 of Porter-Cologne requires that each RWQCB formulate and adopt a water quality control plan (Basin Plan) for its region and provides guidelines for the development of water quality objectives. Both Porter-Cologne and the Basin Plans in turn provide for the regulation of point and nonpoint source discharges and for the enforcement of discharge requirements.

Two additional regulations are applicable to water quality regulation in California. In May 2000, the EPA promulgated the California Toxics Rule (CTR), which provides numeric water quality criteria for certain pollutants in California. In March 2000, the SWRCB adopted a "Policy for the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California" (the State Implementation Policy, or SIP), which contains provisions implementing the CTR water quality criteria in NPDES permits, among other things. Together with the Basin Plan, the SIP and CTR provide the basis for NPDES permits issued for discharges to inland surface waters, enclosed bays, and estuaries in California.[2]

As a result of the implementation of the SIP and the CTR, and escalation of the TMDL program over the past 3-5 years, significant confusion has arisen in the NPDES permit program. Many new permits contain limitations aimed at achieving CTR criteria and TMDL requirements, and affected permittees (both point and nonpoint) contend that they will be forced to spend substantial amounts to comply with requirements that may not have a discernible effect on water quality or use attainment. For example, this situation may arise when natural sources of a specific constituent overwhelm the amount of the constituent added by human activities to the water body. Reducing the NPDES permittees' discharges would result in little or no detectable water quality improvement. In addition, dischargers may be forced to implement costly controls to address problems that may have insignificant public health or ecological consequences, such as meeting recreational water quality standards for flows that are not used for swimming and similar activities. Despite the often substantial cost and adverse effect on other social priorities, most of these new permit conditions and related Basin Plan elements are being adopted without consideration of the economic or social impacts (including the need for developing housing) required under Porter-Cologne.

---

[2] Discharges to the ocean are regulated by the Regional Boards and the SWRCB under the California Ocean Plan, which is adopted and updated periodically by the SWRCB. The Ocean Plan contains water quality standards applicable to ocean waters within California (i.e., territorial marine waters of the State outside enclosed bays, estuaries, and coastal lagoons).

Section 13000 of Porter-Cologne sets forth California's fundamental requirement that state water quality regulation must balance competing concerns to achieve the highest "reasonable" level of water quality:

> The Legislature further finds and declares that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible.

California Porter-Cologne Act, Section 13000 ("Policy").

This policy specifically informs Section 13241 and 13242 of Porter-Cologne with respect to establishing and implementing water quality objectives. Section 13241 states that a variety of factors must be considered before a RWQCB may establish a water quality objective, as follows:

> "factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:
>
> (a) Past, present and probable future beneficial uses of water.
>
> (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
>
> (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
>
> (d) Economic considerations.
>
> (e) The need for developing housing within the region.
>
> (f) The need to develop and use recycled water."

Section 13242 states that:

> "the program of implementation for achieving water quality objectives shall include, but not be limited to:
>
> (a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
>
> (b) A time schedule for the actions to be taken.

(c) A description of surveillance to be undertaken to determine compliance with objectives."

The most pertinent authority on the interpretation of these sections of the Porter-Cologne Act is a January 4, 1994 memorandum by the SWRCB Office of the Chief Counsel, "Guidance on the Consideration of Economics in the Adoption of Water Quality Objectives" (reaffirmed in 1999 by the Office of the Chief Counsel in "Economic Considerations in TMDL Development and Basin Planning"). The 1994 Chief Counsel's memorandum concludes that:

- A RWQCB must balance environmental, beneficial use, and economic considerations in establishing a Basin Plan.

- The Porter-Cologne Act does not require that a RWQCB conduct a formal cost-benefit analysis when adopting a Basin Plan or an amendment thereto.

- Water quality objectives may be adopted despite significant economic consequences. In such cases, however, a RWQCB must clearly explain why the objective is otherwise necessary, such as the sensitivity of the receiving waterbody, the toxicity of the regulated substance, or public health implications. This rationale must be transparent and discernable from the staff report, resolution or findings that accompany the adoption of the objective at issue.

- A RWQCB has an affirmative duty to consider economics when adopting water quality objectives and will likely not meet its obligation to consider the factors required by Porter-Cologne simply by responding to economic or other information supplied by third parties. Rather, the RWQCB should review available information on receiving water and effluent quality to determine if the proposed objective is being attained or can be attained. The RWQCB should then identify methods presently available for complying with the proposed objective and consider available information on the costs associated with the treatment methods or other methods identified to achieve compliance.

- A RWQCB must consider and respond on the record to any economic or other information provided by third parties in the Basin Plan process.

III. ANALYSIS OF THE LOS ANGELES REGION BASIN PLAN

This report evaluates several of the national and state concerns identified above in the specific instance of water quality regulation within the Los Angeles Region of California. It examines the administrative record as provided to date by the SWRCB and the RWQCB[3] supporting the development of the Los Angeles Basin Plan, including the 1971 Interim Basin Plan, documents pertaining to the establishment of the 1975 Basin Plan, and documents related to the 1978 revisions to the Basin Plan. Only limited documentation was provided by the RWQCB for the 1980s period, largely related to a 1984 and 1985 proposed update of the Basin Plan (referred to as the "205(j) project"). Extensive administrative comments and documentation were provided for the 1994 Basin Plan update. Subsequent to 1994, the administrative record contains references to Basin Plan chloride water quality objective revisions (circa 1997), the proposed de-designation of MUN uses (circa 1998), revised bacteria water quality objectives, triennial review priorities, and selected TMDL proceedings, including three trash TMDLs and information on recently adopted bacteria TMDLs.

Utilizing the administrative record, the designation of beneficial uses and the establishment of water quality objectives in the Basin Plan process were examined for conformance with statutory objectives. Implementation of the Basin Plan in the NPDES and TMDL processes was also assessed. This report identifies four key areas of concern:

1. Basin Plan water quality criteria and associated implementation programs have been adopted with inadequate consideration of and adherence to the Porter-Cologne Section 13241 and 13242 requirements.

2. Certain water quality objectives, including bacterial, sediment, and mineral quality standards, inadequately consider natural processes, ambient data, the quality of water imported to the region, and hydraulic linkages between surface and ground waters.

3. The Basin Plan contains beneficial use designations that do not reflect current or probable future beneficial uses and that therefore trigger regulatory controls that seek to protect unlikely or inapplicable beneficial use protections.

4. The RWQCB interprets the Basin Plan's tributary rule (as defined below) to include even the most minor, ephemeral drainages and storm flow channels, as well as all upstream reaches of a water body. This approach represents a very significant expansion of water quality regulations that is

[3] The RWQCB and SWRCB provided this documentation in response to a request submitted pursuant to the Public Records Act. As noted within this report, the authors are concerned that the administrative record as provided to date may be incomplete.

not adequately supported by the administrative record or applicable legal precedent.

A. Consideration of Porter-Cologne Sections 13241 and 13242

Although Porter-Cologne mandates that consideration be given to a variety of public interest factors when water quality objectives are established, the administrative record shows that only a small portion of the Los Angeles Basin Plan was developed in this manner. For example, in conformance with Porter-Cologne Section 13241, economic analyses were performed in the early 1970s to assess the impact of regulations on municipal wastewater treatment and associated facilities. However, there is no evidence in the public record that economic analyses have been performed to evaluate the impact of extending the same water quality objectives to nonpoint sources, including stormwater and urban runoff and agricultural drainage. Similarly, the administrative record contains minimal, if any, analysis of the impacts of proposed water quality objectives on the need to develop housing within the region, or to water quality conditions that could be reasonably achieved through coordinated control of all factors affecting water quality.

As noted above, during the implementation process for the Basin Plan for the Los Angeles River Basin (4B)[4] in 1974, a detailed economic analysis was conducted for municipal wastewater treatment improvements.[5] The Abstract of the Water Quality Control Plan for Basin 4B provided information about "Basin 4B's municipal wastewater treatment improvements and estimated costs…[which] are considered necessary to achieve and maintain water quality objectives vital to protection of beneficial uses of water." The Abstract clearly stated, however, that because the referenced water quality objectives would not be extended to nonpoint sources, no economic analysis was performed for such regulations:

> "quantitative data on nonpoint sources are too limited and uncertain to be presented herein, but it should be noted that these sources that are controllable do not contribute damaging amounts of pollutants to the groundwaters or navigable waters. With respect to uncontrollable nonpoint sources, such as urban and rural runoff, there may be certain things that the public can accomplish to lessen the impact, even though much of the effect is unavoidable [the document references general housekeeping measures such as reduced spills of oils, minimizing runoff content of inorganic litter, etc.] … No specific nonpoint source control facilities are proposed under the Recommended [Basin] Plan. It is

---

[4] Prior to 1994, separate Basin Plans existed for the Santa Clara River Basin (called "4A") and the Los Angeles River Basin ("4B").

[5] See, e.g., Table 7 of the Basin Plan Abstract, June 1974. The Abstract of the Water Quality Control Plan for Basin 4B was "intended to serve as a general public information document which will be circulated widely and will provide public understanding of the essential elements of the Water Quality Control Plan."

> impractical to attempt to treat runoff generally… No specific financial provisions are considered for the control of nonpoint sources of pollution, but generally those responsible for correction of the problem will pay for such correction [the document states that property owners will pay for sewers to eliminate subsurface disposal systems, vessel owners will pay for new sewage-holding facilities, and automobile owners will pay for emission control devices]."

Subsequent documents further emphasize that the 1975 Basin Plan did not contemplate applying water quality objectives to nonpoint sources and that the RWQCB acknowledged the need for analyzing the economic (and other) impacts should such action ever be considered.[6] Interested parties commented in the administrative record that the issue of responsibility (including economic responsibility) for controlling nonpoint sources was not addressed in the Basin Plan. For example, the Los Angeles County Flood Control District comments to the RWQCB in November 1976 stated that[7]:

> "…we request that Table 15-61 or the accompanying text clarify how the State will improve and maintain those waters of the State which fail to meet the Water Quality Objectives even after all discharges from point sources have met NPDES limitations and all other mandatory improvements have been made. For example, if the water in a water segment does not meet the Health Department's standards for the prescribed recreation activity, who assumes responsibility for correction?"

The analysis requested by the Flood Control District is not contained in the administrative record, nor does the administrative record contain a response to this query.

The record also demonstrates that the RWQCB failed to consider economic impacts in setting water quality objectives and establishing beneficial use designations. For example, the RWQCB was explicitly asked in 1976 to consider the economic impacts of ammonia objectives,[8] but no record of a response to this request has been found. The

[6] For example, the RWQCB states in the May 1976 document "Program for Phase II Water Quality Control Planning in Los Angeles Region, 1976-1981", "water quality data should be updated, water quality standards should be established, (i.e., determination of whether Chapter 4 – "Water Quality Objectives" is applicable to storm runoff)." This document further states that "analyses should be made of the implementation plan for point and nonpoint source control including regulatory programs and management agencies, to determine their respective impacts on surface, marine and groundwaters, land and air environment, and social, financial, and economic aspects…[t]his element should deal with environmental assessment of inland areas, bays, estuaries, tidal prisms, and the ocean; and with air quality regulatory, management, social, financial, and economic impacts."

[7] "Comments on the Issue Statement for Phase II Water Quality Control Planning – Los Angeles River Basin – 4B", comments provided to the California Regional Water Quality Control Board – Los Angeles Region, November 5, 1976.

[8] Memo from Bill B. Dendy, Executive Officer, SWRCB, to Regional Board Executive Officers, dated November 22, 1976, which asks, "Can the present objective [maximum unionized ammonia concentration

City of Los Angeles and others raised the economic impact of the ammonia objectives during the revision process leading to the 1994 Basin Plan,[9] but economic considerations were not addressed in the RWQCB's response to these comments.[10]

Over the years, in reviewing proposed Basin Plan revisions, multiple interested parties repeatedly commented on the lack of economic analyses in setting beneficial use designations. The City of Burbank commented on this issue in 1978,[11] and multiple parties submitted similar comments in the 1994 Basin Plan revision process. For example, the United Water Conservation District questioned whether input had been obtained from those whose economic condition might be affected by habitat designations.[12] The Camarillo Sanitary District commented that it believed that the RWQCB was required to take economic impacts into account when setting standards.[13] The Simi Valley County Sanitation District noted that strict application of water quality objectives without allowance for site-specific objectives would result in significant

---

of 0.025 mg/l] be achieved economically (with respect to treatment costs or agricultural production) in your Region? If not, cite some examples where problems may occur."

[9] See, e.g., letter from City of Los Angeles to Deborah J. Smith, Planning Unit, California RWQCB, dated February 1, 1994: "…ammonia limits given in [the Basin Plan] appear to apply to the Los Angeles River through its designation as a WARM beneficial use. If adopted, this designation would require considerable capital investment and O&M expense to the City for the construction of nitrification/denitrification facilities…"

[10] See Response to Comments at p. 32-33 of the Basin Plan Responsiveness Summary, Comment 3-5, which does not contain mention of economic impacts. Although apparently not part of the administrative record provided to the authors by the RWQCB, the *Staff Report, Regional Water Quality Control Plan, Los Angeles Region, Draft of April 29, 1994*, does contain a discussion of the economic impacts of implementation of the ammonia objective. This staff report notes that "potentially high costs associated with ammonia removal and the individual nature of the different discharges and stream reaches and groundwater basins leads to the conclusion that site-specific studies need to be undertaken. Therefore staff have determined that a generous compliance schedule for ammonia effluent limits (up to 8 years) may be necessary to determine if, and what kind of, ammonia reductions are necessary for each facility. Therefore, there will be no immediate economic impact of this objectives [sic] until each case is considered to determine the necessary additional treatment, if any."

[11] Letter from City of Burbank to RWQCB, November 21, 1978: "The final plan should consider not only wildlife habitat and beneficial uses, but the potential financial burden being placed on our citizens."

[12] See letter dated March 4, 1994, from United Water Conservation District to the RWQCB: "We are particularly concerned about the emphasis placed on habitats in the basin plan… Has there been input from landowners, water users, and others whose economic health depends on the water resources? …[S]ome of the habitat lists in the draft document could have enormous impacts on economics, private rights, and water rights…"

[13] February 3, 1994 letter from Camarillo Sanitary District to RWQCB: "We believe the word 'reasonable' [referring to the 'reasonable protection' language of Section 13241] mentioned in the above definition requires that the Regional Board take into account economic impacts when setting standards for effluent-dominated streams… The taxpayers do not want their tax dollars to be squandered to pay for treatment plant improvements that do little to protect the beneficial uses, if any, of an effluent-dominated stream."

expenditures, and that the RWQCB "may be in violation of the Porter-Cologne Act."[14] It further urged the RWQCB to "provide 'ceiling cost' guidelines on reasonableness for the implementation of the proposed objectives."[15]

In its response to comments, the RWQCB noted that "economic guidelines are being developed by the State Board and USEPA at this time. These guidelines will be utilized by the Regional Board where appropriate."[16] However, no such economic guidelines exist in or have been added to the administrative record reviewed to date.

The record also reflects significant discussion regarding the economic impacts of the designation of municipal and domestic (MUN) beneficial uses pursuant to the State's Sources of Drinking Water Policy, particularly with regard to the 1994 Basin Plan update. This issue is discussed in greater detail in Part C, below.

Several parties have questioned whether the Basin Plan and associated documents constituted a California Environmental Quality Act (CEQA) Environmental Impact Report (EIR)-equivalent document. These comments centered on the requirements of Porter-Cologne Section 13241, noting that an analysis of the Section 13241 factors must be included in the Basin Plan or the Functional Equivalent CEQA Document.[17] Although many parties have repeatedly requested clarification of these issues, the RWQCB has referred in the record only to the CEQA statutory "checklist" in response. The checklist is an abbreviated document that does not constitute a sufficient assessment of the economic and other factors required under Porter-Cologne such as water quality conditions (including natural processes, see below) that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area, the

---

[14] January 20, 1994 letter from Simi Valley County Sanitation District to RWQCB: "The District strongly disagrees with the addition of strict ammonia limitations… Additionally, the District disagrees with the proposed Basin Plan designation of beneficial use for the Arroyo Simi… Without provision of SSO [site-specific objectives] for ammonia, nitrate and nitrite, TDS, and chloride, the District will be forced to drastically and unnecessarily expand the existing WQCP and spend many millions of dollars of scarce public funds to comply with the objectives of the proposed Basin Plan limits… If the proposed basin plan is adopted in its present form with no provisions for SSO, we believe that the RWQCB may be in violation of the Porter-Cologne Act, by failing to consider if the new objectives could be achieved through reasonable control on the factors."

[15] See letter from Simi Valley County Sanitation District to RWQCB, dated May 27, 1994.

[16] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the April 28, 1994 DRAFT Water Quality Control Plan, Los Angeles Region*, June 13, 1994, at p. 24.

[17] The basin planning process is exempted from the California Environmental Quality Act (CEQA) requirement for the preparation of an Environmental Impact Report (EIR) or Negative Declaration and Initial Study (see CA Code of Regulation, Title 14, Section 15261). Any regulatory programs of the Board that are certified as functionally equivalent must satisfy the requirements of California Code of Regulations (CCR) Title 23, Section 377(a). For the purposes of Basin Plan revisions, the RWQCB considers the FED to consist of the Basin Plan with proposed changes; the Staff Report on the Basin Plan changes; and a Notice of Filing and CEQA Checklist and Determination with Respect to Significant Environmental Impacts.

need for developing housing within the region, and the need to develop and use recycled water.[18]

The most recent Basin Plan (1994) and the Basin Plan administrative record do not appear to meet any of the Porter-Cologne Section 13242 requirements. These require the RWQCB to provide a description of the nature of actions that are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private, and a time schedule for actions to be taken. Such information is generally absent from the Basin Plan and its supporting record.

