5.7 HYDROLOGY AND WATER QUALITY

This section of the Recirculated Draft Environmental Impact Report (DEIR) evaluates the potential impacts to hydrology and water quality conditions in the City of Irvine from implementation of the proposed Irvine Business Complex Vision Plan and Overlay Zoning Code. Hydrology deals with the distribution and circulation of water, both on land and underground. Water quality deals with the quality of surface and groundwater. Surface water is water on the surface of the land and includes lakes, rivers, streams, and creeks. Groundwater is water below the surface of the earth. The analysis in this section is based on the following:

- *Irvine Business Complex (IBC) Master Drainage Study Update*, VA Consulting, Inc., April 20, 2009.
- *Water Quality Technical Report for the IBC Vision Plan and Mixed-Use Overlay Zoning Code*, Fuscoe Engineering, December 2009

Complete copies of these studies are included in Appendix K to this Draft EIR.

5.7.1 Environmental Setting

5.7.1.1 Hydrology

Regional Drainage

The 2,800-acre Irvine Business Complex project site is located within the San Diego Creek watershed, which is part of the larger Santa Ana River basin. The San Diego Creek Watershed covers 112.2 square miles in central Orange County, of which the Irvine Business Complex project site comprises 3.9-percent of the total watershed area. The watershed includes portions of the cities of Costa Mesa, Irvine, Laguna Woods, Lake Forest, Newport Beach, Orange, Santa Ana, and Tustin. Its main tributary, San Diego Creek, drains from the Santiago Hills and outlets into the Upper Newport Bay. Smaller tributaries include Serrano Creek, Borrego Canyon Wash, Agua Chinon Wash, Bee Canyon Wash, Peters Canyon Wash, Sand Canyon Wash, Bonita Canyon Creek, and the Santa Ana Delhi Channel. Watershed uses are generally comprised of agricultural, vacant, developed and recreational land uses. The entire western portion of the watershed is developed, with development spreading to the east and south.

The Santa Ana Regional Water Quality Control Board (RWQCB) generally divides the San Diego Creek into two reaches: Reach 1 extends from the Upper Newport Bay outlet of the creek to the crossing at Jeffrey Road, and Reach 2 extends from Jeffrey Road to its headwaters within the City of Lake Forest. Specifically, runoff from the Irvine Business Complex area ultimately discharges into Reach 1 of San Diego Creek, which flows generally along the eastern boundary of the Complex.

Local Surface Water and Drainage

The IBC is a business-concentrated area located within the City of Irvine and is generally bounded on the west by the Costa Mesa Freeway (SR-55), on the south by Campus Drive, and on the east by the San Diego Creek Channel (Reach 1). The existing condition of the IBC consists primarily of commercial and office buildings, warehouses and a few residential high rise condominiums. The majority of the local drainage systems within the IBC (approximately 75 percent) discharge to one of the three regional facilities within the area: Lane Channel (designated F08 by the Orange County Flood Control District [OCFCD]), Armstrong Channel (F08S01), and Barranca Channel (F09), all of which ultimately discharge into San Diego Creek Reach 1. Armstrong Channel is tributary to Lane Channel at MacArthur Boulevard, which then confluences with San Diego Creek near Interstate 405 (I-405), south of Jamboree Road. Barranca Channel also confluences with San Diego Creek, albeit upstream of Lane Channel's confluence point at Main Street, south of Jamboree Road. Brief descriptions of these three channels are discussed below (VA Consulting Inc. 2009). A small portion (less than 25 percent) of the Irvine Business Complex drains runoff to San Diego Creek via separate storm

drain systems. Refer to Figure 5.7-1, *Existing Major Drainage Channels*, for locations of the major drainage channels and their respective drainage areas.

Lane Channel (F08)

The Lane Channel generally drains the western portions of the Irvine Business Complex, in addition to areas south of the I-405 within the City of Irvine. Overall, the Lane Channel drains a total of 2,787 acres (excludes Armstrong Channel tributary acreage), of which 1,253 acres (or 45 percent) is located within the IBC. The remaining portions of the watershed are located within the City of Santa Ana. At its downstream location, Lane Channel is an earthen trapezoidal channel from its confluence with San Diego Creek immediately upstream of the I-405 Freeway and continues upstream and parallel to the I-405 for roughly 6,800 feet until it reaches the MacArthur Boulevard off-ramp. At this location, the channel transitions into a triple reinforced concrete box (RCB) and turns northerly to run along MacArthur Boulevard until it crosses Main Street, approximately 600 feet north. After crossing Main Street, it transitions back from a triple RCB to a concrete-lined rectangular channel and continues north along MacArthur Boulevard. The channel continues until it reaches the SR-55 Freeway, and crosses underneath as a double RCB. This facility then transitions to an earthen trapezoidal channel that runs parallel to the westerly side of SR-55.

A portion of the Lane Channel, extending from approximately 1,000 feet south of Red Hill Avenue to approximately 1,200 feet north of Red Hill Avenue has been improved as part of the widening projects for the MacArthur Boulevard and Red Hill Avenue intersection. The improvements included constructing an earthen rectangular channel with concrete retaining walls to replace the earthen trapezoidal section. In addition, the existing triple RCB culvert was extended with the widening of the intersection.