B. Development and Implementation of Water Quality Objectives

Appropriate consideration is often not given in the Basin Plan and administrative record to ambient processes and naturally-occurring sources of "contaminants." Because the RWQCB did not fully consider these processes when setting water quality objectives, application of these objectives (e.g., for bacteria or sediments) to naturally occurring sources of contaminants could require extensive collection of stormwater flows and costly treatment and/or disinfection with little effect. In addition, water quality objectives that were set with consideration of natural conditions (e.g., mineral quality objectives) often considered only a subset of the potential full range of conditions or relied upon samples from locations that were not representative of the entire water body. Many have been reinterpreted over time so that they are applied much more broadly and often more stringently than originally intended and than is justified by natural conditions.

Bacterial standards. The Los Angeles Basin Plan contains bacteria objectives that apply to the beneficial uses of water contact recreation (REC-1) and non-water contact recreation (REC-2). Until very recently, the Basin Plan contained only fecal coliform bacteria objectives that were developed by the National Technical Advisory Committee (NTAC) to the Federal Water Pollution Control Administration in 1968.[19]

---

[18] For example, the original CEQA checklist (dated April 29, 1994) notes, "The need for higher levels of wastewater treatment may require higher levels of energy. The environmental benefits to be realized from the improvement in water quality are expected to more than offset impacts from increased energy consumption." In response to comments that this statement was without support, the statement was revised (June 13, 1994) to read, "The need for higher levels of wastewater treatment may require higher levels of energy. In the long term, environmental benefits to the people and ecology of California should offset the impacts from the increased energy consumption." The CEQA checklist document also contains the following statements with regard to costs: "Sewage treatment facilities will be required to limit concentrations of ammonia in their discharges. Some sewage treatment plants may be required to meet lower limitations on certain inorganic constituents. This may result in increased costs to dischargers" and "Continued implementation of the NPDES Stormwater Permitting Program may cause the local municipalities, industrial dischargers, and owners/operators of construction projects to expend resources to improve the quality of stormwater discharges."

[19] See *Water Quality Criteria, a Report of the National Technical Advisory Committee to the Secretary of the Interior*, Federal Water Pollution Control Administration: Washington, D.C., April 1, 1968, at p. 8 and p. 12:

The fecal coliform standards contained in the 1975 and 1994 Los Angeles Basin Plans were based upon prospective epidemiological studies conducted by the United States Public Health Service in 1948, 1949, and 1950. These studies found an "epidemiologically detectable health effect" at levels of 2300 to 2400 coliforms per 100 ml at bathing beaches on Lake Michigan (at Chicago) and in the Ohio River. Later work showed that approximately 18% of the coliforms present in the mid-1960s at the Ohio location belonged to the fecal coliform subgroup. The recreational contact water quality criteria suggested by the committee were based upon the fraction of coliforms present as fecal coliforms and a factor of safety of two.

The fecal coliform standards recommended in 1968 were adopted by many states and municipalities and remain in use in many locations. Several studies conducted since 1968 have questioned these criteria and recommended use of alternatives.[20] As early as 1972, a Committee formed by the National Academy of Science-National Academy of Engineers noted the deficiencies in the study design and data used to establish the recreational fecal coliform criteria, and stated that it could not recommend a recreational water criterion because of a paucity of valid epidemiological data.[21]

In response to these concerns, EPA in 1972 initiated studies at marine and freshwater bathing beaches that were designed to correct the deficiencies in the earlier studies and analyses. These studies were conducted at sites contaminated either with pollution from multiple point sources (usually treated effluents that had been disinfected) or by effluents discharged from single point sources. The studies examined three bacterial indicators of fecal pollution (*E. coli*, enterococci, and fecal coliforms) and found that fecal coliform densities showed "little or no correlation" to gastrointestinal illness rates in swimmers. In contrast, a good correlation was found between swimming-

---

"Surface waters should be suitable for use in "secondary contact" recreation – activities not involving significant risks of ingestion – without reference to official designation of recreation as a water use. For this purpose, in addition to aesthetic criteria, surface waters should be maintained in a condition to minimize potential health hazards by utilizing fecal coliform criteria. In the absence of local epidemiological experience, the Subcommittee recommends an average not exceeding 2,000 fecal coliforms per 100 ml and a maximum of 4,000 per 100 ml, except in specified mixing zones adjacent to outfalls."

"Fecal coliforms should be used as the indicator organism for evaluating the microbiological suitability of recreation waters. As determined by multiple-tube fermentation or membrane filter procedures and based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a log mean of 200/100ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml."

[20] For a summary of these studies, see the discussion provided on pages 1-3 of the *Ambient Water Quality Criteria for Bacteria – 1986*, USEPA 440/5-84-002, January 1986.

[21] Committee on Water Quality Criteria. National Academy of Sciences-National Academy of Engineering. *Water Quality Criteria*. USEPA R3-73-033, Washington, D.C., 1972.

associated gastrointestinal symptoms and either *E. coli* or enterococci in swimming waters.[22] Based on these studies, EPA in 1986 proposed section 304(a) criteria for full body contact recreation based upon *E. coli* and/or enterococci but noted that "it is not until their adoption as part of the State water quality standards that the criteria become regulatory."[23]

As early as 1988, the RWQCB included a revision of bacteria criteria in a list of issues to be evaluated via the triennial review process.[24] Recently, the Los Angeles RWQCB adopted a Basin Plan amendment that revises the bacteria water quality objectives for fresh water contact recreation (REC-1) and for marine waters designated REC-1, as well as providing implementation provisions.[25] For fresh waters, this Basin

---

[22] See Dufour, A.P., *Health Effects Criteria for Fresh Recreational Waters*. USEPA 600/1-84-004, August 1984.

[23] *Ambient Water Quality Criteria for Bacteria – 1986*, USEPA 440/5-84-002, January 1986.

[24] See the Work Plan for the Triennial Review of the Basin Plans for the Santa Clara River (4A) and the Los Angeles River (4B) Basins, Los Angeles RWQCB, July 1988, at p. 23: "Consider using enterococcus bacteria or pathogenic viruses as indicator organism. …EPA has recently developed criteria to estimate pathogen presence based on the presence of enterococcus bacteria in the effluent… enterococcus has been found to have the highest correlation with human health effects of all other bacteria and viruses tested including coliforms… Another option is to monitor pathogenic organisms and viruses that actually cause disease rather than indicator bacteria."

[25]State of California, California Regional Water Quality Control Board, Los Angeles Region, Resolution No. 01-018, Amendment to the Water Quality Control Plan for the Los Angeles Region to Update the Bacteria Objectives for Water Bodies Designated for Water Contact Recreation. Adopted by the Los Angeles RWQCB on October 25, 2001. For fresh waters, the amended Basin Plan bacteria objectives are as follows:

1. Geometric mean limits
   . E. coli density shall not exceed 126/100ml.
   . Fecal coliform density shall not exceed 200/100 ml.
1. Single Sample Limits
   . E. coli density shall not exceed 235/100 ml.
   . Fecal coliform density shall not exceed 400/100 ml.

This Basin Plan amendment specifies bacteria criteria for marine waters designated REC-1 as follows:

1. Geometric mean limits
   . Total coliform density shall not exceed 1,000/100 ml.
   . Fecal coliform density shall not exceed 200/100 ml.
   . Enterococcus density shall not exceed 35/100 ml.
1. Single sample limits
   . Total coliform density shall not exceed 10,000/100 ml.
   . Fecal coliform density shall not exceed 400/100 ml.
   . Enterococcus density shall not exceed 104/100 ml.
   . Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Implementation provisions are as follows:

The geometric mean values should be calculated based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period).

Plan amendment has retained the numeric values for the fecal coliform water quality objective contained in the earlier Basin Plan and has added an *E. coli* objective, both to be evaluated as geometric means and as single sample exceedances (rather than <10% of samples during a 30-day period to be below specified limits).

In its justification for the revised objectives, the RWQCB cites both the EPA studies noted above and an epidemiological study of swimmers at three Los Angeles County beaches.[26] The RWQCB noted that total and fecal coliform concentrations were not strongly associated with increased risk for gastrointestinal illness, consistent with the EPA studies, and that these indicators "were associated with increased risk of skin rashes" in the Santa Monica Bay study.[27] However, the Santa Monica Bay epidemiological study examined only swimmers at ocean sites and in dry weather and provides no scientific support for retaining fecal coliform concentrations in water quality criteria for inland (fresh) waters or for wet weather events.

Several comment letters received by the RWQCB on the revised bacteria water quality objectives noted that the objectives failed to consider the level of use of a receiving water, seasonality, or the risk associated with the water quality objectives. For example, the City of Los Angeles noted that "the RWQCB included only bacteriological criteria specific to 'designated beach areas' for all waters designated as REC-1, and failed to include additional criteria for other levels of use in full contact recreation waters as identified in the 1986 U.S. EPA Bacteriological Criteria."[28] In response, the RWQCB stated that it had considered applying different use levels for some inland water bodies but decided against this approach because "EPA's use levels do not take into account

---

If any of the single sample limits are exceeded, the Regional Board may require repeat sampling on a daily basis until the sample falls below the single sample limit in order to determine the persistence of the exceedance.

When repeat sampling is required because of an exceedance of any one single sample limit, values from all samples collected during that 30-day period will be used to calculate the geometric mean.

[26] See p. 5 of the California Regional Water Quality Control Board, Los Angeles Region Staff Report (draft), Proposed amendment of the Water Quality Control Plan – Los Angeles Region to revise bacteria objectives for waters designated for contact recreation, July 31, 2001. Note that no Final Staff Report is contained in the Administrative Record.

[27] Ibid.

[28] See letter from Judith A. Wilson, Director, Bureau of Sanitation, City of Los Angeles, to Dennis Dickerson, RWQCB, September 17, 2001. See also letter from Rod H. Kubomoto, County of Los Angeles Department of Public Works, September 18, 2001: "Standards should be based on intensity of use and applied to appropriate watercourses – As set forth in the EPA Pathogen Protocol, several States use fecal indicator standards that vary seasonally in accordance with use designations…We recommend that the Regional Board consider beneficial use designations through seasonal use analysis and develop appropriate water quality standards for each water body." Also, October 18, 2001 letter from Raymond C. Miller, Southern California Alliance of Publicly Owned Treatment Works (SCAP): "Our main concern is the fact that your proposed changes do not differentiate between different levels of use that occur in different water bodies due to their attractiveness and appropriateness for recreational use, and which may occur on a seasonal basis."

frequent exposure by vulnerable sub-groups of the population…such as children… Therefore, staff feels that it is important to protect these water bodies at the same levels as 'designated beach areas' per the U.S. EPA 1986 guidance."[29]

Comment letters also noted that assessment of compliance based upon a single sample result "may lead to erroneous conclusions…[by] finding noncompliance through an unusually high value for any single bacterial sample."[30] These comments further noted that use of "not-to-exceed" single sample standards "is not a mere statistical change; it greatly increases the likelihood that water quality objectives will be violated in a greater number of watercourses and require greater cleanup efforts to ensure compliance."[31] The County Sanitation Districts of Los Angeles County also expressed concern about how single-sample limits will be used in future impairment determinations.[32] Finally, a recently published study of fecal indicator bacteria at southern California beaches shows that concentrations vary significantly over even short (10-minute) timescales, suggesting that geometric mean standards, not single samples, should be used to assess beach water quality.[33]

Recent studies in southern California have shown that high concentrations of indicator bacteria are present in runoff from pristine, undeveloped areas that have little potential for human bacterial contamination.[34] For example, stormwater runoff from the head of the Rose Creek watershed in the San Diego Region contained levels of indicator bacteria well in excess of water quality objectives even though this area is nonurban, contains no sewer lines or lift stations, and is restricted from public access. Recent data collected within the Los Angeles Basin also show high levels of bacteria from natural sources. As noted by the County of Los Angeles Department of Public Works:

---

[29] See Responsiveness Summary for the Proposed amendment of the Water Quality Control Plan – Los Angeles Region to revise bacteria objectives for waters designated for primary contact recreation, undated, response No. 2.

[30] Letter from County of Los Angeles Department of Public Works to the RWQCB, September 18, 2001.

[31] Ibid.

[32] Letter from Jose A. Saez, LACSD, to RWQCB, September 18, 2001: "…we are concerned about how receiving water data will be used to determine future impairment designations. The proposed objectives include single-sample limits for both freshwater and marine waters. None of the current objectives for bacteria represent single-sample limits. Implementation of single-sample limits, particularly the enterococcus limit proposed for ocean receiving waters, will likely result in occasional exceedences… These sources may contribute to occasional single results above the objective, without this being an indication of a real concern for contamination in the receiving water…"

[33] Boehm, A.B., Grant, S.B., Kim, J.H., Mowbray, S.L., McGee, C.D., Clark, C.D., Foley, D.M., and Wellman, D.E. Decadal and shorter period variability of surf zone water quality at Huntington Beach, California. Environmental Science & Technology 36(18):3885-3892.

[34] See, for example, Schiff, K., and P. Kinney. *Tracking sources of bacterial contamination in stormwater discharges to Mission Bay, California*, 2001. Water Environment Research, 73(5): 534-542, and Moore, D., *Bacteriological survey of San Juan Creek Watershed*, Task 3 report for the San Juan Creek Watershed Bacteriological Study, November 14, 2001.

> "Natural conditions often exceed the Basin Plan objectives by several orders of magnitude. Samples from Public Works' NPDES monitoring program during the 2000-01 storm season show that runoff from undeveloped land can reflect total coliform levels ranging up to 240,000 MPN/100ml, fecal coliform levels ranging up to 1,700 MPN/100ml, and fecal enterococcus levels ranging up to 160,000 MPN/100ml. The fact that natural loadings routinely exceed basin plan objectives must be addressed in this amendment as well as future TMDLs. This is required not only as a matter of good science, but also by State law."[35]

It is clear from scientific studies that high concentrations of indicator bacteria may not necessarily indicate human sources of contamination and may not indicate a significant potential for causing human illnesses.[36] Although EPA has recently changed its policy regarding high levels of indicator organisms from animal sources,[37] EPA has recognized that routine exceedances of ambient water quality criteria due to natural sources of pollution do occur. In response, EPA has recommended changes to designated uses as the most appropriate way to address these situations.[38] Such changes would also help to eliminate conflicts between certain designated uses and habitat uses in which

---

[35] See comment letter from the County of Los Angeles Department of Public Works to the RWQCB on September 18, 2001.

[36] Epidemiological studies have generally been conducted during the summer recreational season and not during periods of stormwater runoff. See, for example, Haile, R.W., et al. 1999. *Health effects of swimming in ocean water contaminated by storm drain runoff*. Epidemiology 10:355-363, and Santa Monica Bay Restoration Project, 1996. *An epidemiological study of possible adverse health effects of swimming in Santa Monica Bay*. Santa Monica Bay Restoration Project, Monterey Park, CA. Results, therefore, may not be directly applicable to stormwater runoff. LACSD also noted in comments on the draft Santa Monica Bay Beaches Wet-Weather TMDL that a "confirmation epidemiological study that includes an evaluation of the reference site during wet weather conditions is needed" (see comment 22.5 in the RWQCB's responsiveness summary, dated September 23, 2002).

[37] See, e.g., Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 draft, EPA-823-B-02-003, at p. 26: "The available data suggest that there is some risk posed to humans as a result of exposure to microorganisms resulting from non-human fecal contamination… Consequently, due to the potential for animal sources to contribute human pathogens to surface waters, EPA is changing its 1994 policy…to recommend that states and authorized tribes apply their water quality criteria for bacteria to all waterbodies designated for primary contact recreation in order to ensure protection of human health from gastrointestinal illness."

[38] See Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 draft, EPA-823-B-02-003, at p. 28: "For waterbodies affected by natural sources such as these [resident wildlife populations, migrating waterfowl, wildlife refuges, or lakes frequented by waterfowl], where a significant portion of fecal contamination is shown to be from natural sources and a state or authorized tribe demonstrates the water quality criterion for bacteria and the primary contact recreation designated use is not attainable through the control of other sources, an intermittent, wildlife impacted, or secondary contact recreational use may be the most appropriate designated use."

natural conditions favored by wildlife would, illogically, have to be modified to meet water quality standards.[39]

The administrative record also shows that several water bodies within the Los Angeles Region are listed as REC-1 and/or REC-2 despite limited opportunity for recreational activities due to channel configurations, restricted access, or flood danger. Many stakeholders have commented that because of these considerations, Basin Plan recreational beneficial use designations are often inappropriate.[40] Particularly during periods of high stormflows, it is extremely unsafe to swim or wade in these waters, and the potential for human contact with bacteria and/or human pathogens that may be contained in these water bodies is minimal.[41]

The Basin Plan administrative record contains almost no consideration of the economic impacts of bacterial standards, applicable natural conditions, or reasonable use designations. In general, the record shows that RWQCB responds to such issues by contending that because the previous bacteria water quality objectives (as contained in the 1975 and subsequent Basin Plans) were not met over time, the methods and costs necessary to achieve compliance with any subsequent amended objectives "are not expected to be different from those necessary to achieve the existing [previous] objectives for total and fecal coliform."[42] This contention fails to meet the Section 13241 analysis requirements because it provides no rationale for the RWQCB's assertion and ignores the fact that no Section 13241 analysis was performed with respect to the original objectives. It also neglects to consider that the original bacteria objectives were not intended to be applied to nonpoint sources or storm flows and thus that no consideration of the cost associated with such regulations was ever made. Indeed, the RWQCB's own statements in the record expressly acknowledge that economic (and other) analyses

---

[39] See letter from Paul H. Lane of the Department of Water and Power to Lee Spady of the San Fernando Valley Audubon Society, dated June 15, 1976, and written in response to a request for a bird sanctuary designation at the Van Norman Complex: "The development of a bird sanctuary adjacent to this important facility is not consistent with our responsibility to protect and maintain the quality of the water served to the citizens of Los Angeles. Although the Department intends to maintain as much of the natural environmental setting at the Van Norman Complex site as possible, we cannot encourage its use by waterfowl and other species of migratory and resident birds."

[40] See discussion in section on beneficial uses, below.

[41] Note that many of the water contact recreation (REC-1) beneficial use designations in the Los Angeles Basin Plan are accompanied by a footnote that acknowledges that access is prohibited by the Los Angeles County Department of Public Works or other relevant agency. However, water quality objectives are applied and enforced equally for all water bodies with the REC-1 designation, including those that carry this footnote. See also discussion in Section C.

[42] See p. 8 of the California Regional Water Quality Control Board, Los Angeles Region Staff Report (draft), Proposed amendment of the Water Quality Control Plan – Los Angeles Region to revise bacteria objectives for waters designated for contact recreation, July 31, 2001. Note that no Final Staff Report is contained in the Administrative Record.

should be performed before applying the water quality criteria contained in the 1975 Basin Plan to non-point sources.[43]

Many of the comment letters received in response to the revised bacteria objectives stated that RWQCB staff "has not properly considered economic considerations, the water quality conditions that could reasonably be achieved, and other factors required to be considered under Water Code section 13241… [and that the RWQCB] grossly underestimates the full costs for appropriate TMDL development, including those costs associated with dry weather diversion projects, treatment of diverted dry weather flow to established treatment facilities, and costs for wet weather control of bacteriological objectives."[44] The Basin Plan does not distinguish between periods of dry and wet weather in determining the applicability of bacterial standards, and these standards are routinely violated during storm flows. Treating stormwater flows to meet bacterial standards would require collection, treatment, and disinfection of very large volumes of water. The Basin Plan record contains no analysis of whether this process would be cost-prohibitive, the significant technical challenges involved in the collection and treatment of storm flows, and the anticipated benefits, if any, that would be achieved.

The record contains limited RWQCB responses to some of these issues in the context of TMDL development. For example, the RWQCB states in the Draft Santa Monica Bay Beaches Wet-Weather Bacteria TMDL, which implements the new bacteria objectives, that it is "not the intent of this TMDL to require diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas."[45] However, comments received from a number of parties questioned whether the TMDL could be achieved without such diversion and treatment. Comments also criticized the draft TMDL economic analysis, implementation plans, and feasibility,[46] the scientific

---

[43] See, e.g., footnote 6.

[44] Letter from Judith A. Wilson, City of Los Angeles Bureau of Sanitation, to RWQCB, September 17, 2001. See also a letter from Rod H. Kubomoto, County of Los Angeles Department of Public Works, September 18, 2001: "The staff report does not adequately consider the costs of implementing the amendment to the bacteria objectives in the basin plan. Full implementation of this basin plan amendment could require treatment of storm water. A 1998 Caltrans study estimates the capital cost of this basinwide treatment to be approximately $37 billion."

[45] See p. 40 of the Draft Santa Monica Bay Beaches Wet-Weather Bacteria TMDL, dated August 1, 2002. This TMDL proposes a "reference system/anti-degradation approach" to implementing the bacteria objectives, whereby TMDL compliance would be determined by comparing the number of days water quality at a given location exceeds water quality objectives (called "exceedance days") with a pre-determined number of exceedance days expected to occur during wet weather at a reference watershed that is predominantly open space.

[46] See the RWQCB's responsiveness summary to the Santa Monica Bay Beaches Wet-Weather TMDL, September 23, 2002: From comments provided by the City of Los Angeles, Department of Public Works (comment 6.28): "It is suggested that a UAA is developed to determine that there are no widespread and adverse economic and social impacts of treating wastewater." From the Stormwater Quality Task Force (comment 2.9): "The TMDL recognizes that there will be significant costs involved in [capturing and treating wet weather runoff], but does not adequately characterize the full implications of achieving

basis of the revised water quality objectives[47] and their implementation via a TMDL.[48] None of these concerns appear to have been adequately addressed by the RWQCB to date.

---

compliance…" See also comment 2.14, which stated that "it is important under the Porter Cologne Act the Regional Board consider the full potential expenditures and implementation impact…" and the RWQCB's response: "The Regional Board is not required to conduct a cost-benefit analysis when amending its Basin Plan pursuant to Water Code section 13242. Regional Board staff have considered economic factors in its environmental analysis of reasonably foreseeable methods of compliance with the TMDL as required." See also comments from the City of Signal Hill (comment 8.5): "The TMDL does not sufficiently address the economics and financial considerations, and greatly underestimated the overall cost of implementation." Even after revision of the TMDL, many commenters expressed continued concern. For example, the County of Los Angeles, Department of Public Works stated (comment 15.1): "We are concerned that the stringent REC-1 bacterial objectives applied in this TMDL would require extraordinary resources to control bacteria during wet weather" and (comment 15.2): "We believe the Regional Board staff's cost is significantly underestimated because the capital cost for construction of new dedicated runoff treatment facilities that would be needed in these [south Bay and Palos Verdes] areas was not included." Similarly, the Executive Advisory Committee, Stormwater Program – Los Angeles County noted (comment 20.1) that there was a "Lack of Cost Estimates for Implementation Strategies" and that (comment 20.2) "the implementation chapter (9) is woefully inadequate in scope and detail to permit certification of the CEQA checklist or amendment adoption." The County Sanitation Districts of Los Angeles County noted (comment 22.1) that "the Districts oppose the intentional diversion of storm water to its collection system as an implementation strategy" as specified in the draft TMDL. CSDLAC further noted that (comment 22.2) "cost estimates associated with increasing capacity in the collection system should be identified" and "the Districts request that the RWQCB estimate and consider the cost impacts associated with necessary modifications of sewage collection systems to accommodate diverted flows or if necessary, dedicated treatment facilities." In response, the RWQCB noted that "if the CSDLAC will not allow diversion to its facility, other implementation strategies should be employed" and stated that "the cost estimates are based on diversion of some wet weather flows to existing wastewater treatment facilities. Sewer and treatment plant capacities were considered in this potential implementation strategy." Finally, multiple parties commented that the division of responsibility is not clear in case the TMDL is not met. For example, the City of Redondo Beach noted (comment 18.4) that "it would be helpful to provide clarity to the term 'jointly responsible'" and (comment 18.5) "additional clarification is needed to insure a clear understanding of all agencies that will have some responsibility in implementing the TMDL." The RWQCB maintains that these concerns are addressed adequately by the draft TMDL.

[47] See, for example, comments from the County of Los Angeles, Department of Public Works (comment 9.1): "We recommend different bacterial standards by season…" See also comments from the Executive Advisory Committee, Stormwater Program – County of Los Angeles (comment C.1): "The LARWQCB's choice of four bacterial standards is scientifically unsupportable" and (comment C.5): "Total and fecal coliforms do not protect public health." Comments were also received from the County of Los Angeles, Department of Public Works (comment 15.3): "We recommend that the Regional Board consider the application of less stringent bacterial objectives, such as the objectives for 'moderate full-body contact recreation,' 'lightly used full-body contact recreation,' …"

[48] See, for example, comments from the County of Los Angeles, Department of Public Works (comment 9.5): "We recommend that bacteria dilution and die-off should be taken into consideration to establish accurate exceedance criteria." The County Sanitation Districts of Los Angeles County also commented (comment 10.6) that "the LACSD believes that the use of the 'wave wash', or 'point zero', where freshwater runoff initially reaches the ocean, to determine compliance, is inappropriate for several reasons."

Sediment water quality objectives. The Los Angeles Basin Plan contains only narrative standards for solid, suspended, or settleable materials (i.e., "waters shall not contain suspended or settleable materials in concentrations that cause nuisance or adversely affect beneficial uses"). This narrative standard is often applied without regard to natural, historic sediment levels, which can be very high, especially in runoff from storm flows originating in the San Gabriel Mountains.

Because the sediment water quality objective is narrative, application of the standard can vary substantially from situation to situation. Determining sediment levels that constitute a nuisance or an adverse impact to beneficial uses is subjective and is generally based upon perceived threats to habitat (e.g., spawning grounds).[49] Similarly, it may be very difficult to determine the contribution of a given project (e.g., a construction site) to total sediment loads or perceived impairment within a water body.

The Basin Plan administrative record contains numerous comments regarding suspended sediment objectives and implementation. Most comments focus on the high natural levels of sediments within the Los Angeles Basin, particularly during storm flows, and express concerns that implementation of sediment objectives do not account for these conditions. For example, in comments on revisions proposed for inclusion in the 1994 Los Angeles Basin Plan, the County of Los Angeles Department of Public Works (CLADPW) noted that the sediment water quality objectives do not account for natural sources and may be subject to "abuse in interpretation."[50]

CLADPW objected to proposed language stating that sediment sluicing (i.e., the practice of "flushing" sediments that collect behind flood control dams during winter rains through the reservoirs and downstream channels) may "destroy aquatic habitats."[51] The Basin Plan contains language discouraging the use of sediment sluicing: "The Regional Board strongly opposes sluicing of sediment from reservoirs for maintenance

---

[49] See, for example, p. 4-40 of the Los Angeles Basin Plan: "Suspended solids (such as soil particles) can, upon settling, destroy spawning grounds and other habitats."

[50] See February 17, 1994 comment letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB: "The water quality objectives for solid, suspended, or settleable materials…do not take into account that the water quality of flows from and within naturally erosive watersheds are highly dynamic, and therefore the level of beneficial uses will also fluctuate. In addition, the term 'nuisance' is very subjective, vague, prone to abuse in its interpretation, and its use as a standard for discharger compliance is inappropriate. Therefore, based on the Basin Plan's proposed objective for turbidity, the objective for solid, suspended or settleable materials should be revised to read as follows: 'Waters shall not contain suspended or settleable material in concentrations in excess of 20% above natural levels as a result of waste discharges.'"

[51] See February 17, 1994 comment letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB. In response to comments, the language in the 1994 Basin Plan was revised to read as follows: "Further problems in the upper San Gabriel River occur as vast amounts of naturally eroding sediment from the rugged San Gabriel Mountains settle into reservoirs behind flood control dams. Improper sediment sluicing operations from these reservoirs can impact aquatic habitats and groundwater recharge areas."

purposes when this activity has the potential to impair downstream uses."[52] In its comment letter, CLADPW noted that the "San Gabriel Mountains…are among the most erosive in the world; therefore, 'vast amounts of sediment…' are expected and are a natural characteristic of the 'pristine' watershed."[53] CLADPW further noted that "the fluvial-geomorphic process plays an integral part in maintaining the dynamic nature of a river system," influencing "the form and condition of the stream, creating habitat niches and providing for a greater ecological biodiversity of species." The Main San Gabriel Basin Watermaster also expressed concern with the 1994 Basin Plan revisions that discourage sediment-sluicing operations.[54] Water bodies within the Los Angeles Region are the natural conveyances for beach replenishment material. If sediment loading within these water bodies is restricted, particularly during storm flows, beaches may be left with inadequate supplies of sand.[55] The net result would be more significant beach erosion than is currently occurring. Although the RWQCB identified an evaluation of the appropriateness of a prohibition on sediment sluicing as a high priority in the 2001 triennial review priority list, it is not conducting this task as part of the triennial review.[56]

As noted in Part C, below, CLADPW and others have repeatedly commented to the RWQCB that many of the habitat and recreational designations for flood control facilities are inappropriate, because accumulated sediments must be routinely cleaned from flood control facilities and such maintenance precludes sustained habitat vegetation. Nevertheless, the RWQCB has never provided an adequate rationale for adopting Basin Plan elements that conflict with the intended purpose and operation of such facilities.

Mineral quality objectives. The Los Angeles Basin Plan contains water body-specific objectives for various mineral quality parameters, including total dissolved solids (TDS), sulfate, chloride, boron, nitrogen (nitrate + nitrite), and sodium adsorption ratio

---

[52] 1994 Los Angeles Basin Plan at p. 4-44.

[53] See February 17, 1994 comment letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB.

[54] See comment letter from the Main San Gabriel Basin Watermaster to Deborah J. Smith, RWQCB, dated January 31, 1994: "The Main San Gabriel Basin Watermaster would urge the Regional Board to also discuss and support alternate proposals to remove sediments from the reservoirs in order to maintain storage for water conservation and flood control."

[55] See, e.g., comments from County of Los Angeles Department of Public Works to RWQCB, May 26, 1994, Attachment B (at p. 7): "The Plan's sediment reduction mandate will thus increase the rate of siltation in the LACDPW' [sic] flood control and water conservation facilities… In addition, it is our understanding that some agencies such as the California Coastal Commission believe that upstream sediment retention interferes with beach replenishment. Therefore, impacts from this Plan's mandate to further decrease sediment delivery to the oceans may be considered by these agencies as adverse to beach replenishment."

[56] California Regional Water Quality Control Board, Los Angeles Region, Staff Report: 2001 Triennial Review: Prioritization of Basin Planning Issues, April 16, 2001, at p. 32.

(SAR). The 1971 Interim Basin Plan contained a limited subset of mineral quality objectives.[57]

The 1975 Basin Plan mineral objectives for TDS, sulfate, chloride, and nitrogen for selected reaches of the LA River, San Gabriel River, and tributaries were originally developed as flow-weighted mean mineral quality objectives for the Los Angeles Basin.[58] The mineral quality objectives were apparently developed from monitoring data collected at a limited number of locations in the listed reaches from November 1969 through August 1970, a very wet climatic period. In some cases, these samples were collected where concentrations within the reach were at their lowest levels. During drier periods, the RWQCB was forced to adopt measures such as the 1990 drought policy (Resolution 90-004) and 1997 amendment of chloride objectives to allow for more realistic mineral standards based on a wider, more normal distribution of wet and dry hydrologic conditions. Furthermore, in determining mineral objectives, the Basin Plan assumed that the Peripheral Canal around the Delta would be built, keeping southern California water supply imports low in chloride,[59] and that the soft-bottom section of the L.A. River could allow infiltration of minerals to the groundwater. Both of these assumptions proved erroneous, as the Peripheral Canal was never built and groundwater generally flows into the Los Angeles River in the river's soft-bottom reach.[60] As a result, the TDS, sulfate,

---

[57] Water Quality Control Plan (Interim), Santa Clara River Basin 4-A and Los Angeles River Basin 4-B, June 1971, at p. 51. Mineral quality objectives are provided for the Los Angeles River and its tributaries upstream of Figueroa Street, and downstream from Figueroa Street to Tidal Prism.

[58] See Table 4-1 of the 1975 Los Angeles Basin Plan at pages I-4-11 and I-4-12.

[59] See, e.g., comments prepared by the City of Los Angeles Bureau of Engineering and presented to the Chloride Work Group at a workshop on (or about) April 13, 1993: One of "two important assumptions behind the Basin Plan projections [of water quality for the 1975 Basin Plan] that did not materialize as expected: 1. Construction of the Peripheral Canal in Sacramento Delta… The [1975] Basin Plan itself projects that failure to construct the Peripheral Canal would result in poorer quality State Project waters delivered to the Basin."

[60] As noted in "Assessment of long term impacts, Third quarterly report, July – September, 1995, Department of Public Works, Bureau of Sanitation," November 8, 1995: "[T]he City of Los Angeles conducted a more comprehensive study of the relationship between river water quality (as impacted by reclamation plant discharges) and that of local groundwaters (*Potential Infiltration of Chlorides from the Los Angeles River into the Groundwater Aquifer*, January 1993). This effort included input from the Upper Los Angeles River Area Watermaster and two consulting firms…(*Impact of Chloride, Sulfate and TDS Discharges on Beneficial Uses, Public Health, and Groundwater in the Upper Los Angeles River Basin*, February 1993) … The results of these studies led to several primary conclusions:

1. Prevailing hydrologic (as well as drought) conditions in groundwaters adjoining the unlined portion of the Los Angeles River result in high groundwater levels (and in some areas rising groundwater) that preclude significant percolation of flows from the river into underlying aquifers. These conditions have been observed prior to and following the 1977 drought and throughout periods of local groundwater pumping.
1. Local groundwater levels have risen in response to the cessation or reduction of location groundwater pumping … in 1979, further decreasing the potential for groundwater intrusion by percolating river flows.
1. Overall statistical correlation of river and groundwater quality data is generally poor, leading to the conclusion that there is no significant impact by river flows on underlying groundwater quality.

chloride, and nitrogen water quality objectives were based on unusually wet conditions and computed from an unspecified averaging period.[61] In response to comments received from EPA during the approval process of the 1975 Basin Plan, the RWQCB clarified that these objectives were to be interpreted as the flow-weighted annual (water year) average mineral concentrations, with no single sample exceeding 110% of the objective value.

When the 1994 Los Angeles Basin Plan was adopted, the mineral quality objectives remained substantially the same as in the 1975 Basin Plan. For the Los Angeles and San Gabriel River watersheds, one additional stream reach was added, but numeric objectives remained unchanged.[62] However, the RWQCB failed to include the footnote contained in the 1975 plan (and in the 1976 and 1978 amendments to the 1975 plan) specifying that mineral quality objectives were to be interpreted as flow-weighted annual average concentrations. This significant change in interpretation was made without public notice and without a Section 13241 analysis. As a result, the mineral quality objectives have been subsequently re-interpreted as instantaneous maxima to be achieved at any location within the reach. Natural mineral concentrations are, at any point in time, frequently higher than the applicable water quality objectives. Consequently, when such objectives are interpreted as instantaneous maxima, enormous expense may be required to comply compared with the achievement of flow-weighted annual average goals. To date the RWQCB has neither clarified nor resolved this significant concern with the Basin Plan mineral water quality objectives.

Chloride objectives. Water quality objectives for chloride have been among the most controversial issues in the Basin Plan. Chloride water quality objectives were set

---

1. …[T]he resumption of groundwater extractions from local well fields may create a potential for increased percolation due to local drawdown effects, and should be monitored."