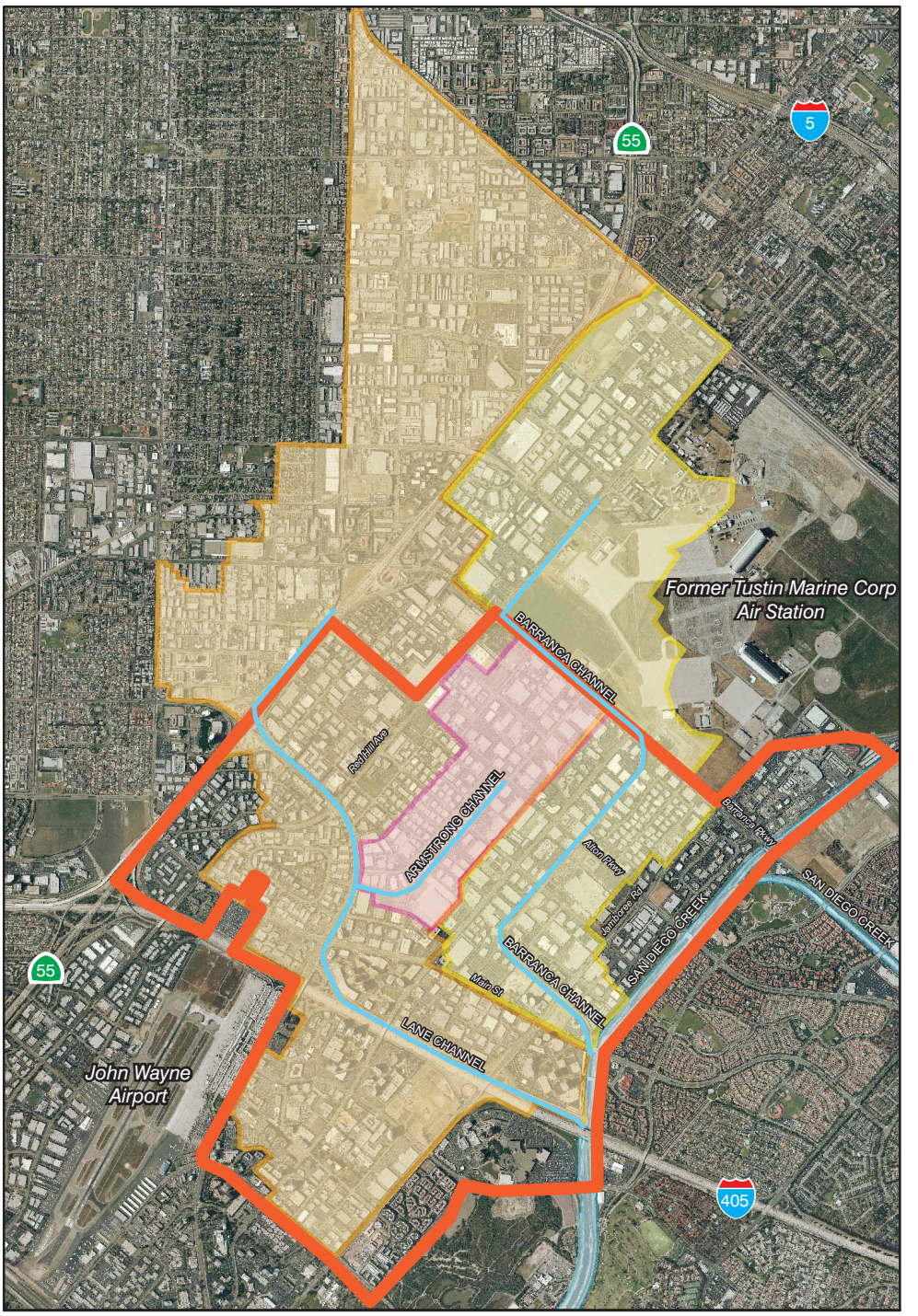
Armstrong Channel (F08S01)

The Armstrong Channel generally collects runoff from the central and western portions of the IBC, draining an area of approximately 356 acres, all of which are located within the Irvine Business Complex. Armstrong Channel is a riprap-lined trapezoidal channel that discharges into Lane Channel approximately 360 feet downstream of Armstrong Avenue. In general, Armstrong Channel extends upstream from its Lane Channel confluence and parallel to Armstrong Avenue, crosses McGaw Avenue and continues upstream to Alton Parkway.

Barranca Channel (F09)

In general, the Barranca Channel drains the central and eastern portions of the Irvine Business Complex, in addition to portions of the Cities of Tustin and Santa Ana. Overall, the Barranca Channel drains 1,337 acres, and roughly 500 acres (or 37 percent) are within the Irvine Business Complex. At its downstream location, Barranca Channel confluences with San Diego Creek at Main Street, approximately 1,800 feet upstream of the Lane Channel confluence. From there, it continues upstream in a northwest direction as a riprap-lined trapezoidal soft bottom section. It then crosses Jamboree Road as a double RCB, and then transitions back to an earthen trapezoidal channel that parallels Kelvin Avenue. The flood control facility continues in this fashion for approximately 1,350 feet before curving northeasterly at the AT&SF railroad crossing. It then continues north, parallel to Von Karman Avenue until it reaches Barranca Parkway, south of the Tustin Legacy development at the former MCAS Tustin, as a riprap-lined channel until it reaches Red Hill Avenue. The riprap-lined channel then transitions into an RCP and turns northeasterly to continue upstream along Red Hill Avenue.