See also the 1994 Los Angeles Basin Plan at p. 1-19: "One seven-mile reach in the narrows area (in the middle portion of the river system), where groundwater rises into the streambed, is mostly unlined along the stream bottom and provides natural habitat for fish and other wildlife in an otherwise concrete conveyance."

[61] See Table 4-1 of the 1975 Los Angeles Basin Plan at pages I-4-11 and I-4-12. Table 14-2 of the 1975 Basin Plan contains mineral monitoring data for selected surface waters in Basin 4B. The monitoring period varies among the listed reaches, but extends approximately from November of 1969 through August of 1970. This data set has probably been relied upon to set the mineral objectives listed in Table 4-1 of the 1975 Basin Plan. For example, some of the reaches (Rio Hondo above Spreading Grounds, Z-6-9780.00), the objectives seem to be based on only 6 data points. For the LA River at Figueroa (Z-6-1300) 11 samples were measured for minerals, including nitrate, which had an average at 19 mg/l as NO_3 (4.3 mg/l as NO_3-N) and ranged between 6.8 and 31 mg/l as NO_3 (1.5-7 mg/l as NO_3 - N). If these background data were used for the setting of the 8 mg/l NO_3 - N objective, it would appear that the maximum measured value of 31 mg/l as NO_3 (7 mg/l as NO_3 - N) would be the basis for setting the objective for this reach. However, for the Rio Hondo Station (Z-6-9780.00) it is unclear how the data were used to set the 8 mg/l NO_3 - N + NO_2 - N objective. From the available data at this station, the average measured nitrate was 17.4 mg/l as NO_3 (3.9 mg/l as NO_3 - N) with a range between 3.2 and 45 mg/l as NO_3 (0.7 - 10.3 mg/l as NO_3 - N).

[62] See Table 3-8 of the 1994 Los Angeles Basin Plan, at pp. 3-12 through 3-14.

for surface waters in the Los Angeles region in the 1975 Basin Plan, and some were subsequently amended in 1978 based on additional ambient water quality data.[63] As with other mineral objectives, chloride objectives were based on ambient surface water conditions at that time, a very wet period, and according to the EPA's national "anti-degradation" policy. As a result, they reflect unusually low baseline levels of chloride that are not consistent with normal, higher natural concentrations. Chloride objectives were also set using data collected at the downstream end of each reach but applied to the entire reach upstream of the sampling location (i.e., upstream to the next sampling location).

Through the drought years that occurred periodically during the 1970s, 80s, and 90s, wastewater dischargers found it difficult or impossible to meet the chloride objectives since the imported water supplying their service areas naturally contained chlorides in higher concentrations than the water quality criteria. In response, the RWQCB passed a resolution in 1990 known as the "drought policy" (Resolution No. 90-004) granting temporary relief from Basin Plan chloride objectives for some dischargers.[64]

When chloride concentrations in imported water supplies did not diminish over time, the RWQCB moved to implement a more permanent solution to the dischargers' dilemma using a similar strategy for computing chloride objectives as that employed under the drought policy. Revised standards were adopted in 1997 for most of Los Angeles County, while temporary, interim standards were adopted in the Santa Clara River and Calleguas Creek watersheds to allow further study of outstanding issues related to the sensitivity of local crops to chlorides.[65] Ultimately, these interim standards expired and the chloride standards contained in the 1994 Basin Plan were upheld in the Santa Clara and Calleguas Creek watersheds. As a consequence, several reaches in these watersheds were listed as impaired for chlorides based upon the 1994 Basin Plan water quality objectives. TMDLs have been adopted for certain reaches, although the RWQCB has not yet adopted implementation plans for these TMDLs.

---

[63] See, e.g., letter from Victoria Conway, "Los Angeles County Sanitation Districts Comments on the Draft Basin Plan Amendment to Revise the Reach Definitions and Chloride Water Quality Objectives for Calleguas Creek" to Mr. Dennis Dickerson, CRWQCB LAR, and Ms. Alexis Strauss, EPA Region IX, February 11, 2002, at p. 2.

[64] Resolution No. 90-04, "Effects of Drought Induced Water Supply Changes and Water Conservation Measures on Compliance with Waste Discharge Requirements Within the Los Angeles Region," adopted March 26, 1990. This policy temporarily raised the chloride water quality objective to the lower of 250 mg/l (the secondary MCL for chloride) or the water supply plus an 85 mg/l loading factor.

[65] Resolution No. 97-02, "Amendment to the Water Quality Control Plan to incorporate a Policy for Addressing Levels of Chloride in Discharges of Wastewaters," adopted on January 27, 1997. This resolution permanently revised chloride objectives for certain reaches of the Los Angeles River, Rio Hondo, and the San Gabriel River. The resolution also established interim chloride limitations valid for three years for certain reaches of the Santa Clara River, the Arroyo Simi, and Calleguas Creek and tributaries.

Although interim measures in the past provided some temporary relief, the chloride objectives contained in the 1994 Basin Plan for the Santa Clara River and Calleguas Creek watersheds remain unchanged, and significant concern remains among stakeholders. As with other mineral quality objectives, a footnote from the 1975 Basin Plan indicating that chloride objectives were to be applied as flow-weighted annual average concentrations was dropped in the 1994 update of the Basin Plan, and no analysis of the Section 13241 public interest factors was conducted to assess the impact of this change. As a result, the chloride objective is now applied as an instantaneous maximum concentration. Although the 1990 drought policy (Resolution No. 90-004) and the 1997 Basin Plan amendment (Resolution No. 97-02) addressed, at least temporarily, the issue of high-chloride *imported* water supplies, they did not provide relief for dischargers in areas supplied by high-chloride *local groundwater*.[66] Several parties have commented that the Basin Plan's chloride objectives are not based upon representative data[67] and that dilution and groundwater recharge produce a chloride concentration gradient along the Santa Clara River, so that it may be inappropriate to apply chloride objectives to "end-of-pipe" discharges upstream.[68] Stakeholders and RWQCB staff have also noted that

---

[66] Just like dischargers in areas supplied by imported water with high chloride concentrations, dischargers in areas supplied by local groundwater are often unable to meet chloride objectives through no fault of their own. For example, as noted by the Ventura Regional Sanitation District (VRSD) in a letter to the RWQCB dated February 1, 1990: "The District recommends that the proposed resolution be amended to allow for communities with water supplies which are not exclusively derived from imported water. As long as these communities are making every legal effort to control chlorides, they should not be penalized with a limit which cannot reasonably or economically be met." Furthermore, in a letter dated May 1, 1990, the VRSD wrote, "None of the three facilities affected by this Resolution receive imported water. The District has proven in numerous reports to the Board that chlorides [sic] levels in the potable water supply derived from local wells have steadily risen as the result of over drafting during drought conditions. With that rise in chlorides comes the installation of more domestic water softening units which further exacerbate the chlorides levels in the treatment plant's discharge." In a letter to the RWQCB dated February 2, 1990, the LACSD noted, "The Saugus and Valencia Water Reclamation Plants have existing limits of 100 mg/L. Groundwater supplies in their service area can have average concentrations as high as 97 mg/L. With this in mind background groundwater concentrations should not be eliminated from consideration. Both groundwater and imported water contribute to the chloride concentration of the supply water, and this factor is beyond the control of most water users/waste dischargers."

[67] For example, an analysis conducted by LACSD showed that the chloride objective for the Santa Clara River at the Blue Cut gauging station was based upon data collected for the years 1970 through 1975, which yielded a mean chloride concentration of 71 mg/l and a maximum of 95 mg/l. However, LACSD showed that incorporating the full data record from 1951 through 1975 resulted in a mean chloride concentration of 147 mg/l and a maximum of 585 mg/l (April 7, 1998, LACSD letter to the RWQCB). Although LACSD recognized that the RWQCB excluded much of the early data due to valid concerns over discontinued industrial practices in the watershed that unnaturally elevated chloride levels, the RWQCB's exclusion of all such information to establish the chloride objective (such as the magnitude of wet and dry weather variance) at Blue Cut may be unwarranted.

[68] Data have shown that the average chloride concentration in the river downstream of the wastewater discharges is lower than the average discharge concentration. For example, a letter from Victoria Conway (CSDLAC) to Dennis Dickerson (RWQCB), February 28, 2000, states: "Monitoring data shows [sic] that gradients in chloride concentration exist between our plants and downstream receiving water station. Though our plants have historically discharged chloride levels above the proposed objective of 143 mg/l, concentrations reported for the LA/Ventura County Line have remained below this objective. In addition, Santa Clara River agricultural interests have stated publicly that there is no current impairment due to

chloride objectives are likely lower than necessary to protect agricultural beneficial uses.[69] Finally, several parties have commented that economic factors have not been adequately considered in establishing final chloride objectives.[70]

---

chloride in surface or groundwater." Moreover, a Kennedy-Jenks study showed that chloride concentrations at the Freeman diversion have never exceeded 100 mg/l, even under dry conditions (Kennedy-Jenks Consultants, January 1, 1998, Phase I Development of a Water Quality Model to Evaluate Chloride Contributions to the Santa Clara River, for the CSDLAC, pp. 5-6): "It should be noted that during the dry season an approximately 15-mile dry gap in the river bed exists near the LA/Ventura county line. Because of this condition it is believed that the amount of Saugus and Valencia POTW effluent flow, if any, that reaches the Freeman Diversion is insignificant in volume… [The] geometric mean for chloride concentration in the Saugus POTW effluent is 120 mg/l for the wet season and 116 mg/l for the dry season…[For the] Valencia POTW, [the] geometric mean [during the] wet season [is] 140 mg/l and [during the] dry season [is] 143 mg/l…The average chloride concentrations at the Freeman diversion do not exceed the Basin Plan objective of 100 mg/l during the wet season (geometric mean = 49 mg/l) or the dry season (geometric mean = 55 mg/l). The analysis also shows that the 95th percentile chloride concentrations at the Freeman diversion are below 100 mg/l during both the wet season (98 mg/l) and the dry season (90 mg/l)." Furthermore, statistical analysis conducted for the Upper Santa Clara River Chloride TMDL shows that 'dilution' occurs between LACSD discharge locations and the Blue Cut gauging station (LARWQCB, 2002. "Total Maximum Daily Load for Chloride in the Upper Santa Clara River, Staff Report." August 21, 2002. 32.).

[69] Scientific publications note that chloride concentrations between 100 and 142 mg/l will likely have no impact on even sensitive crops, particularly if non-foliar irrigation practices are used (as is generally the case in the Santa Clara watershed), and if a low-chloride source is periodically used to leach soils. For example, "Water Quality for Agriculture," (R.S. Ayers and D.W. Westcot, 1985, Food and Agriculture Organization of the United Nations-Irrigation and Drainage Paper No. 29, Rev. 1, Rome) provides a non-impact chloride concentration level of 3.3 meq/l, which translates to 117 mg/l. In a December 20, 1999, letter from Jon Bishop (RWQCB) it is noted that "the guidelines of the UC Committee of Consultants, 1974, use 143 mg/l as the chloride concentration value below which all crops can be safely irrigated for long periods of time." In an April 26, 1999, letter to the RWQCB, the LACSD stated the following: "It appears that the threshold of 100 mg/L originally cited in the 1976 Basin Plan for protection of agriculture, was incorrectly interpreted from a reference, as no distinction was made between the threshold for spray irrigation (100 mg/L) and surface irrigation (142 mg/L). The literature review revealed that agricultural experts intended the 100 mg/L to be used as a guideline and not as an absolute threshold limit for protection of chloride sensitive crops… Based on the review of more recent literature, the 142 mg/L chloride concentration seems to be a reasonable long-term average value for the protection of avocados (Mexican rootstock) and other chloride sensitive surface irrigated crops." Many factors influence the toxicity of chloride in irrigation water, such as irrigation practice, amount of water applied, soil structure and drainage, and even climate with evapotranspiration factors. Historic production in Ventura County indicates that crops may be more tolerant to chloride than the current water quality objective of 100 mg/l suggests. Jon Bishop (RWQCB), December 20, 1999: "Minimum historical levels in surface water at various locations in the Santa Clara River have ranged from 49 to 143 mg/l. Successful cultivation of avocado in the Calleguas watershed has been reported when concentrations of 150 mg/l were typical. Growers and experts report that in the Calleguas watershed, avocado had been grown with diminishing success at concentrations between 150 mg/l and 180 mg/l." Furthermore, in an August 2, 1999, letter to the RWQCB, the Newhall Ranch Company notes, "Raising the objective to 142 mg/L will not result in any change to the current chloride concentrations in the Santa Clara River because there is no effect on the operational practices of the dischargers. Chloride concentrations will remain at the status quo; dischargers will not suddenly increase chloride loadings, particularly since the current interim limit of 190 mg/L is higher that [sic] the proposed objective of 142 mg/L."

[70] The lack of an economic analysis has been noted by agencies in the Calleguas watershed. If the agriculturally preferable chloride objective is lower than what is reasonably achievable by wastewater dischargers, the marginal costs of advanced wastewater treatment (such as reverse osmosis) and

Water quality objectives for color, taste, and odor. The 1994 Los Angeles Basin Plan contains narrative standards for color and for taste and odor.[71] Although the text accompanying the color criterion acknowledges that "color in water can result from natural conditions (e.g., from plant material or minerals)," the criterion itself contains no such language. In fact, the original color water quality objective contained in the 1971 Interim Basin Plan specified "no significant increase beyond natural background levels."[72]

In comments received during the 1994 Basin Plan revision process, the RWQCB was encouraged to consider ambient conditions for color, taste, and odor.[73] The RWQCB's response to these comments addressed only color (not taste or odor), and stated that the RWQCB did not intend to regulate natural color.[74] The Basin Plan (and the response to this comment) did not clarify how (or if) the RWQCB intends to regulate naturally occurring nonpoint sources of color, taste, and odor that are perceived to violate the narrative water quality objectives.

---

agricultural loss should be considered to arrive at an appropriate, reasonable solution as mandated by Porter-Cologne. The Camarillo Sanitary District wrote the following in a July 16, 1999 letter to the RWQCB: "Presentations to date have not included economic analysis of alternatives to a restrictive discharge limitation…For example, is the benefit of higher crop yield greater than the annualized cost of installing membrane filtration and constructing brine disposal lines? Would demineralization of irrigation water (wellhead treatment) be less expensive than attempting to reduce chlorides in all surface flows and groundwater through super-treatment of permitted discharges?"

[71] For inland surface waters, the water quality criterion for color reads as follows: "Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses." The water quality criteria for taste and odor reads as follows: "Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible aquatic resources, cause nuisance, or adversely affect beneficial uses." See Basin Plan at p. 3-9 and at p. 3-16, respectively.

[72] Water Quality Control Plan (Interim), Santa Clara River Basin 4-A and Los Angeles River Basin 4-B, June 1971, at p. 49.

[73] See February 17, 1994 comment letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB: "The water quality objectives…for color, taste, and odor should take ambient conditions into account, and the objectives should clearly state that dischargers shall not be held to standards greater than the ambient conditions. For example, if a discharger is discharging into a water body which already has poor color, taste, and odor, then the discharger should be responsible only for ensuring that his actions do not further degrade that water quality; the discharger should not be responsible for cleaning up conditions created by others or by nature."

[74] See Basin Plan Responsiveness Summary, RWQCB, April 28, 1994: "This objective has been in effect in the Basin Plan since 1975 (and in previous interim plans). The Board regulates color problems that arise from discharges, both point and nonpoint, to waters of the state. It is not the Board's intent to regulate natural color."

C. Beneficial Use Designations

Because beneficial use designations determine which water quality objectives will be applied to a given water body, logical and reasonable designations are essential to regulating water quality efficiently and appropriately. Beneficial uses must be designated as “existing” for uses that have been attained for a water body on (or after) November 28, 1975 (whether or not they are included in the water quality standards). The Basin Plan also includes designated “existing” uses that likely have not been attained since 1975; the RWQCB criteria for these designations are unclear. Intermittent beneficial uses can be designated for streams that have intermittent flow.[75] Although such a phrase does not appear in federal or state water quality law, the Los Angeles Basin Plan provides that “potential” uses can be designated, whether or not they have been attained, in order to implement either federal or state mandates and goals (such as the CWA’s goals of fishable and swimmable waters).[76] The Basin Plan cites several circumstances that justify a “potential” use designation, including[77]:

- Implementation of the State Board’s policy entitled “Sources of Drinking Water Policy” (Resolution No. 88-63)
- Plans to put the water to the designated future use
- Potential to put the water to such future use
- Designation of a use by the RWQCB as a regional water quality goal
- Public desire to put the water to such future use

As detailed below, the Basin Plan’s “potential use” guidelines and other beneficial use designations have been controversial. The administrative record contains a number of comments regarding beneficial use designations that interested parties feel are inappropriate, including many municipal and domestic supply (MUN) designations and the presumption of the MUN designation for waters that the RWQCB has identified as having the groundwater recharge (GWR) use designation. Other comments concern the Basin Plan contact and non-contact recreational beneficial use (REC-1 and REC-2) and habitat beneficial use (e.g., COLD, WARM, SPWN) designations for water bodies where such uses do not exist and are not reasonably likely to occur.

MUN beneficial use designations. The Basin Plan designates the municipal and domestic supply (MUN) beneficial use for “uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.”[78] Other than water supply reservoirs and associated conveyances, few water bodies within

---

[75] Note that the RWQCB considers “intermittent” uses to be “existing” uses for implementing water quality standards.

[76] Section 13241 of Porter-Cologne uses the term “probable future,” not potential future use.

[77] 1994 Los Angeles Region Basin Plan at p. 2-1.

[78] 1994 Los Angeles Region Basin Plan at p. 2-1.

the Los Angeles Region are used directly for municipal or domestic supply. In part, this is because flows within many water bodies vary from little to no flow during the dry months to very high, but brief flows associated with storms during the wet weather season. Even when year-round flow is present, dry season flow in urbanized areas tends to be dominated by urban runoff and treated wastewater, neither of which has been seriously considered as a direct source of drinking water. However, water bodies receiving urban runoff and/or treated wastewater within the Los Angeles Region (e.g., the San Gabriel River) may contribute to groundwater recharge, and this groundwater may then be used for municipal and domestic supplies (i.e., indirect use).

When the EPA approved the 1975 Los Angeles Basin Plan, it conditioned its approval upon the adoption of certain improvements in water quality standards. Among these improvements was the specification that "surface waters which recharge groundwaters designated for MUN supply should be designated MUN…"[79] In the 1975 Los Angeles Basin Plan and the 1978 revisions to present and potential beneficial use designations, few water bodies were designated for the MUN beneficial use.

In 1988, the SWRCB adopted Resolution No. 88-63, the "Sources of Drinking Water" policy, which specified that, with certain exceptions, "all surface and ground waters of the state are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards."[80] In March 1989, the Los Angeles RWQCB adopted Resolution No. 89-03, "Incorporation of Sources of Drinking Water Policy into the Water Quality Control Plans (Basin Plans) – Santa Clara River Basin (4A)/Los Angeles River Basin (4B)." The administrative record as provided by the RWQCB contains no documentation of hearings conducted or comments received in conjunction with either of these policies and does not contain the text or accompanying documentation for this Basin Plan amendment. This resolution and related information were obtained independently and reveal that the Los Angeles RWQCB did not create new MUN designations for water bodies listed in the Basin Plan as part of Resolution No. 89-03. Specifically, the RWQCB noted that:

[79] Letter from Paul De Falco, Jr., to Governor Edmund G. Brown Jr., dated January 8, 1976, with attachments. From p. 2 of Enclosure 3: "Surface waters which recharge groundwaters designated for MUN supply should be designated MUN, or otherwise be protected by the chemical constituent, radioactivity and pesticide limits set forth in the California Administrative Code. DISCUSSION: In the present Basin Plan, numerous surface waters are indicated for the beneficial use of groundwater recharge (GWR) in basins where the groundwater is used for MUN. Most of the constituents limited in the California Administrative Code (Title 17, Ch. 5(1)(9), Article 4, Section 7019) are not removed by percolation or normal treatment, and therefore should be limited in the contributory surface waters."

[80] See SWRCB Resolution No. 88-63. Exceptions include: surface and groundwaters with TDS concentrations above 3,000 mg/l; surface and groundwaters that are contaminated, "either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices; " surface waters where "the water is in systems designed or modified to collect or treat municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards; or the water is in systems designed or modified for the primary purpose of conveying or holding agricultural drainage waters…"

> "Water bodies listed in Table 4 (as amended in 1978) without an existing MUN beneficial use would retain this designation as stipulated under the Exceptions of the Policy. Current water quality information indicated that these water bodies were not suitable or potentially suitable as a source of drinking water. In addition, the water quality criteria used by the basin plan contractors in the 1970s for designating MUN sources originally appear to be consistent with those listed under the Policy."[81]

In contrast, the 1994 Los Angeles Basin Plan designated all inland surface and groundwaters as MUN, "presuming at least a potential suitability for such a designation."[82] Multiple interested parties commented that such MUN designations were inappropriate because the waters in question either had no potential use for water supply,[83] were in modified channels inappropriate for municipal supply,[84] or predominantly contained treated effluent.[85] Commenters also noted that a MUN

---

[81] Finding 1 of Resolution No. 89-03 states: "…Water bodies within the Region that do not have beneficial uses designated for them in Table 4 (in the updated Appendices with the 1978 revisions) are assigned MUN designations in accordance with the provisions [of SWRCB Resolution No. 88-63]… These MUN designations in no way affect the presence or absence of other beneficial use designations in these water bodies." The memorandum transmitting Resolution No. 89-03 to the SWRCB (dated April 12, 1989), further clarifies this policy, stating that "[w]ater bodies listed in Table 4 (as amended in 1978) with an existing MUN beneficial use would retain this designation as provided for under the Policy. Based on available water quality information and Exception #4 under the Policy, it was determined that these water bodies were still a source of drinking water… Water bodies listed in Table 4 (as amended in 1978) without an existing MUN beneficial use would retain this designation as stipulated under the Exceptions of the Policy. Current water quality information indicated that these water bodies were not suitable or potentially suitable as a source of drinking water. In addition, the water quality criteria used by the basin plan contractors in the 1970s for designating MUN sources originally appear to be consistent with those listed under the Policy."

[82] See 1994 Los Angeles Basin Plan at p. 2-3.

[83] See letter dated February 15, 1994, from City of Los Angeles Department of Water and Power to RWQCB: "LADWP feels that even if the wastewater treatment plants and other river dischargers treated their effluent to meet drinking water standards, which is unfeasible, technically difficult, and expensive, the amount of polluted urban runoff entering the [Los Angeles and San Gabriel] rivers would still render the river water unusable as a drinking water source." See also letter dated January 20, 1994, from Simi Valley County Sanitation District to RWQCB: "…the District disagrees with the proposed Basin Plans [sic] designation of beneficial use for the Arroyo Simi…There is no known drinking water use for the Arroyo Simi, and therefore, this designation should be reconsidered." From January 28, 1994 letter from Ojai Valley Sanitary District to RWQCB: "The Lower Ventura River (LVR) hydrology has a high dissolved solids content…previous regulatory decisions recognized the high mineral content and low water quality as an unsatisfactory 'existing or potential' municipal water source… The Lower Ventura River should maintain the No-MUN status."

[84] See letter from County Sanitation Districts of Los Angeles County (LACSD), February 4, 1994, to RWQCB: "In general, we believe that, under the State policy regarding Sources of Drinking Water (SWRCB Resolution No. 88-63), the potential beneficial use category MUN should not be assigned to water bodies that are concrete-lined and/or effluent-dominated."

[85] See, e.g., letter from Simi Valley County Sanitation District to RWQCB, February 3, 1994, at p. 1: "Request for change: Under Inland Surface Waters insert 'Waters not appropriate for municipal use

designation based solely on the potential for groundwater recharge was inappropriate[86] and questioned whether the MUN designation should apply to stormwaters.[87] In many cases, these potential MUN designations occurred in apparent violation of the Sources of Drinking Water Policy, which provides exceptions for modified channels that are used to convey wastewater or stormwater.

In its summary of significant comments to the 1994 Basin Plan Update, the RWQCB stated that:

> "The Regional Board adopted a policy in 1989, officially bringing these MUN uses into our Basin Plan. We have been operating under this policy ever since. Our current Draft Update simply adds the designations to the tables; however, they are not new designations. The Basin Plan is just clarifying what happened in 1988… Because these designations have been on the books since 1988, there is no impact to the dischargers."[88]

This statement contradicts the RWQCB's 1989 actions, as noted above. Although exceptions were not pursued at the time the 1994 Basin Plan was adopted, the Basin Plan recognized that exceptions to the new policy could be possible in the future and stated the RWQCB's intent to review the criteria and identify waters that should be excepted from MUN designation. These exceptions were to be proposed as a Basin Plan amendment. In the interim, the RWQCB added a footnote to these potential MUN uses stating that "no new effluent limitations will be placed in Waste Discharge Requirements as a results [sic] of these designations until the Regional Board adopts this amendment."[89] The beneficial use tables within the Los Angeles Basin Plan designate the affected waters with an

---

including waters which are predominantly effluent waters and too costly to treat to drinking water standards will not be designated MUN.'"

[86] See comments submitted on February 4, 1994, by County Sanitation Districts of Los Angeles County (LACSD) to the RWQCB: "…where the MUN designation is based on infiltration to groundwater basins, we believe that this beneficial use is more appropriately designated – and is adequately protected – with the GWR (groundwater recharge) beneficial use category." It should also be noted that the designation of GWR for certain reaches (most notably the unlined seven-mile portion of the Los Angeles River at the Narrows (Elysian Valley) is controversial. Commenters to the 1994 Basin Plan revisions cite evidence that this portion of the river is unlined because it is now and will be in the future a "gaining" stream (i.e., groundwater flows upward into the river channel), despite RWQCB assertions that it may become a recharge area in the future. See also footnote 60.

[87] See comments submitted on February 4, 1994, by County Sanitation Districts of Los Angeles County (LACSD) to the RWQCB: "Will stormwater discharges be required to meeting drinking water standards in those cases where stormwater discharges drain to water bodies designated potential MUN? We recommend that…natural background levels of contaminants be used as the objective for those cases where background levels may exceed water quality objectives based on state or national drinking water standards."

[88] See Basin Plan Briefing, Regional Board Member Briefing, Summary of Significant Comments, 1994 Basin Plan Update, dated February 25, 1994.

[89] See 1994 Los Angeles Basin Plan at p. 2-4.

asterisk (*), and footnotes state that some of these designations may be considered for exemptions at a later date.

In 1998, the RWQCB initiated de-designation proceedings for eight surface water bodies and two groundwater basins. These proceedings led to discussion of the rationale for the MUN designation. The RWQCB supported the de-designation of ground water for two sections of the west basin, and this approach was subsequently adopted as a Basin Plan amendment.[90] However, the RWQCB did not concur with the request for de-designation of coastal groundwater suggested by the City of Malibu due to saltwater intrusion and the dependence on septic systems in the region,[91] stating that "groundwater in the area has been a historical source of drinking water; prior to the mid-1960s, it was the sole source of drinking water. Today, residents in the outlying areas continue to depend on domestic wells."[92]

The surface water bodies that were proposed in 1998 for de-designation are paved for flood control, with contiguous paving from the upstream point of proposed de-designation to the estuary. They thus have no potential for interaction with groundwater resources. The RWQCB's requirements for de-designation of surface water bodies have been conservative. For example, the City of Los Angeles Bureau of Sanitation quoted a 1991 study that rationalized the de-designation of the Los Angeles River by showing it to be 85% effluent in the summer and to convey significant volumes of stormwater runoff in the winter.[93] The RWQCB maintained the MUN designation was appropriate due to the

---

[90] The groundwater de-designations included the portion of the West Basin underlying the Chevron facility in El Segundo and the portion of the West Basin underlying Terminal Island, which have been filled with marine dredge sediments during the past 100 years. RWQCB MUN Policy: Staff Report August 28, 1998, at p. 3.

[91] See letter from Harry R. Peacock of the City of Malibu to Wendy Phillips of the RWQCB, dated September 15, 1998. "The City has argued for many years about the impracticality of listing the groundwater within the entire jurisdiction of Malibu for potential municipal use as drinking water. This is especially true in the low lying areas along the coast adjacent to the salt water intrusion layer and, as of course you know, most of the development is on septic systems. There is not even a remote possibility of a need to preserve this groundwater for municipal use. Please consider "dedesignation" of the coastal areas within the City of Malibu from the MUN beneficial use preserving groundwater for drinking purposes. The City is actively developing and implementing measures for regulating on-site septic systems for the protection of public health. The MUN designation will impose costly requirements which WILL NOT PROVIDE ANY PUBLIC BENEFIT."(emphasis in original)

[92] See 1998 *Changes in Beneficial Use Designation for Selected Waters Comments and Responses,* RWQCB, at p. 2.

[93] See October 22, 1998 *Responses to Written Comments on a Proposed Amendment to the Water Quality Control Plan to incorporate "Changes in Beneficial Use Designations for Selected Waters"* at p. 4: "A study conducted in 1991 showed the Los Angeles river to be 85% effluent during summer. During the winter rainy season, it conveys significant volumes of storm runoff." The commenter states that "these criteria meet the requirements of State Board Resolution No. 88-63 and therefore the Los Angeles River should have it's [sic] MUN beneficial use dedesignated at this time."

7-mile stretch in Glendale Narrows where the river base is not lined and provides an opportunity for interaction between surface flows and groundwater.[94]

Heal the Bay (HTB) and the Natural Resources Defense Council (NRDC) expressed opposition to the argument that channel modifications precluded attainment of the designated MUN use.[95] The RWQCB contended that the channel modifications in fact did preclude the use of these surface waters as sources of drinking water. The RWQCB stated that if in the future there were plans to divert the flows to recharge basins, then the groundwater recharge (GWR) designation would be appropriate.[96] Consistent with these arguments, it was proposed that the San Gabriel River and Coyote Creek be de-designated for MUN[97] because the large point source dischargers in the region (POTWs) already exceed their required level of treatment, and stormwater dischargers are required to implement reasonable best management practices under existing permits. Yet, these controls have not resulted in the attainment of water quality suitable for MUN use.[98]

Economic concerns were raised in 1999 in comments opposing the RWQCB's proposed *Basin Plan Amendment Revising Beneficial Use Designations for Selected Surface and Ground Water Bodies*. The Natural Resources Defense Council (NRDC) cited the Clean Water Act, which requires economic analysis as one criterion for de-designation, arguing that the RWQCB did not provide adequate economic and other rationales for de-designation.[99] At the February 3, 1999 State Board Workshop, the County Sanitation Districts of Los Angeles County (LACSD) pointed out that the cost of the "no action" alternative (maintenance of the MUN designations) to the proposed

---

[94] Ibid at p. 3.

[95] See Heal the Bay and Natural Resources Defense Council letter to Dennis Dickerson RWQCB dated October 12, 1998. HTB and the NRDC opposed de-designation pursuant to Section 40 CFR 131.10(g)(4), which states that: "de-designation of uses may occur when hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such a modification in a way that would result in the attainment of the use."

[96] 1998 *Changes in Beneficial Use Designation for Selected Waters Comments and Responses,* RWQCB, at p. 3.

[97] Ibid.

[98] 1998 *Changes in Beneficial Use Designation for Selected Waters Comments and Responses,* RWQCB, at p. 3.

[99] See letter from Steve Fleischli and Alex Helperin of the Natural Resources Defense Council to the State Water Resources Control Board, dated February 8, 1999: "The federal regulations specifically provide for consideration of such factors, in Section 131.10(g)(6). However, as is clear from the record, the Los Angeles Regional Water Quality Control Board ("Regional Board") issued the Proposed Amendment under Section 131.10(g)(4), not 131.10(g)(6). As a consequence, there was no analysis - or even any evidence presented - on the economic questions. The Regional Board did not even mention 131.10(g)(6) at any point in its presentation or in its own analysis. In short, the Board has <u>not</u> relied on economic factors in support of its decision."

amendment would be substantial.[100] The RWQCB maintained that the exemption criteria found in the State Board Resolution were the basis for the initial stages of this Basin Plan amendment. Economic concerns, although addressed by LACSD and NRDC comment letters, were viewed as secondary to the fact that the surface waters proposed for dedesignation were designed or modified to collect industrial wastewaters and/or storm water runoff, thereby meeting criterion 2(a) of State Board Resolution No. 88-63.[101]

Several commenters expressed concern about the criteria set forth in 40 CFR 131.10 (h) that prohibit de-designation when the beneficial use can be met through limits required under 301(b) and 306 of the Clean Water Act.[102] De-designation of MUN uses was also characterized in some comment letters as a reduction in water quality standards.[103] The RWQCB staff report regarding de-designation of the affected water bodies noted that the exemption criteria of the Sources of Drinking Water Policy were applicable because the surface waters proposed for de-designation were designed or modified to collect industrial wastewaters and/or storm water runoff. Consequently, the requirements of CFR 131.10 (federal requirements for removal of designated uses) were met.[104] The Resolution to de-designate the eight surface water bodies was subsequently approved by the State Water Resources Control Board on February 18,1999 (State Board

---

[100] See letter from Sharon Green of LACSD to Dennis Dickerson of the LARWQCB dated October 9, 1998 at p. 6: "[I]n terms of regulatory requirements anticipated in the near future associated with the MUN use, we expect that compliance costs could be significant. For instance, we project that we would have to add reverse osmosis treatment at the Long Beach, Los Coyotes, and San Jose Creek WRPs to comply with several of the human health criteria for water and organisms. It is estimated that this treatment could result in as much as $217 million in capital costs, with up to $48 million in annual operations & maintenance costs. If the MUN use did not apply, it is anticipated that those costs could be avoided." See also the October 22, 1998, State Water Resources Control Board's *Changes in Beneficial Use Designations for Selected Waters Comments and Responses* at p. 7. The RWQCB responded to LACSD by noting the comment.

[101] October 28, 1998 Response to Written Comments on a Proposed Amendment to the Water Quality Control Plan to incorporate "Changes in Beneficial Use Designations for Selected Waters" at p. 10. "Staff disagree that the August 28, 1998 Staff Report specifically stated that the exemption criteria found in State Board Resolution No. 88-63 do not need to be met. Be that as it may, staff points out that these criteria were the basis for the initial stages of this Basin Plan amendment and staff believes that all waters proposed for dedesignation comply with one or more of the exemption criteria set forth in State Board Resolution No. 88-63. All surface waters proposed for dedesignation were designed or modified to collect industrial wastewaters and/or storm water runoff, thereby meeting criteria 2(a) of State Board Resolution No 88-63."

[102] See Heal the Bay and Natural Resources Defense Council letter to Dennis Dickerson RWQCB dated October 12, 1998.

[103] See letter from Jacqueline Lambrichts of Friends of the Los Angeles River to Mary Jane Forster of the State Water Resources Control Board dated Tuesday, February 16, 1999. "In your deliberations and vote this upcoming Thursday, please consider not supporting the de-designation of the Lower San Gabriel River from MUN Beneficial Uses designation. The following support this position: MUN de-designation will reduce the water quality standards, resulting in the potential for increased pollution."

[104] See August 28, 1998 Staff Report entitled *Revised Beneficial Use Designations for Sources of Drinking Water* at p. 5.