Existing Major Drainage Channels



Source: Fuscoe 2009

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Local Storm Drain Facilities

In addition to the three major drainage channels listed above, local storm water runoff within the Irvine Business Complex is collected by a series of smaller drainage channels and underground storm drains that discharge into the tributary channels and into San Diego Creek. These include privately owned systems, and systems owned and maintained by the City of Irvine and OCFCD. For the purposes of the Irvine Business Complex General Plan Amendment, hydrology conditions are evaluated at a Program-Level EIR based on land use conditions, since the proposed land use changes may have regional implications. Local or site-specific drainage impacts cannot be evaluated at this time, as these impacts are determined at the project-specific level of land development and not at development planning level. Local drainage impacts will be evaluated at the development of the individual projects within the Irvine Business Complex, in accordance with applicable City and OCFCD standards.

Applicable Plans and Policies

Currently, the majority of the approximate 2,800-acre Irvine Business Complex is zoned for multi-use, with the prominent land use being commercial office, with some industrial and warehouse uses. Since the early development of the region and the corresponding development of the existing flood control facilities, the methodologies and criteria for analyzing stormwater runoff conditions in Orange County have changed and become more stringent (i.e., new flood control facilities must convey a larger size design storm). To understand the current level of flood protection provided by the three regional facilities within the IBC, VA Consulting prepared a IBC Master Drainage Study Update (April 2009) to review the available drainage information and evaluate Lane Channel, Armstrong Channel and Barranca Channel using the updated methodologies. The study accounted for several additional hydrology studies that have been prepared in conjunction with various channel improvement projects and redevelopment projects in the region over the past 20 years. The following studies and reports listed below were utilized as part of the Drainage Study Update to derive the existing conditions of the major drainage channels within the Irvine Business Complex project area.

Lane Channel (F08) and Armstrong Channel (F08S01)

- *San Diego Creek through Newport Highway*; prepared by OCFCD, July 1974.
    - Examined the diversion of drainage areas from the Santa Ana-Delhi Channel watershed to the Lane Channel facility.
- *Hydrology Report for Lane Channel Entire Drainage System – Facility No. F08*, prepared by OCPFRD, July 2002.
    - Studied the 100-year design discharges for the Lane Channel and updated the existing discharges based on Addendum No. 1 of the 1986 Orange County Hydrology Manual. This study also incorporated improvements to the channel that had been previously constructed.
- Drainage Report for Lane Channel (Facility No. F08) Improvements at MacArthur Boulevard/Red Hill Avenue Intersection in the City of Irvine, California, prepared by The Keith Companies, May 2004.
    - Presented hydraulic information for design improvements made to the Lane Channel as part of the MacArthur Boulevard and Red Hill Avenue widening projects.
- Barranca Channel (F09)*Hydrology Report Barranca Channel Facility No. F09 Entire Drainage System*, prepared by EMA Flood Program Division, June 1987.
    - Provided 100-year discharges for Barranca Channel between the outlet at San Diego Creek and the crossing at Red Hill Avenue.

- *Final Runoff Management Plan for Tustin Legacy*, prepared by RBF Consulting, December 2004.
    - Documented existing conditions for the Barranca Channel and Peters Canyon Channel, and outlined a mitigation plan for the Tustin Legacy development project at the former Marine Corps Air Station (MCAS) Tustin.
- *San Diego Creek Flood Control Master Plan Barranca Channel Update*, prepared by RBF Consulting, September 2007.
    - Updated 100-year discharges along Barranca Channel from its confluence with San Diego creek to its terminus at Red Hill Avenue. Also included revisions to the Barranca Channel as part of the Legacy Park Development.

Existing Drainage Conditions

As previously mentioned, the 2009 Master Drainage Study Update analyzed the existing flood control conditions for the Irvine Business Complex development area. The land use assumptions in this study were based on the current land use and zoning maps for the Cities of Irvine, Tustin, and Santa Ana to account for previous and recently converted mixed-use and urban residential developments within portions of the Irvine Business Complex.

In the study, the 100-year expected value (EV) storm event was used to generate peak flow discharges for specific concentration points within Lane Channel and Armstrong Channel. For Barranca Channel, the 100-year High Confidence (HC) storm event was used to generate peak flow discharges in accordance with the latest addition of the Orange County Hydrology Manual. The results are summarized in Table 5.7-1 and Table 5.7-2, respectively.

Table 5.7-1
Summary of Existing Drainage Conditions – Lane Channel & Armstrong Channel

Concentration Point No. [1]	Location	Station ID	100-Year EV Flow Rate (cfs)	Description	Tributary Area (acres)
Lane Channel (F08)					
1.17	San Diego Creek	1+46.90	3,126	Earthen trapezoidal channel	3,143
1.16	700' u/s of Jamboree Rd	31+50	3,126	Earthen trapezoidal channel	3,032
1.15	600' u/s of Jamboree Rd	57+00	2,807	Earthen trapezoidal channel	2,532
1.14	Sky Park East	89+50	2,777	RC rectangular soft-bottom channel	2,310
1.13	Red Hill Ave	110+00	2,454	11' x 6.5' triple RCB	1,896
1.12	Fitch	123+00	1,837	RC rectangular soft-bottom channel	1,474
1.11	SR-55	140+00	1,414	Earthen trapezoidal channel	1,063
Armstrong Channel (F08S01)					
110	Lane Channel	1+38.56	519	10' x 9' double RCB	356
109	McGaw Ave	33+50	419	12' x 9' double RCB	235
108	Alton Pkwy	46+00	338	Riprap-lined trapezoidal channel	177

Source: VA Consulting, Inc. (2009, April 20). Irvine Business Complex Master Drainage Study Update.
Cfs cubic feet per second
d/s downstream
EV expected value
RC reinforced concrete
RCB reinforced concrete box
u/s upstream
[1] For locations of concentration points and stations, refer to Figures 2 through 4 of the Irvine Business Complex Master Drainage Study Update, prepared by VA Consulting, Inc. (2009, April 20).