Resolution 99-20) and transmitted to the Office of Administrative Law (OAL) for review on June 2, 1999. The OAL, however, did not approve the resolution.[105]

In May 2000, the EPA approved the 1994 Los Angeles Basin Plan in its entirety but required that the asterisked MUN designated uses be immediately enforced.[106] In August 2000, LACSD, in conjunction with the Cities of Los Angeles, Burbank, and Simi Valley, filed a lawsuit against the EPA with regard to the agency's action regarding the asterisked MUN designations. On December 5, 2001, the U.S. Federal District Court issued an order in favor of the plaintiffs, effectively invalidating EPA's action. As a result, the EPA submitted a letter to the state in February 2002 that affirmed that any potential drinking water supply beneficial uses in the Basin Plan had no legal effect, and therefore should not be used to set effluent limitations in NPDES permits.[107]

Despite the court's decision, ambiguity remains concerning the MUN designations in the Los Angeles Basin Plan and implementation of water quality objectives for MUN-designated waters. For example, it remains unclear whether storm flows in MUN-designated channels will be expected to meet water quality objectives for MUN use, or whether a Section 13241 analysis was ever conducted for the application of MUN-triggered water quality objectives to storm flows. Additionally, it is not clear that remaining MUN designations (those without the asterisk in the 1994 Los Angeles Basin Plan) represent uses that existed after 1975 or that they comply with the State Sources of Drinking Water Policy.

---

[105] California Regulatory Notice Register 99, Volume No. 32-Z at p. 1529. State of California Office of Administrative Law AOL File No. 99-0602-01. The OAL did not approve the resolution for the following reasons:

1. The administrative record does not contain substantial evidence to demonstrate that the removal of the municipal and domestic (MUN) beneficial use designation from the specified parts of the eight surface water bodies is allowed under 40 CFR 131.10 (g)(4).
1. The Regional Board's position that physical preclusion of the use attainment resulting from the concrete lining renders the issue of attainment of drinking water quality moot appears to be inconsistent with the prohibition of removal in 40 CFR 131.10(h).
1. The Regional Board's response to public comments does not comply with the public participation requirements of the Federal Water Pollution Control Act (33 U.S.C. Sec. 1251 et seq.).

Significantly, it should be noted that both the RWQCB and the SWRCB found that these Los Angeles Region de-designations did meet the exception criteria in the State Sources of Drinking Water Policy; the Office of Administrative Law did not disapprove that finding.

[106] May 26, 2000 letter from Alexis Strauss, USEPA, to Edward C. Anton, Acting Executive Director, California State Water Resources Control Board.

[107] See Order granting plaintiffs' motion for summary judgment and remanding action to EPA, No. CV 00-08919 R(RZx), City of Los Angeles et al. v. United States Environmental Protection Agency…, dated December 18, 2001. See also letter dated February 15, 2002, from Alexis Strauss, USEPA Region IX, to Celeste Cantu, Executive Director, California SWRCB: "…waters identified with an ("*") in Table 2-1 do not have an MUN as a designated use until such time as the State undertakes additional study and modifies its Basin Plan." EPA also stated that this conditional use designation has no legal effect.

Beneficial use designations for flood control channels, concrete-lined channels, and water bodies with limited access. The 1994 Los Angeles Basin Plan contains multiple beneficial use designations for concrete-lined channels, including contact and non-contact recreation (REC-1 and REC-2) and habitat designations. These designations were first advocated in Basin Plan revisions proposed by the RWQCB in November 1978, with the understanding that they would be reconsidered if warranted by available evidence.[108] The City of Burbank commented on the proposed 1978 beneficial use designations, stating that it disagreed with the REC-2 designation for the Burbank Western Drain, a deep rectangular concrete channel that is fenced along its entire length.[109] The City of Burbank also recommended changes to beneficial use designations (including recreation and habitat designations) for the Burbank Western Drain and for the Los Angeles River.[110]

Many of these issues were raised again during the 1994 Basin Plan revision process. Within the 1994 Basin Plan, most water bodies were assigned potential (P) or existing (E) REC-1 and/or REC-2 designations, even though the 1993 study upon which many beneficial use designations were ostensibly based recommended either no or only potential (P) REC-1 uses, respectively, for several of the region's water bodies.[111] The

---

[108] See memo from RWQCB to Interested Persons, dated December 20, 1978: "At its November 27, 1978, meeting the Regional Board adopted revisions to the Water Quality Control Plan for the Los Angeles River Basin (4B). That adoption included an amendment to designate beneficial uses for selected lined flood control structures, whereby recognition was provided for these watercourses having the potential to support warm freshwater and wildlife habitats. However, the Board took this action with the understanding that staff could request reconsideration of this issue for any watercourse if available documentation so warranted."

[109] See letter from City of Burbank to RWQCB, November 21, 1978: Re: the Burbank Western Drain: "We are in agreement with all the proposed designations with the exception of … REC-2…The Burbank Western Drain is a deep rectangular concrete channel. Fencing along the entire length of channel exists on top of the sidewalls prohibiting entry. The channel by itself provides none of the recreational uses listed under REC-2 for either present or potential beneficial uses…However, the physical nature of this right-of-way [adjacent to the channel] severely limits this possibility [of bicycle paths]… Any access to the channel, now or in the future, is virtually impossible."

[110] See letter from City of Burbank to RWQCB, dated May 15, 1978.

[111] See Saint, P.K., Hanes, T.L., and Lloyd, W.J., *Waterbodies, wetlands, and beneficial uses in the Los Angeles Region, a report presented to L.A. Regional Water Quality Control Board, Volume 1: Waterbodies and their beneficial uses*, 1993. Note that this report was not provided as part of the administrative record but was produced only after a specific request. This report was commissioned by the RWQCB "to survey and research beneficial uses of all waterbodies throughout the Region" (see 1994 Basin Plan at p. 2-3). Examples of beneficial uses from the 1994 Basin that are inconsistent with the recommendations of Saint et al. (1993) include: Saint et al. recommended no REC-1 designation for the Burbank Western Channel (405.21), while the 1994 Basin Plan lists this water body as potential (P) REC-1 with a footnote stating that access is prohibited by Los Angeles County DPW in concrete-channelized areas. Saint et al. recommended no REC-1 designation for Lower Van Norman Reservoir (405.21), which is assigned an existing (E) REC-1 use in the 1994 Basin Plan. Another example is the Los Angeles River (reach 405.15), which Saint et al. recommended be given a potential (P) REC-1 designation, but which carries an existing (E) REC-1 designation in the 1994 Basin Plan, again with a footnote stating that access is prohibited by Los Angeles County DPW.

City of Burbank again questioned the application of the REC-2 (intermittent) and MUN, WARM, and WILD (potential) designations for the Burbank Western Channel.[112] Similarly, the City of Los Angeles and Department of Public Works questioned the recreational designations for the Los Angeles River (both REC-1 and REC-2), particularly where access is limited.[113] Several commenters also questioned the basis for habitat designations. Finally, concerns have been expressed that the designation of certain beneficial uses for flood control facilities are inconsistent with the "operating parameters and function" of the facilities.[114] Although many of these concerns were recognized by the RWQCB in 1978,[115] the Los Angeles Basin Plan has not been modified to reflect the inconsistencies in these dual uses.

---

[112] See letter from City of Burbank to Dr. Robert P. Ghirelli, RWQCB, January 31, 1994: "We question whether the existing physical nature of the Burbank Western Channel, flow quantities and source of waters carried in this channel could support the beneficial uses cited above."

[113] Letter from City of Los Angeles to Deborah J. Smith, RWQCB, February 1, 1994: "…the Los Angeles river was modified with concrete bottom and side slopes by the U.S. Army Corps of Engineers to control storm water flows, and as such there was no intention for the river to be utilized as a recreational area as defined. Portions of the river may occasionally be utilized by a limited number of individuals in a REC-1 capacity, although this was clearly not the intent when the channel bottom and sides were concreted. As there appears to be limited potential to modify existing conditions to create a situation where a REC-1 designation would apply, we request that the REC-2 designation be assigned as it more accurately reflects the river's actual and potential recreational uses." See also comments submitted by CLADPW on May 26, 1994: "We believe that the CRWQCB's claim that it needs to protect uses which occur despite fences and prohibitions is incorrect. Fences and prohibitions exist on our facilities for reasons of public safety and health, and violators are subject to prosecution under the law. We do not believe that the CRWQCB has the authority to encourage or sanction illegal activities by designating inappropriate beneficial uses to facilities where such uses are legally and properly prohibited."

[114] See, e.g., letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB, May 26, 1994, and attachments: "The designation of beneficial uses …[by the RWQCB]…on the LACDPW's flood control facilities are often inconsistent with the operating parameters and function of the facilities. The Plan does not address this concern in many places with regard to recreational uses. It should reflect that revision for all concrete-lined flood control channels under our jurisdiction…No concrete-lined flood control channels should have designations for the following existing, intermittent, or potential beneficial uses: Groundwater Recharge (GWR) Support of Habitats (AQUA, WARM, COLD, SAL, EST, WET, MAR WILD, BIOL, RARE, MIGR, SPWN, and SHELL)…We have always disputed the CRWQCB's designation of "potential" beneficial uses to flood control channels and will continue to do so because we believe the designations were incorrect in 1975 and are still incorrect."

[115] See RWQCB notes from Paul Martyn to Ray Hertel Re: Basin Plan Update (4B), undated (likely from August 1978): "The LACFCD [Los Angeles County Flood Control District] reservoirs were constructed to conserve water, entrap sediment and control flooding from storm flows. It is of paramount importance that these facilities be cleaned on a periodic basis in order to maintain their effective capacity. In addition…, these reservoirs must be drawn-down before the winter rains so as to provide storage capacity. Both these operations are not necessarily conducive to the maintenance of either COLD or WARM habitats; however, without such maintenance procedures, these reservoirs would eventually cease to function as viable waterbodies. Therefore it is desirable to incorporate wording in the beneficial use table, whereby COLD and WARM habitats in such facilities will be recognized as being of secondary importance. The following wording was suggested: 'The existence of an aquatic habitat in this reservoir is incidental to its operation as a flood control/water conservation structure.'"

In response to comments, the RWQCB stated that the federal Clean Water Act includes the goal that all waters of the nation be designated swimmable (i.e., REC-1) and fishable (i.e., WARM, COLD, EST, or MAR), and that a formal exemption via a use attainability analysis is required for any water body not so designated. The RWQCB further contended that "uses that are or have been attained since 1975…are required to be designated including activities that are illegal such as homeless bathing in the Los Angeles River." Finally, the RWQCB argued that "all waterbodies of the region, including concrete lined channels, are considered waters of the state and of the nation, by definition (per USEPA guidance)."[116]

The RWQCB position fails to consider the economic and other required implications of these designations. Additionally, the designations fail to account for flow conditions. For example, recreational uses are highly unlikely during periods of wet weather, when conditions within flood control channels are dangerous. During such high flow periods, enforcement of water quality objectives related to recreational uses will generate virtually no public health benefits despite substantial expense. The RWQCB's failure to include flood control as a beneficial use, or to even consider flood control needs when establishing other beneficial uses, impairs the function of flood control facilities and potentially endangers lives and property within the region.

Implications of potential beneficial use designations. The administrative record demonstrates that the RWQCB's position on potential beneficial uses has changed significantly over time. In the earliest iterations of the Los Angeles Basin Plan, fewer potential designated uses were assigned, and it appears that the RWQCB at that time did not intend to require water bodies with potential beneficial use designations to meet the associated water quality objectives.[117] In fact, in the proposed 1978 revisions to the present and potential beneficial uses contained in the Basin Plan for the Los Angeles River Basin (4B), the RWQCB included language specifying that potential beneficial

---

[116] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the April 28, 1994 DRAFT Water Quality Control Plan, Los Angeles Region*, June 13, 1994, at p. 6.

[117] See, e.g., undated file notes (likely from December 1978) from Paul Martyn to Ray Hertel Re: Basin Plan Revisions: "The proposed deletions [deletions of WARM and WILD designations and use of a "P" potential designation for these uses in certain channels] do not change existing water quality standards, as potential designations are not recognized in the preparation of waste discharge requirements…a potential designation could be used as a catalyst for needless additional protection." See also file notes (likely from May 1976) from Paul Martyn to Ray Hertel Re: Draft Revisions to the Water Quality Control Basin Plan 4B: "F&G [Department of Fish and Game] tentatively agreed to our potential designations if a general wording is placed in the Basin Plan to account for last minute discoveries of habitats in affected reaches during permit adoption processes. Specifically, if F&G determines a habitat does exist where only a 'P' was listed and we concur, then during the waste discharge adoption process we would strengthen the requirements without modifying the Basin Plan beneficial uses."

uses were only to be regulated via point source waste discharge requirements as those uses were actually attained.[118]

Despite this background and express intent, the EPA specified that all beneficial uses were to be protected according to the designation itself and without regard to qualifiers (e.g., existing, intermittent, and potential).[119] The SWRCB affirmed to EPA in a February 8, 1980 letter that the EPA's position would be enforced. The RWQCB acknowledged in response to the EPA's comments and the SWRCB's letter that the RWQCB's original implementation policy for existing and potential uses was intentional and had informed such designations in the Basin Plan.[120] Yet, the EPA and SWRCB effectively converted what the RWQCB explicitly intended to be unenforced "potential" designations into immediate enforcement priorities. This unintended result has never been addressed or corrected in subsequent Basin Plans, nor has a Section 13241 analysis been done to assess this change in interpretation.

Many parties have commented on the potential beneficial use designations contained in the 1994 Basin Plan revisions. For example, CLADPW commented that many of the potential beneficial uses in the Plan are neither realistic nor consistent with the current functions of the region's infrastructure.[121] Extensive comments submitted by the County Sanitation Districts of Los Angeles County (LACSD) request that the

---

[118] See *Present and Potential Beneficial Uses, Proposed Revisions, October, 1978*: "The footnotes in the table of beneficial uses identify existing physical constraints (such as structural modifications, flow characteristics, accessibility) in water bodies or identified reaches thereof which prevent or effectively impede the attainability of the beneficial uses as footnoted. In the formulation of waste discharge requirements these limitations are taken into account. The waste discharge requirements will protect the listed beneficial uses as they are attained. This is in harmony with the intent of the Board to require that degree of treatment consistent with state and Federal guidelines but not to impose further treatment beyond these guidelines except where the Board finds such further treatment is warranted to protect attained and readily attainable beneficial uses."

[119] See USEPA comment letter to Carla Bard, SWRCB, dated January 9, 1980, with the following language in an attachment (which is dated November 1979): "It is our understanding that the use designations of 'E' (existing), 'I' (intermittent), 'P' (potential), or 'A' (anticipated) have value in the fact that they identify the present relation of the use to the water referenced. We further understand that when designated as 'E', 'I', 'P' or 'A', the water is to be protected at all times for the beneficial use and that there is no difference in value between the designations."

[120] File notes from Tom Schaffer to Ray Hertel, February 19, 1980: "Note: SWRCB's response to EPA says EPA's understanding that 'E', 'P', and 'I' applied to beneficial uses have no difference in value. The last paragraph of our justification (see attached last sheet [referenced in footnote 118]) <u>does</u> show a difference." (emphasis in original)

[121] Letter from Dave Yamahara, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB, February 2, 1994: "Many of the beneficial uses designated in this plan as 'existing uses' are not practical. Many of the 'potential' beneficial uses of various water bodies are neither realistic, in a technical or financial sense, nor are they consistent with the current functions of the existing infrastructure…the designation of many of our existing channels as potential municipal and domestic sources of potable water is not reasonable…It is crucial that beneficial designations be carefully and appropriately established, to avoid confusion and impractical regulations that may not be implementable."

RWQCB clarify the meaning of potential uses, noting that Porter-Cologne requires the designation of probable beneficial uses, which may be quite different than potential beneficial uses.[122] Other parties have submitted similar comments[123] and noted specific cases where the potential designation seemed inappropriate.[124]

In its responses to comments, the RWQCB stated that "'potential' is the term that has been used since the original 1975 Basin Plans."[125] But the RWQCB's response failed to acknowledge that when such potential uses were first developed, it was never intended that water quality objectives would be enforced to protect such uses. The RWQCB has also stated that "'probability' can be considered in site-specific circumstances in setting

---

[122] See comment letter from Robert P. Miele, LACSD, to Deborah J. Smith, RWQCB, February 4, 1994, with enclosures. "What does 'potential' use mean? The list of possibilities included [in the Basin Plan] is quite broad, and the likelihood of these occurring range [sic] from probable to unlikely. We believe that this broad range is inappropriate, and that the definition should be more precise. How are factors…that may limit attainment of beneficial uses, such as physical or biological modifications, considered in designating potential beneficial uses? Such limiting factors should be considered when setting water quality objectives; otherwise, requiring attainment of chemical water quality objectives may be a futile – and costly – exercise. The Porter-Cologne Water Quality Act directs the Regional Boards, in setting water quality objectives, to consider the 'past, present, and *probable future* beneficial uses of water.' (§13241) (emphasis added) This suggests that the term 'probable' may be a more accurate representation of the intent of the Porter-Cologne Act than 'potential.'" See also comments from Robert P. Miele, County Sanitation Districts of Los Angeles County, to Deborah J. Smith, RWQCB, May 27, 1994: "In our previous comments, we expressed concern regarding the meaning and application of beneficial use designations applied as 'potential' uses. We continue to be troubled by the wide range of meanings offered by the Board, and lack of clarification given as to how designation of a potential use affects water quality objectives and effluent limitations in permits…We believe that this broad range of reasons for designation of a use as 'potential' is inappropriate…Legally, we believe that both the Clean Water Act and the Porter-Cologne Water Quality Act provide the flexibility necessary for a reasonable, more realistic interpretation of the term 'potential.' **Therefore, we recommend that the explanation of potential uses on p. 2-1 (and the application of it in Table 2-1) be modified to reflect only those potential uses that are: 1) planned in the reasonably foreseeable future, and 2) not precluded by institutional, physical, thermal, biological, or other factors affecting the waterbody**." (emphasis in original)

[123] See, e.g., comments from County of Los Angeles Department of Public Works to Deborah J. Smith, RWQCB, February 17, 1994: "The Basin Plan does not include the criteria used in determining how a particular beneficial use is designated for a waterbody. The Federal Clean Water Act (CWA) calls for the designation of 'probable potential beneficial uses' (emphasis added) while the Basin Plan employs the undefined term 'potential beneficial use,' (i.e., it leaves out the word 'probable')…The Basin Plan does not explain how its beneficial use designations specifically conform to the objectives of the CWA…"

[124] See, e.g., comments from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, RWQCB, May 26, 1994: "In addition, the CRWQCB's reference to the re-configuration of the Los Angeles River to provide for greater recreation should also include that such action is not definite, and that public safety will be the primary consideration in any re-configuration plan for a flood control channel. Until a formal plan is actually adopted by the entities charged with the responsibility of providing flood control, recreational uses do not yet meet the CWA's criterion of 'attainability' and thus cannot be considered 'potential.' Therefore, we believe the Plan's designation of potential or existing recreational beneficial uses to the Los Angeles River is inappropriate."