Table 5.7-2
Summary of Existing Drainage Conditions – Barranca Channel

Concentration Point No. [1]	Location	Station ID	100-Year HC Flow Rate (cfs)	Description	Tributary Area (acres)
Barranca Channel (F09)					
102.2	San Diego Creek	2+84.89	1,470	12' x 12' double RCB	1,337
102.1	Jamboree Road	19+00	1,470	Riprap-lined trapezoidal channel	1,320
102.0	650' u/s of Jamboree Rd	25+50	1,430	Earthen trapezoidal channel	1,254
101.9	AT&SF Railroad	40+00	1,337	Riprap-lined trapezoidal channel	1,172
101.8	550' d/s of McGaw Ave	46+00	1,333	Earthen trapezoidal channel	1,137
101.7	Alton Pkwy	65+00	1,246	Riprap-lined trapezoidal channel	1,044
101.6	900' u/s of Alton Pkwy	74+00	1,156	Earthen trapezoidal channel	968
101.5	1,600' u/s of Alton Pkwy	81+00	1,013	Earthen trapezoidal channel	883
101.4	Barranca Pkwy	90+00	997	Earthen trapezoidal channel	836

Source: VA Consulting, Inc. (2009, April 20). Irvine Business Complex Master Drainage Study Update.
cfs cubic feet per second
d/s downstream
HC high confidence
RCB reinforced concrete box
u/s upstream
[1] For locations of concentration points and stations, refer to Figures 2 through 4 of the Irvine Business Complex Master Drainage Study Update, prepared by VA Consulting, Inc. (2009, April 20).

Based on the hydrology modeling results, VA Consulting also performed a hydraulic analysis of the channels using the Water Surface Pressure Gradient (WSPG) software developed by the Los Angeles County Flood Control District to estimate the 100-year peak discharge water surface elevation within the channels. The hydraulic analyses assumed that the 100-year elevation in San Diego Creek (F05) is at a maximum of 1.5 feet below the top of existing banks. This high tailwater condition is a primary cause of potential ponding and overtopping of the major flood control facilities in the IBC area during the 100-year storm event. The VA Consulting analysis is a steady-state analysis during the 100-year peak event and thus is conservative with regard to maximum water surfaces. An analysis of storm volumes and the volume of storm water runoff that is temporarily diverted into storage during peak storm events due to the channel deficiencies could lower, but would not increase, the maximum water surface. The performance of each channel under the specified steady-state design flow rates are described below for existing conditions.

Lane Channel (F08) and Armstrong Channel (F08S01)

In the existing condition, Lane Channel and Armstrong Channel do not have sufficient capacity to convey the 100-year expected value flow rates In several areas of the channel, overtopping could occur under the peak flow rates.

Barranca Channel (F09)

In the existing condition, portions of the Barranca Channel have sufficient capacity to convey the 100-year High Confidence flow rates. At approximately station 65+00, the channel width decreases and the 100-year flow has the potential to partially overtop the channel bank.

Flood Hazards

Designated Flood Zones

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for flood plain management and is designed to minimize flood damage within Special Flood Hazard Areas (SFHA). The Federal Emergency Management Agency (FEMA) is the agency which administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHAs) are defined as areas that have a 1 percent chance of flooding within a given year. This is also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

When development projects are located within the SFHA, the project must be reviewed by FEMA to determine whether or not the project meets the criteria of the National Flood Insurance Program, and if revisions will be needed to the FEMA maps for the community as a result of the project's construction. This process known as a Conditional Letter of Map Revision (CLOMR). Requests for a CLOMR must be accompanied by detailed flood hazard analyses regarding the anticipated modifications to the regulatory floodway, and must be signed by the Floodplain Administrator. However, the CLOMR does not change the FEMA maps. The official revision to a FEMA map is made through the Letter of Map Revision (LOMR) process, which is performed upon completion of the project to verify elevation changes as a result of the project.

According to the FIRM catalog, there are several FIRMs produced by FEMA for the Irvine Business Complex and vicinity:

- Map Number 06059C278H
- Map Number 06059C279H
- Map Number 06059C0283H
- Map Number 06059C0286H
- Map Number 06059C0287H

Based on the FIRMs (revised February 18, 2004), the majority of the Irvine Business Complex falls within Zone X, which is defined as areas determined to be outside the 0.2 percent annual chance floodplain (500-year floodplain) as defined by FEMA. The channels themselves fall within Zone A.