[125] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the December 29, 1993 DRAFT Water Quality Control Plan, Los Angeles Region*, April 28, 1994, at p. 15.

effluent limits, cleanup levels, and water quality objectives"[126] and that EPA guidance "is broad and includes those uses that reflect the *goals* of the Clean Water Act and other polices [sic] and regulations."[127] (emphasis in original)

To date, the administrative record shows that the RWQCB has failed to clarify the requirements for potential designations or to correct the historically unintended enforcement of such designations by means of water quality objectives. The RWQCB also apparently failed to conduct a Section 13241 analysis for the application of water quality objectives to potential beneficial uses. Although protecting potential beneficial uses is likely to be expensive and to pose considerable technical challenges (e.g., if bacterial standards are enforced for stormwater in channels, such as the Burbank Western Channel, that are designated potential REC-1), it is unlikely that any significant benefits will be derived from protecting uses that are highly unlikely to ever be achieved.

Beneficial uses in effluent-dominated streams. Within the Los Angeles Region, many water bodies would be dry (or nearly dry) during the dry season if not for the discharge of treated effluent to these streams. The Basin Plan record shows that, because such watercourses experience flows due to effluent discharges, the RWQCB has increasingly designated them for potential and existing beneficial uses that would otherwise not occur. Paradoxically, however, enforcement of water quality objectives associated with such new beneficial uses may preclude the effluent flows that give rise to the designations in the first place. In addition, there is concern as to whether designation "requires" the maintenance (i.e., the delivery) of water flows in effluent-dominated channels in lieu of use of the water (commonly called "reclaimed" or "recycled" water) for other purposes (e.g., irrigation).

In its review of the 1975 Los Angeles Basin Plan, the EPA requested that the state upgrade beneficial use designations for streams that are augmented by year-round reclaimed water discharges.[128] The California Department of Fish and Game addressed related issues in its Wastewater Reclamation Policy, issued August 10, 1976. This policy specified that, "in streams or lakes where permanent surface water would not exist without discharge of reclaimed water, the quality of reclaimed water for protection of fish and wildlife need not necessarily meet as stringent criteria as for discharge to the existing permanent waters," but instead must satisfy certain basic criteria.[129] The policy also

---

[126] Ibid.

[127] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the April 28, 1994 DRAFT Water Quality Control Plan, Los Angeles Region*, June 13, 1994, at p. 5.

[128] See Enclosure 3 to the letter from Russell Freeman, USEPA, to Edmund G. Brown, Jr., State of California, April 16, 1976: "Therefore, as part of the continuing planning process, the beneficial uses of intermittent streams in this basin which will be augmented by year-round wastewater discharges to provide continuous stream flow should be upgraded to reflect additional potential uses such as warm and cold water fish habitat, fish migration, and spawning."

[129] See California Department of Fish and Game Wastewater Reclamation Policy, August 10, 1976: "…In streams or lakes where permanent surface water would not exist without discharge of reclaimed water, the quality of reclaimed water for protection of fish and wildlife need not necessarily meet as stringent criteria

stated that other beneficial uses (e.g., agricultural irrigation, groundwater recharge, etc.) should take precedence over stream flow augmentation or creation of new lakes "except when (1) a designated rare or endangered species will be adversely affected; (2) the overall negative instream impacts to fish and wildlife habitat would be greater than the overall benefits to fish and wildlife gained from the proposed consumptive use of reclaimed wastewater; or (3) a population of fish or wildlife species will be lost without compensation as a result of stream flow cessation or reduction resulting from wastewater reclamation project operation."[130]

As early as April 1976, interested parties expressed concern that revised designations would obligate reclaimed water producers to meet higher restrictions to preserve the designated beneficial uses they were generating in the first place.[131] Similar concerns were raised in comments on the 1994 Basin Plan revisions[132] and some parties suggested the creation of a new beneficial use category for effluent-dominated waters.[133]

---

as for discharge to the existing permanent waters, but must satisfy the following: 1) Reclaimed waters discharged shall be free of substances in amounts acutely toxic to aquatic life (including all forms, e.g., plankton, insect larvae, other invertebrates, fish and mammals) or wildlife, 2) shall not contain bioaccumulatory substances in amounts known to be detrimental to biota or capable of rendering aquatic life or wildlife unfit for human consumption, 3) shall provide for the sustenance and maintenance of aquatic life and/or wildlife resources, and 4) shall meet standards imposed by the State Department of Public Health."

[130] Ibid.

[131] See RWQCB file notes from Larry [Meyerson] to John Joham (re our Plan amendments), dated April 21, [1976]: "Maint. of rare species in some streambeds may require higher restrictions and prevent use for recharge conveyance. Some conveyance channels carry only water for spreading, Replen. Dist. doesn't want to be in position of having to maintain flows to preserve these uses." See also Letter from John G. Joham, Jr., Central and West Basin Water Replenishment District, to Raymond M. Hertel, RWQCB, October 25, 1976, quoting earlier April 20, 1976 letter: "In many of the cases, the stream flow which would appear to make possible the consideration of maintenance of fish and wildlife is the imported and/or reclaimed water on its way to the spreading grounds. Therefore, it seems to me that the Replenishment District could end up in a position of placing water in what would otherwise be a dry stream channel; then have it said that, by virtue of flow in the channel, the maintenance of fish and wildlife would be reasonable; as a result have standards set which require better water quality than the imported and/or reclaimed water; and, therefore, have the use of the channel for conveyance of imported water and/or reclaimed water not compatible with the objectives. Such a result would obviously be ridiculous."

[132] See, e.g., letter from John W. Elwell, Camarillo Sanitary District, to Debra J. Smith, RWQCB, February 3, 1994: "In our view, these systems [effluent-dominated streams] should not be regulated carte blanche with the same standards that are applied to perennial streams wherein flow is predominately [sic] from natural rather than man-made sources. The Board should strongly consider setting site specific limits for wastewater facilities…that discharge into effluent-dominated streams… Before establishing beneficial uses for an effluent-dominated stream, the Board should consider the practicality of designating each beneficial use for the effluent-dominated stream." These comments also noted that the RWQCB is required to take economic impacts and environmental considerations into account when setting standards for effluent-dominated streams.

[133] See letter from Donald H. Nelson, City of Thousand Oaks, to Deborah J. Smith, RWQCB, January 26, 1994: "The Basin Plan does not address effluent-dominated waters or effluent created ecosystems (EDWs)…A formal means to deal with EDWs is necessary to allow beneficial regional planning and project development activities to proceed. The Basin Plan must explicitly recognize these effluent-

Other comments contended that beneficial uses assigned to effluent-dominated streams were contraindicated by the very presence of the effluent flows.[134]

In response to these concerns, the RWQCB stated that "the issue of effluent- or reclaimed water-dominated streams will be placed on the Triennial Review list for the next Basin Plan update."[135] The RWQCB also stated that "the Board will consider site-specific beneficial uses and other conditions when establishing effluent limits on a case-by-case basis for individual dischargers, or in the future, on a watershed basis."[136]

Although the RWQCB committed to revisiting these issues, the administrative record contains no evidence that they were addressed. As a result, the contradictions between effluent discharge stream flows and designations that undermine the maintenance of such flows remain in the Basin Plan.

Conflicts between beneficial use designations and the intended uses. In several cases, a designated beneficial use may not be appropriate for a given water body, either (1) because enforcement of the water quality objectives associated with that use would preclude the use or (2) because the use would impair the quality of the water for its intended purposes.

An early example of such a conflict is the potential beneficial use designation of WARM within Coyote Creek. In 1978, the Department of Fish and Game requested a WARM designation for Coyote Creek due to the presence of tilapia, a non-native, warm water fish introduced in 1973 to control benthic midges. According to DFG, these fish reproduced within the tidal prism and migrated upstream during warm weather periods.

---

dominated waters and created systems, acknowledging that they are unique and warrant site specific consideration and management techniques…the Basin Plan needs to address how such EDWs will be managed for the greatest all-around benefit. The City of Thousand Oaks, in its specific comments, is proposing a new use designation, **Reclaimed Water-Created Aquatic Ecosystems (RWC)**, that will provide the flexibility to achieve this goal." (emphasis in original)

[134] Letter from Ora E. Lampman, City of Burbank, to Robert P. Ghirelli, RWQCB, January 31, 1994: "We don't believe that the GWR, REC-1 and WARM are the existing beneficial uses in the stream [the Los Angeles River]. This contradicts the statements in Page 1-9 which states [sic] that, generally, the flows in the stream are dominated by tertiary treated wastewater effluent from the municipal wastewater treatment plants, urban runoff, and rising ground water in the unlined reaches of the stream."

[135] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the December 29, 1993DRAFT Water Quality Control Plan, Los Angeles Region*, April 28, 1994, at p. 16. Although identified as a high priority for consideration in the 2001 triennial review priority list, determination of the "most appropriate approach to address effluent and agriculturally dominated water bodies" is not being addressed in the 2001 Triennial Review. See California Regional Water Quality Control Board, Los Angeles Region, Staff Report: 2001 Triennial Review: Prioritization of Basin Planning Issues, April 16, 2001, at p. i and p. 24.

[136] Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the December 29, 1993DRAFT Water Quality Control Plan, Los Angeles Region*, April 28, 1994, at p. 32.

Thermal discharges from power plants ensured the survival of the tilapia during winter periods.

The administrative record demonstrates that the RWQCB understood that a WARM beneficial use would preclude the discharge of treated effluent, including the warm power plant water, that actually sustained the tilapia. The temperature water quality objective for a WARM beneficial use specifies that a discharge shall not raise receiving water temperatures by more than 5ºF, a standard that would be violated by the power plant discharges during winter months. The RWQCB noted that "[this] situation is particularly ironic in that the LBWRP effluent would stabilize temperatures below the point of discharge and could possibly allow for the year-round presence of tilapia within the creek."[137] Coyote Creek currently carries a potential (P) WARM designation in the 1994 Basin Plan.

Operators of reclaimed water facilities have pointed to a similar potential conflict in the Basin Plan. As detailed above, reclaimed water in various water bodies, even water bodies constructed explicitly for the storage of reclaimed water, can result in designations for habitat and other beneficial uses. The water quality objectives for these beneficial uses, however, often require a higher degree of treatment (i.e., "better" water quality) for the reclaimed water than would be required in the absence of the designations. As a result, to protect the beneficial uses created solely by reclaimed water discharges, reclaimed water producers would have to illogically cease making the very same discharges or treat to a level that may provide no tangible benefit to the environment.

A similar contradiction results from Basin Plan use designations for drinking water supply reservoirs, some of which are open to the environment (uncovered). Although public access to these reservoirs is strictly prohibited, most have been designated for potential REC-1 and/or REC-2 uses by the RWQCB. As a result, they are regulated to protect potential uses that are not compatible with their actual functions and which will almost certainly never be allowed. Operators of the affected reservoirs have repeatedly stated in the record that these water bodies should not be regulated as "waters of the State" or "waters of the nation" because they are part of a closed water distribution system[138] and that recreational uses would result in the degradation of water quality.[139]

---

[137] See RWQCB file notes from Paul Martyn to Ray Hertel, undated (likely August 1978).

[138] See, e.g., letter from Bruce Kuebler and J. Alan Walti, Los Angeles Department of Water and Power (LADWP), to Robert P. Ghirelli, RWQCB, February 15, 1994: "The reservoirs and forebay proposed or currently listed in the Table of Inland Surface Water Bodies of the Basin Plan that are owned and operated by the LADWP are not 'waters of the state' and should be deleted from Table 2-1 and Table 4-20. The reservoirs are integrated components of a treated, closed domestic supply system and are not open to other waters of the state…Complete maintenance and operational flexibility for these reservoirs, as with any other part of our distribution system, … is essential to meet varying demands and seismic safety."

[139] Letter from James A. Noyes, County of Los Angeles Department of Public Works, to Deborah J. Smith, February 17, 1994: "The Basin Plan states that recreational use has contributed to the degradation of the Los Angeles Region's surface waters. However, the Basin Plan's attempt to increase recreational activity around certain waterbeds by designating 'potential' recreational 'beneficial uses' to them would seem to

In its response to such comments, the RWQCB has stated that "these waterbodies are and have previously been considered waters of the state…they are not 'closed' to the environment and support several beneficial uses. In most cases, existing natural streambeds and washes were dammed up or lined with concrete to create these facilities."[140] The RWQCB has also noted that "the Regional Board shares the concern that these important waterbodies be protected from contamination. All impoundments of water (open to the environment), however, are considered waters of the nation according to USEPA guidance, with the exception of certain wastewater facilities. These waterbodies are often impoundments of portions of natural watersheds that prior to damming would have had beneficial uses and potentially in the future, if these reservoirs are abandoned, would be designated a full complement of beneficial uses…These reservoirs are designated as 'P' [potential] for REC1 use because the Clean Water Act includes the goal that all waterbodies have swimmable and fishable goals."[141] Although these statements recognize the problem of conflicting designations, they do not resolve the practical issues surrounding the designation of potential uses for reservoirs that cannot support those uses, nor do they recognize that "fishable/swimmable" uses are required by the Clean Water Act to be designated "wherever attainable."

D. Interpretation Of The Tributary Rule

Most of the inland surface waters within the Los Angeles Region are subject to several beneficial use designations. The Basin Plan contains a rule, however, that can be read to extend the designated uses to virtually every water body's tributary system (i.e., extending the downstream uses to the upstream tributaries). The Plan also provides that "those waters not specifically listed (generally smaller tributaries) are designated with the same beneficial uses as the streams, lakes, or reservoirs to which they are tributary."[142]

---

have the effect of degrading waters even further, which would appear to be in conflict with the Basin Plan's very goals of improving water quality." Letter from Gary H. Yamamoto, California Department of Health Services, to Robert Ghirrelli, May 26, 1994: "The 'finished water' distribution reservoirs are part of a clearly defined drinking water distribution system and serve as 'open' storage tanks…Water in these reservoirs is considered to be of 'finished quality' because it has received prior treatment at approved water treatment facilities to meet all federal and state drinking water standards. Water from these reservoirs is served directly to residents and businesses without further treatment other than chlorination. As such, public access to these distribution reservoirs and surrounding watershed is strictly prohibited by this Department…These reservoirs should not be included as waters of the state…Our primary concern is the beneficial use designations, REC1 and REC2. Beneficial uses of recreation and drinking water are incompatible for distributions reservoirs…If recreational activities were allowed then water from these reservoirs could no longer be used for drinking and domestic purposes."

[140] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the December 29, 1993 DRAFT Water Quality Control Plan, Los Angeles Region*, April 28, 1994, at p. 22.

[141] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the April 28, 1994 DRAFT Water Quality Control Plan, Los Angeles Region*, June 13, 1994, at p. 9.

[142] See 1994 Los Angeles Basin Plan at p. 2-4.

This policy is commonly called the "tributary rule." Because pollutant concentrations may decrease as a result of dilution or via physical and chemical transformations, it is important to consider downstream impacts prior to applying downstream beneficial uses to tributaries. The Los Angeles RWQCB's approach gives rise to numerous problems noted in the administrative record, including questions about which tributaries are properly classified as "waters of the state," (e.g., with respect to finished drinking water reservoirs) and whether flows in gutters, or rivulets in small canyons, should be subject to designations applied to perennial streams or lakes.

These issues were raised in connection with the 1978 revision process for the Los Angeles Basin Plan. In a letter submitted on June 2, 1978, LACFCD requested that Table 2-3 (which contained beneficial use designations) be reorganized and that differences between natural streams, open channels, and closed conduits be specifically identified. Further, LACFCD requested that the Basin Plan clarify which beneficial uses were to be protected in closed conduits.[143]

In response, the RWQCB recommended no change to the beneficial use table because "closed flood control conveyance facilities do not meet designated beneficial use criteria due to physical constraints. Such structures do not conform to federal fishable/swimmable criteria for the same reason."[144] A subsequent internal memo from the same period reached a similar conclusion[145]:

> "[LACFCD] contends that non-visible surface waters within underground or covered pipes, tunnels, and channels are navigable waters and must be included in the Basin Plan. In our original evaluation of this request we stated: 'No change recommended, as closed flood control conveyance facilities do not meet designated beneficial use criteria due to physical constraints. Such structures do not conform to federal fishable/swimmable criteria for the same reason.' To expand further on this initial response, staff believes the system of covered pipes, tunnels, and channels constructed to transport storm waters are excluded from the term 'navigable waters…'"
>
> "Staff believes that, inasmuch as these structures do not have separate existence, but are part of a system tributary to waters of the state which are

[143] See letter from John K. Mitchell, Los Angeles County Flood Control District, to RWQCB, dated June 2, 1978, and associated enclosures: "Table 2-3 is not restricted to natural or open channels, but this is not indicated. Many major drainage areas receiving NPDES permitted and other flows are not included because closed conduits service them. The Basin Plan is used to determine the beneficial uses to be protected in these closed conduits. A few major closed conduits systems are Kenter Canyon Drain, Storm Drain 1105, and DDI 23."