These conditions may change as a result of development activities associated with the proposed Irvine Business Complex Vision Plan and Overlay Zoning Code and any additional drainage improvements that may alter the 100-year flood protection zone (SFHA). If identified during the design process of the individual projects that habitable structures may be located within SFHA, the City of Irvine and/or OCFCD will pursue the appropriate FEMA approvals and/or map revisions based on the final improvements to the specific projects.

Inundation by Dam Failure, Sieche, Tsunami, or Mudflow/Debris Flow

The Irvine Business Complex is not subject to inundation from seiches and tsunamis. It is not located on or nearby the Pacific Ocean or any large inland bodies of water, where seiche wave action or tsunamis would impact the project site. In addition, there are no major dams within the project vicinity or within the San Diego Creek Watershed. Additionally, inundation by seiche or mudflow is also not anticipated for the project site. The surrounding areas are mostly flat and built-out. For this reason, the Irvine Business Complex is not immediately downstream of an area subject to landslides and seasonal mudflows. Furthermore, debris basins and flood control structures exist throughout the area, which are maintained by the local agencies (i.e., City of Irvine, OCFCD).

5.7.1.2 Water Quality

Regulatory Framework

Clean Water Act

Controlling pollution of the nation's receiving water bodies has been a major environmental concern for more than three decades. Growing public awareness of the impacts of water pollution in the United States culminated in the establishment of the federal Clean Water Act[1] (CWA) in 1972, which provided the regulatory framework for surface water quality protection.

The United States Congress amended the CWA in 1987 to specifically regulate discharges to waters of the US from public storm drain systems and storm water flows from industrial facilities, including construction sites, and require such discharges be regulated through permits under the National Pollutant Discharge Elimination System (NPDES; pursuant to CWA Section 402[p]). Rather than setting numeric effluent limitations for storm water and urban runoff, CWA regulation calls for the implementation of Best Management Practices (BMPs) to reduce or prevent the discharge of pollutants from these activities to the Maximum Extent Practicable (MEP) for urban runoff and meeting the Best Available Technology Economically achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) standards for construction storm water. Regulations and permits have been implemented at the federal, state, and local level to form a comprehensive regulatory framework to serve and protect the quality of the nation's surface water resources. The recently adopted MS4 permit (R8-2009-0030) and general construction permit (2009-0009-DWQ) do contain, for the first time, waste load allocations (WLAs) and numeric effluent limits.

In addition to reducing pollution with the regulations described above, the CWA also seeks to maintain the integrity of clean waters of the United States – in other words, to keep clean waters clean and to prevent undue degradation of others. As part of the CWA, the Federal Antidegradation Policy [40 CFR Section 131.12] states that each state "shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy…" (40 CFR Section 131.12[a]). Three levels of protection are defined by the federal regulations:

1. Existing uses must be protected in all of the Nation's receiving waters, prohibiting any degradation that would compromise those existing uses;

2. Where existing uses are better than those needed to support propagation of aquatic wildlife and water recreation, those uses shall be maintained, unless the state finds that degradation is "…necessary to accommodate important economic or social development" [40 CFR Section 131.12(a)(2)]. Degradation, however, is not allowed to fall below the existing use of the receiving water; and

3. States must prohibit the degradation of Outstanding National Resource Waters, such as waters of National and State parks, wildlife refuges, and waters of exceptional recreation or ecological significance.

Porter-Cologne Water Quality Act

In the State of California, the State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Boards (RWQCBs) have assumed the responsibility of implementing US EPA's NPDES Program and other programs under the CWA such as the Impaired Waters Program and the Antidegradation Policy. The primary quality control law in California is the Porter-Cologne Water Quality Act (Water Code Sections 13000 et seq.). Under Porter-Cologne, the SWRCB issues joint federal NPDES Storm Water permits and state Waste Discharge Requirements (WDRs) to operators of municipal separate storm sewer systems (MS4s), industrial facilities, and construction sites to obtain coverage for the storm water discharges from these operations.

[1] Also referred to as the Federal Water Pollution Control Act of 1972.

Applicable Plans and Programs

Basin Plan for the Santa Ana River

In addition to its permitting programs, the SWRCB, through its nine RWQCBs, developed Regional Water Quality Control Plans (or Basin Plans) that designate beneficial uses and water quality objectives for California's surface waters and groundwater basins, as mandated by both the CWA and the state's Porter-Cologne Water Quality Control Act. Water quality standards are thus established in these Basin Plans and provide the foundation for the regulatory programs implemented by the state. The Santa Ana RWQCB's Basin Plan, which covers the Irvine Business Complex project area, specifically (i) designates beneficial uses for surface waters and ground waters, (ii) sets narrative and numerical objectives that must be met in order to protect the beneficial uses and conform to the state's antidegradation policy, and (iii) describes implementation programs to protect all waters in the Region (SARWQCB 2008). In other words, the Santa Ana RWQCB Basin Plan provides all relevant information necessary to carry out federal mandates for the antidegradation policy, 303(d) listing of impaired waters, and related TMDLs, and provides information relative to NPDES and WDR permit limits.

CWA 303(d) List of Water Quality Limited Segments

Under Section 303(d) of the CWA, states are required to identify water bodies that do not meet their water quality standards. Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, nonpoint sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL.