[144] See Mail Checklist, Basin Plan 4B Revisions, undated.

[145] Internal memo from Los Angeles Region to Regional Board Members, Subject: Staff analysis of Los Angeles County Flood Control District's requested changes to Basin Plan 4B (LACFCD's December 4, 1978, letter and November 27, 1978 Board meeting), dated March (unclear), 1979.

> protected by the Board, this protection, in effect, serves to protect the flood control structures. The waters in lined flood control conduits are presently protected from any adverse impacts from point source discharges via the NPDES program. Thus, in setting waste discharge requirements, although the goal is to protect the receiving waters, the requirements themselves, in the form of effluent limitations, also protect the flood control structures. Thus, putting beneficial uses on the waters in these conduits would be superfluous and completely unrealistic."
>
> "As for water quality standards for all navigable waters, the Basin Plan does this in a practical manner. Obviously it is extremely difficult to list in the Plan each unnamed canyon in the entire region; however, in the event of a waste discharge to such a canyon, its omission from the Basin Plan would not, and in fact does not, preclude the Board from regulating the discharge."
>
> "As for water quality standards for non-visible surface waters contained in closed LACFCD conduits, *these waters have no beneficial use* (as discussed above); therefore *no water quality standards are applicable* (water quality standard equals beneficial use plus water quality objectives; cf. 40CFR 130.17 (b))." (emphasis added)

Although the RWQCB intended to limit the tributary rule and its implementation, the subsequent administrative record can be read to significantly expand the rule's scope without proper consideration of the Porter-Cologne Section 13241 factors. In 1994, the Los Angeles County Department of Public Works commented that the application of "beneficial uses for named streams to all tributaries of those streams may limit the use of local sediment placement sites [used in cleaning debris basins], because some of the sediment placement sites are located in watercourses which are 'tributaries,' albeit small ones, to the streams named in the Plan."[146] LACDPW expressed concern that such an interpretation could hamper flood control efforts.

In response, the RWQCB stated, "LACDPW may not be aware that in the current Basin Plan, a tributary rule is in effect which states that all beneficial uses for any stream also apply to all tributaries to that stream. There are no new sediment-related water quality standards (beneficial uses and objectives) or other regulatory provisions as a result of this proposed update that would affect flood control operations."[147] This position suggests that the RWQCB intends to apply the tributary rule as broadly as possible and include the smallest tributaries of a water body within each designated use. In its 2001 triennial review priority list, the RWQCB acknowledges that "in the highly

---

[146] Letter from Gary Hildebrand, Los Angeles County Department of Public Works, to RWQCB, May 26, 1994.

[147] See Regional Water Quality Control Board, Los Angeles Region, *Responsiveness Summary for the April 28, 1994 DRAFT Water Quality Control Plan, Los Angeles Region*, June 13, 1994, at p. 22.

developed Los Angeles Region, many 'tributaries' to a water body may be underground storm drains… [The region also includes] numerous coastal streams, which are essentially tributaries to the ocean."[148] Such an approach would require collection and treatment of storm flows, urban runoff, and other nonpoint sources on a very small, localized scale, a requirement that would likely be impractical and extremely costly. Thus, there is considerable uncertainty about where the waters of the United States begin, and how far upstream the "tributary rule" extends. However, although the RWQCB has recognized at least some of the issues related to the tributary rule, no action is scheduled to address them in the foreseeable future.[149] The issue of defining the "waters of the United States" subject to the jurisdiction of the Clean Water Act is the subject of an Advance Notice of Proposed Rulemaking published for public comment in January 2003 by the U.S. EPA and the U.S. Army Corps of Engineers.[150]

E. Additional issues

While this report addresses a number of key concerns raised in our review of the administrative record, this report should not be considered an exhaustive or complete listing of issues that should be addressed in a Basin Plan update or review process. Among the additional issues that have been identified by stakeholders in the administrative record are the following:

- The application of water quality objectives contained in the Basin Plan to all water bodies throughout the Los Angeles Region, regardless of the beneficial use designations of those water bodies (e.g., nitrogen objectives);
- The development and interpretation of water quality objectives for pH and temperature, especially the interpretation of these objectives with respect to natural conditions;
- The lack of "translators" for certain Basin Plan narrative objectives (including, but not limited to, trash and toxicity);
- The appropriateness of automatically applying water quality objectives for the protection of drinking water to surface water bodies that are designated with the ground water recharge (GWR) use;
- The appropriateness of the methylene blue activated substance (MBAS) water quality objective in effluent-dominated water bodies;

[148] California Regional Water Quality Control Board, Los Angeles Region, Staff Report: 2001 Triennial Review: Prioritization of Basin Planning Issues, April 16, 2001, at p. 11.

[149] Ibid., at p. i and p. 11.

[150] 68 Fed. Reg. 1001 ("Advance Notice of Proposed Rulemaking on the Clean Water Act Regulatory Definition of 'Waters of the United States,'" January 15, 2003.

- The appropriateness of designating water contact recreation (REC-1) for fishing activities, when the quantity of fish present may be inadequate to sustain the designated use;
- The appropriateness of designating water contact recreation (REC-1) for wading.

IV. CONCLUSIONS AND RECOMMENDATIONS

This report is based upon an examination of the administrative record as provided by the Regional Water Quality Control Board for the Los Angeles Region of the Water Quality Control Plan (Basin Plan), which was first adopted in 1975. This review confirms that many of the concerns that exist about water quality regulation on a national level are relevant and valid within the Los Angeles Region, and that many of these concerns have been raised repeatedly since the 1970s. Many Basin Plan elements are found to lack technical foundation and were not necessarily adopted in a manner that achieves the highest level of *reasonable* water quality protection consistent with California's Porter-Cologne Act. In addition, this report shows that the existing Basin Plan regulatory framework and process frequently fails to identify and address the true sources of water quality degradation and impairment. Four priority areas for Basin Plan reform identified in this report include the following:

1. *Evaluation of Porter-Cologne Factors*
2. *Development and Implementation of Water Quality Objectives*
3. *Designation of Appropriate Beneficial Uses*
4. *Application of the "Tributary Rule"*

These four priority areas, and recommendations for addressing them, are summarized below. Although discussed in detail in this report, the issues raised below are not intended to provide a complete or exhaustive listing of stakeholder concerns with the Basin Plan.

Evaluation of Porter-Cologne factors. This report's examination of the administrative record shows that the Los Angeles Basin Plan has failed to adequately consider the factors mandated by Porter-Cologne in the designation of beneficial uses and the establishment of water quality objectives. In many cases, the administrative record contains no significant discussion or reference to the required Section 13241 factors. In others, the record shows that the RWQCB made at most cursory or summary references to third party comments relating to economics, housing, hydrology and other concerns. These responses appear to fall well short of the requirements for economic analysis set forth in the Chief Counsel's 1994 memorandum. As with the Section 13241 factors, the administrative record reflects that Section 13242 has been given minimal (or no) consideration in the development of the Los Angeles Basin Plan.

An example of the lack of consideration of Section 13241 and 13242 factors is the application of water quality objectives to nonpoint sources. When the RWQCB initially established water quality objectives in the mid 1970s, it explicitly did not intend those objectives to be applied to nonpoint sources (including stormwater and urban and rural runoff). Thus, the RWQCB never considered the Section 13241 factors or set forth a program of implementation as required by Section 13242 for the application of water quality standards to nonpoint sources. Yet, in recent years, the RWQCB has been applying these objectives to nonpoint sources, despite the potentially significant cost and without any substantive Porter-Cologne analysis.

Existing and future Basin Plan water quality standards should be assessed in accordance with Section 13241 public interest factors. A program of implementation should then be developed with consideration of Section 13242 guidelines. Consideration of the provisions of Sections 13241 and 13242 should be completed prior to implementation via waste discharge requirements or TMDLs to ensure that public resources are spent in a manner that optimizes water quality protection. Where cost or other impacts, such as housing impacts, are likely to be significant, the RWQCB should provide a detailed rationale for its regulatory programs and decisions, consistent with SWRCB guidance.

Development and implementation of water quality objectives. In addition to Porter-Cologne Section 13241 considerations, certain water quality objectives (including but not limited to bacterial standards, sediment water quality objectives, and mineral quality objectives) in the Los Angeles Basin Plan lack adequate consideration of natural processes and ambient data. For example, the bacterial standards contained in the Los Angeles Basin Plan do not fully reflect newer studies or scientific research and EPA guidance regarding risk-based analysis and appropriate indicator bacteria species. Beneficial use designations and associated bacterial water quality objectives do not distinguish between high and low flow periods, even though the potential for human exposure to bacteria and human pathogens can vary greatly depending upon the season. Recent studies conducted in southern California show that high concentrations of indicator bacteria are present even in stormwater runoff from pristine, undeveloped areas. Treating vast quantities of stormwater runoff to meet current bacterial standards would be costly and technically challenging (especially during high flow events, when the potential for human contact is low) and would not necessarily result in better water quality than would occur naturally in the absence of human influences.

Similarly, the narrative water quality objectives contained in the Los Angeles Basin Plan can be interpreted subjectively. For example, sediment water quality objectives are often applied without regard to natural, historic sediment levels. Comment letters in the Basin Plan administrative record have repeatedly observed that naturally-occurring erosion levels are very high within the Los Angeles Basin and historically cause high sediment concentrations in stormflows. As with the bacterial standards, eliminating or minimizing sediment concentrations in stormflows to meet sediment water quality objectives is a costly and technically difficult undertaking and represents a departure from naturally occurring conditions. In particular, restricting sediment loadings during stormflows could reduce the natural supply of sand and greatly increase the region’s already significant rate of beach erosion.

The Los Angeles Basin Plan also contains water quality objectives for various mineral quality parameters, including total dissolved solids (TDS) and chloride. These mineral quality objectives are based on water samples collected during a wet climatic period (when naturally occurring concentrations were low) and were initially intended to be applied as flow-weighted annual averages at specific locations within a reach. However, the current Basin Plan no longer contains the intended language specifying application of the objectives as flow-weighted annual averages. Thus, the objectives are being applied as instantaneous maximum permitted concentration levels throughout the entire reach, even though naturally occurring mineral concentrations often exceed water quality objectives, particularly in dry periods. Because concentrations of these constituents in general do not cause non-attainment of designated beneficial uses, it makes little sense and would be needlessly costly to meet high-flow related water quality objectives. In addition, these objectives discourage the development of recycled water projects, because recycled water often contains mineral concentrations higher than the applicable objectives.

These and other water quality objectives that are known or likely to be influenced by natural or ambient conditions should be reassessed to determine the extent to which regulation and treatment can measurably and reasonably contribute to water quality improvement and the attainment of beneficial uses. The public interest factors specified in Porter-Cologne Sections 13241 and 13242 should be used in this evaluation. Special priority should be given to assessing the reasonableness of applying water quality objectives to nonpoint sources. Consistent with the NRC's recommendations, special effort should be given to translating narrative into numeric criteria and to developing water quality objectives that are clearly defined in terms of frequency, magnitude, and duration.

Designation of beneficial uses. Because beneficial use designations determine which water quality objectives will apply to a specific water body, appropriate, reasonable designations are essential to efficiently and effectively regulate water quality. However, the Los Angeles Basin Plan contains beneficial use designations that many parties feel were defined without proper technical or scientific support. For example, many waters within the Los Angeles Region have been designated for municipal and domestic supply (MUN), including drinking water, despite the fact that few water bodies within the Los Angeles Region are used, or will ever be used, for such purposes. In part, this is because of the transient nature of flows within the region during dry months. Even when year-round flow is present, flow during the dry season in many water bodies is dominated by urban runoff and treated wastewater, neither of which has ever been considered as a desirable source of drinking water. Further, many water bodies have been designed or modified specifically to efficiently convey stormwater runoff to the ocean. These water bodies are, by design, not appropriate for municipal drinking water use, and these use designations were apparently made without consideration of the public interest factors required by Porter-Cologne.

Several water bodies for which questionable MUN designations were made in the 1994 Basin Plan were proposed for de-designation in 1998. Although approved by the RWQCB and the SWRCB, these de-designations were not approved by the California Office of Administrative Law, largely for procedural reasons. In 2000, the EPA approved the 1994 Los Angeles Basin Plan in its entirety with the sole exception of a Plan provision that suspended the application of certain questionable MUN designated uses. The EPA's decision effectively forced the RWQCB to enforce MUN designations that were recognizably in error. In response to a lawsuit, a U.S. District Court eventually held that the original intent of the RWQCB in suspending the application of these MUN designated uses must be maintained in EPA's approval of the Los Angeles Basin Plan. Despite this ruling, the MUN designations in the Los Angeles Basin Plan and implementation of water quality objectives for MUN-designated waters remain questionable and problematic. For example, it remains unclear whether or not storm flows in MUN-designated channels will be expected to meet MUN-level water quality objectives, or whether groundwater recharge (GWR) designations generate similar requirements, and, if so, how this goal can be achieved in a reasonable, cost-effective manner.

The 1994 Los Angeles Basin Plan contains multiple beneficial use designations for concrete-lined, highly modified channels, including both contact and non-contact recreation (REC-1 and REC-2) and habitat designations. The administrative record contains numerous comments that the REC-1 and REC-2 designations are inappropriate for these channels, particularly where access is restricted and/or illegal, and that these designations do not reflect the level of recreational use. Further, the REC designations trigger restrictive water quality objectives (e.g., bacterial water quality objectives), and require correspondingly expensive treatment, even though the potential for human contact and harm is minimal. Many parties have commented that habitat designations for these streams are also inappropriate, as the presence of habitat may conflict with flood control functions, which require routine maintenance and preservation of largely unvegetated stream channels. Oddly enough, there is no beneficial use or water body category within the Los Angeles Basin Plan for flood control, despite the fact that flood control is the primary reason why many channels within the Basin were modified in the first place. The administrative record shows that Basin Plan REC designations and associated water quality objectives for flood control and related channels generally fail to consider the economic and other Section 13241 factors required by Porter-Cologne.

The Los Angeles Basin Plan specifies a number of "potential" beneficial use designations, although this term is not clearly defined and departs from the Porter-Cologne statutory reference to "probable" future uses. Initially, the RWQCB included potential beneficial use designations in the 1975 and 1978 Basin Plans but intended to regulate such uses via waste discharge requirements applicable to point sources only if and when those uses were actually attained. In its approval of proposed 1978 Basin Plan revisions, however, the EPA specified that all beneficial uses, including those designated as "potential" beneficial uses, were to be protected equally. This decision extended costly and extensive regulatory requirements to what were previously speculative Basin Plan references to highly unlikely, if not implausible "potential" uses. If attainment of these uses is only possible by means that involve major expense, meeting the associated water quality objectives would not be an efficient use of public resources.

Finally, the Los Angeles Basin Plan does not currently contain a beneficial use or water body category for "effluent-dominated streams," although such a category has been proposed on numerous occasions. Many water bodies within the region would be dry (or nearly dry) for the majority of the year if not for the discharge of treated effluent or dry weather urban runoff to these streams. In adopting water quality objectives, the RWQCB has given minimal consideration to the benefits of recycled water use in the stream channels used for conveyance of recycled water to downstream use sites. As a result of treated effluent flows, however, the RWQCB has designated potential and existing beneficial uses, such as habitat beneficial uses, that paradoxically may preclude the same effluent discharges that create the stream flow and associated habitat in the first place. This contradictory approach highlights the need to more logically and reasonably regulate effluent dominated water bodies in the Basin Plan. Despite the fact that Porter-Cologne and SWRCB policy call for the consideration of the need to develop and use recycled water in Basin Plan development, no such beneficial use exists for reservoirs that are constructed solely for the purpose of storing recycled water.

The RWQCB should clarify the requirements for creating and applying beneficial use designations, including "potential" designations. New designations or water body categories, such as flood control or effluent-dominated waters, should be added to reflect the actual, intended uses of many regional water bodies. Seasonal or tiered uses and/or site-specific objectives should be created for areas in which conflicts exist between the applicable beneficial uses and water quality criteria, or where natural sources of 'contaminants' prevent attainment of water quality objectives. Consistent with the NRC's recommendations, Use Attainability Analyses (UAAs) should be conducted for designations in the Basin Plan that are known to be inappropriate, such as MUN designations and REC designations for restricted access flood control channels.

Interpretation of the tributary rule. Most of the inland surface waters within the Los Angeles Region are subject to several beneficial use designations within the Los Angeles Basin Plan. The Basin Plan states that "those waters not specifically listed (generally smaller tributaries) are designated with the same beneficial uses as the streams, lakes, or reservoirs to which they are tributary." This provision is more commonly known as the "tributary rule," and it has stimulated increasing controversy about the extent to which it can and should be applied in the basin. In the interpretation that the RWQCB appears to have adopted in recent administrative documents, the tributary rule could result in the application of water quality objectives to even very small flows (e.g., flows in gutters or rivulets of flow in small canyons). The application of water quality objectives to all tributary streams via the tributary rule disregards the public interest factors of Porter-Cologne Sections 13241 and 13242. Such an interpretation could require the collection and treatment of storm flows, urban runoff, and other nonpoint sources on a very small, localized scale. This would result in impractical, costly and inefficient methods for improving water quality in the larger receiving water bodies that the Clean Water Act and the Porter-Cologne Act primarily intended to protect.

The tributary rule should be revised to reasonably protect designated beneficial uses without extending, at enormous potential expense, regulatory requirements to each and every upstream drainage facility within the Los Angeles Region. For example, the tributary rule could be applied only where there is a hydrologic connection that exists not just in response to storm events, and/or where the hydrologic connection is such that a commingling of water and an exchange of aquatic life is possible.