Storm water runoff from the Irvine Business Complex project site ultimately discharges into Reach I of the San Diego Creek, which ultimately outlets into Upper Newport Bay. According to the 2006 303(d) list published by the Santa Ana RWQCB, San Diego Creek Reach I is listed as impaired for fecal coliform, selenium, and toxaphene. Additionally, the Upper Newport Bay is listed as impaired for chlordane, copper, DDT, metals, polychlorinated biphenyls (PCBs), and sediment toxicity.

Total Maximum Daily Loads

Once a water body has been listed as impaired on the 303(d) list, a TMDL for the constituent of concern (pollutant) must be developed for that water body. In general terms, municipal, small MS4, and other dischargers within each watershed are collectively responsible for meeting the required reductions and other TMDL requirements by the assigned deadline. The recently adopted MS4 permit (R8-2009-0030) includes, for the first time, TMDL waste load allocations.

Several TMDLs have been established jointly for the San Diego Creek and Newport Bay water bodies. Table 5.7-3 summarizes the current TMDLs for the San Diego Creek and Newport Bay watersheds.

Table 5.7-3
Total Maximum Daily Loads for San Diego Creek & Newport Bay

Pollutant	***Applicable Water Body***	***Load Allocations, Numeric Targets, or TMDL***		
Sediment	Newport Bay San Diego Creek	50 percent reduction in sediment loads within 10 years	No more than 28,000 tons per year of sediment discharged to Newport Bay from open space, 19,000 tons from agricultural land, 13,000 tons from construction sites, and	No more than 28,000 tons per year of sediment discharged to San Diego Creek from open space, 19,000 tons from agricultural land, 13,000 tons from construction sites, and

			2,500 tons from urban areas.	2,500 tons from urban areas.
Nutrients	Newport Bay Watershed	Achieve by December 31, 2002: Summer Load Total Nitrogen 200,097 lbs, Total Phosphorous 86,912 lbs.	Achieve by December 31, 2007: Summer Load Total Nitrogen 153,861 lbs, Total Phosphorous 62,080 lbs.	Achieve by December 31, 2012: Winter Load Total Nitrogen 14,364 lbs
	San Diego Creek (Reach 2 only)	Achieve by December 31, 2012: Winter Load Total Nitrogen 14 lbs		
Fecal Coliform	Newport Bay	Achieve by December 30, 2013: Less than 200[a] organisms/100 mL, with no more than 10 percent of the samples exceed 400 organisms /100 mL for any 30-day period.	Achieve by December 30, 2019: Monthly median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL.	
Organophosphate Pesticides	Newport Bay (upper only)	Chlorpyrifos: Acute = 20 ng/L, Chronic = 9		
	San Diego Creek	Diazinon: Acute = 80 ng/L, Chronic = 50 ng/L Chlorpyrifos: Acute = 20 ng/L, Chronic = 14		
Organochlorine Compounds	San Diego Creek	To be achieved by December 31, 2015: Total DDT = 1.08 average grams per day Toxaphene = 0.02 average grams per day		
	Newport Bay (upper only)	To be achieved by December 31, 2015: Total DDT = 0.44 average grams per day Chlordane = 0.25 average grams per day Total PCBs = 0.25 average grams per day		
	Newport Bay (lower only)	To be achieved by December 31, 2015: Total DDT = 0.16 average grams per day Chlordane = 0.09 average grams per day Total PCBs = 0.66 average grams per day		

In addition to the approved TMDLs summarized in Table 5.7-3, there are additional TMDLs being considered for approval by the Santa Ana RWQCB after being established by the US EPA (toxics TMDLs). These include TMDLs for selenium and other metals such as cadmium, copper, lead, zinc, chromium and mercury. Lastly, TMDLs have not yet been developed for fecal coliform in San Diego Creek (Reach 1).

General Construction Permit & Storm Water Pollution Prevention Plans

The SWRCB's General Construction Permit (GCP), NPDES Permit No. CAS000002, regulates stormwater and non-storm water discharges associated with construction or demolition activities including, but not limited to clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre. Construction sites that qualify must submit Permit Registration Documents (PRDs) which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by the General Permit to gain permit coverage or otherwise be in violation of the CWA and California Water Code. The existing GCP, SWRCB Order No. 99-08-DWQ was updated in September 2009 as Order No. 2009-0009-DWQ, and takes effect July 1, 2010. In addition to the requirements of the existing GCP, Order No. 2009-0009-DWQ contains additional requirements for construction sites based on the sites risk of discharging construction-related pollutants, as well as additional monitoring and reporting requirements. Each construction project must complete a risk assessment prior to commencement of construction activities, which assigns a risk level to the site and determines the level of water quality protection/requirements the site must comply with. The updated permit also includes provisions for meeting specific numerical effluent limits (NELs) and Action Levels (ALs) for pollutants based on the site's risk level. Risk levels may change throughout the course of the project depending on the specific construction activities, timing, and areas of disturbance during construction.

Similar to the existing GCP, the updated GCP requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for each individual construction project greater than or equal to 1 acre of disturbed soil area

(regardless of the site's Risk Level). The SWPPP must list Best Management Practices (BMPs) that the discharger will use to control sediment and other pollutants in storm water and non-storm water runoff; the BMPs must meet the BAT and BCT performance standards. Additionally, the SWPPP must contain a visual monitoring inspection program; a chemical monitoring programs for sediment and other "nonvisible" pollutants to be implemented based on the Risk Level of the site, as well as inspection, reporting, training and record-keeping requirements.

Individual projects within the Irvine Business Complex that disturb greater than 1 acre within the City of Irvine will be subject to the storm water discharge requirements of the GCP. The projects will require submittal of an NOI, SWPPP, Risk Assessment, and other Project Registration Documents (PRDs) required by the GCP prior to the commencement of soil-disturbing activities. In the Santa Ana Region, the SWRCB is the permitting authority, while the Santa Ana RWQCB provides local oversight and enforcement of the GCP.

General WDR Permit for Groundwater Discharges

Due to the relatively shallow groundwater levels within portions of the San Diego Creek and Newport Bay watersheds, excess pollutants in groundwater may pose threats to surface water quality when discharged. Discharges that may pose a threat to water quality include wastes associated with well installation, development, test pumping, dewatering from subterranean seepage, and groundwater dewatering wastes from construction sites. The Santa Ana RWQCB requires a permit for discharges from activities involving groundwater extraction or discharge within the Newport Bay watersheds. Under Order No. R8-2006-0065, permittees (dischargers) are required to monitor discharges to surface waters that pose an insignificant (de minimus) threat to water quality. This order only covers short term discharges, such as intermittent discharges and/or one year or less in duration). For discharges of longer durations, permittees are required to apply for coverage under Order No. R8-2006-0004. Alternatively, long-term or permanent discharges from groundwater extraction or dewatering activities may require a separate individual permit issued by the RWQCB.

County of Orange MS4 Permit & Drainage Area Management Plan

In January 2002, the Santa Ana RWQCB reissued the third term MS4 Storm Water Permit (WDR Order R8-2002-0010, NPDES Permit No. CAS618030) to the County of Orange and the incorporated cities of Orange County within the Santa Ana Region. Pursuant to the third term MS4 permit, the County of Orange and incorporated cities were required to develop a Drainage Area Management Plan (DAMP), which provides area-wide guidance for cities in developing their stormwater programs. The Orange County Drainage Area Management Plan (OC DAMP) approved by the Santa Ana RWQCB July 1, 2003, includes a model Local Implementation Program (LIP) for municipalities, such as the City of Irvine, to implement in their jurisdiction. The LIP describes the City's storm water pollution control efforts implemented to meet the requirements of the third term MS4 permit. Therefore, the City LIP and the OC DAMP, in effect, act as companion parts of the City's storm water compliance program.

In May 2009, the Santa Ana RWQCB re-issued the MS4 Permit for the Santa Ana Region of Orange County (Order No. R8-2009-0030). Re-issuance of the third-term permit will result in future changes to the OC DAMP and City of Irvine LIP and stormwater program. This new fourth-term permit includes new requirements that follow similar changes that other Regional Boards have made in their recent permit renewals, such as the San Diego RWQCB and Los Angeles RWQCB. This includes requirements pertaining to hydromodification[2] and low impact development (LID) features associated with new developments and redevelopments. Within 30 months after the permit adoption, City's will be required to update their LIP and stormwater programs to reflect any new permit requirements and associated changes.

City of Irvine Water Quality Management Plan (WQMP)

One component of the New Development / Significant Redevelopment Section of the City's LIP is the provision to prepare a project-specific Water Quality Management Plan (WQMP) for specified categories of development aimed at reducing pollutants in post-development runoff. Specifically, a WQMP includes Santa Ana RWQCB approved BMPs, where applicable, that address post-construction management of storm water runoff water quality. This includes

[2] Hydromodification is generally defined as the alteration of natural flow characteristics.

operation and maintenance requirements for all LID and treatment control BMPs required for specific categories of developments to reduce pollutants in post-development runoff to the Maximum Extent Practicable (MEP). In addition, projects designated as "Priority Projects" are required to incorporate LID BMPs to address pollutants of concern from the project site. In accordance with the OC DAMP and City LIP, a project is considered a Priority Project if it meets any of the following criteria:

- All significant redevelopment projects, where significant redevelopment is defined as projects that include the addition or replacement of 5,000 square feet or more of impervious surface on a developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. Where redevelopment results in the addition or replacement of less than fifty percent of the impervious surfaces of a previously existing developed site, and the existing development was not subject to WQMP requirements, the numeric sizing criteria in the MS4 permit only applies to the addition or replacement, and not to the entire developed site. Where redevelopment results in the addition or replacement of more the fifty percent of the impervious surfaces of a previously developed site, the numeric sizing criteria applies to the entire development;

- New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions (i.e. detached single family home subdivisions, multi-family attached subdivisions (town homes), condominiums, apartments, etc.), mixed use, and public projects. This category includes development projects on public or private land, which fall under the planning and building authority of the City;

- Automotive repair shops (SIC codes 5013, 5014, 5541, 7532-7534, and 7536-7539);

- Restaurants where the land area of development is 5,000 square feet or more;

- All hillside developments on 5,000 square feet or more, which are located on areas with known erosive soil conditions or where natural slope is twenty-five percent or more;

- Developments of 2,500 square feet of impervious surface or more, adjacent to (within 200 feet) or discharging directly3 into environmentally sensitive areas, such as areas designated in the Ocean Plan as Areas of Special Biological Significance or waterbodies listed on the CWA Section 303(d) list of impaired waters;

- Parking lots of 5,000 square feet of impervious surface exposed to storm water. Parking lot is defined as a land area of facility for the temporary storage of motor vehicles;

- Streets, roads, highways and freeways of 5,000 square feet or more of paved surface shall incorporate USEPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the maximum extent practicable standard. This category includes any paved surface used for the transportation of automobiles, trucks, motorcycles and other vehicles and excludes any routine road maintenance activities where the footprint is not changed;

- Retail gasoline outlets of 5,000 or more square feet with a projected average daily traffic of 100 or more vehicles per day;

- Emergency and public safety projects in any of the above-listed categories may be excluded if the delay caused due to the requirement for a WQMP compromises public safety, public health and/or environmental protection.

As required by the City of Irvine's LIP and municipal ordinances on storm water quality management, project-specific WQMPs must be submitted to the City for approval prior to the City issuing any building or grading permits. Since the

[3] Discharging directly means a drainage or conveyance that carries flows from the subject development, not commingled with any other flows.

overall Irvine Business Complex project includes the development of several of the categories listed above, the individual projects will be subject to the requirements of the City of Irvine WQMP guidelines. Individual projects within the Business Complex will be required to submit a project-specific WQMP to ensure all requirements of the City of Irvine's LIP and ordinances on storm water quality are addressed for that project. This includes meeting any new requirements associated with Priority Projects, as well as the requirements of the recently adopted fourth-term MS4 permit, which includes LID features and/or hydromodification controls.

Existing Surface Water Conditions

Regional Drainage

As previously mentioned, runoff from the Irvine Business Complex ultimately discharges into Reach 1 of San Diego Creek, which outlets into the upper Newport Bay downstream. According to the Santa Ana River Basin Plan, the Irvine Business Complex is located within the larger Lower Santa Ana River Hydrologic Unit (801.0) and the East Coast Range Hydrologic Sub-Area (801.11). Beneficial uses and water quality objectives have been developed for San Diego Creek, and are discussed below.

Beneficial Uses

The beneficial uses of Reach 1 of the San Diego Creek, as outlined in the Basin Plan, are:

- REC1 – Contact Water Recreation
- REC2 – Non-Contact Water Recreation
- WARM – Warm Freshwater Habitat
- WILD – Wildlife Habitat

In addition, there are intermittent beneficial uses for the various tributaries to San Diego Creek, such as Peters Canyon Wash, Bonita Creek, Sand Canyon Wash and other tributaries. These intermittent beneficial uses are:

- GWR – Groundwater Recharge
- REC1 – Contact Water Recreation
- REC2 – Non-Contact Water Recreation
- WARM – Warm Freshwater Habitat
- WILD – Wildlife Habitat
- RARE – Rare, Threatened, or Endangered Species[4]

Water Quality Objectives

In order to maintain the beneficial uses listed in the previous section, surface waters must achieve certain water quality objectives outlined in the Basin Plan. Table 5.7-4 summarizes the specific water quality objectives for San Diego Creek, Reach 1.

Table 5.7-4
Water Quality Objectives for San Diego Creek, Reach 1
(mg/L)

Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand

[4] RARE beneficial use applies to Sand Canyon Wash only.

1500	--	--	--	13	--	90

Source: Regional Water Quality Control Board (RWQCB) Santa Ana Region. Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995, updated February 2008.
-- No specific water quality objectives established

In addition to the specific objectives, qualitative and quantitative general water quality objectives have been set in the Basin Plan for the following constituents:

- algae
- boron
- chlorine
- floatables
- nitrogen
- oil & grease
- radioactivity
- sulfate
- taste & odor
- turbidity
- ammonia
- chemical oxygen demand
- color
- fluoride
- metals
- dissolved oxygen
- sodium
- sulfides
- temperature
- methylene blue-activated substances (MBAS)
- bacteria/coliform
- chloride
- total dissolved solids
- hardness
- nitrate
- pH
- settleable solids
- surfactants
- toxic substances

Current Surface Water Quality Conditions

As part of the current Countywide storm water program and OC DAMP, surface water monitoring is conducted along San Diego Creek and several of its tributaries. Currently, there are four monitoring locations for San Diego Creek Reach 1 and its tributaries within the Irvine Business Complex region. A summary of the site locations is provided in Table 5.7-5, and Figure 5.7-2, *Summary of Existing Water Quality Data (County of Orange)*.

Table 5.7-5
County of Orange Irvine Business Complex Monitoring Locations

Site Name	Water Body	General Location	Type
IRVF05TBN1	San Diego Creek	~500 ft downstream of Peters Canyon Channel confluence near Civic Center Plaza	Targeted
IRVF05TBN2	San Diego Creek	~200 ft downstream of Harvard Avenue and Barranca Road intersection	Targeted
IRVF06P06	Peters Canyon Channel	At Barranca Road, upstream of confluence with San Diego Creek	Targeted
IRVFF08P01	Lane Channel	~100 ft downstream of Von Karman Avenue bridge at I-405.	Random

In general, exceedances for Basin Plan water quality objectives were observed consistently for reactive phosphorous, and exceedances were observed on occasion for turbidity, dissolved oxygen and surfactants. However, it should be noted that exceedances for reactive phosphorous were also observed at the majority of the monitoring locations throughout Orange County streams and channels, indicating that the problems may be watershed-wide and not specific to San Diego Creek. Lastly, although the Basin Plan does not identify numerical objectives for these constituents, levels of nitrate, bacteria, electrical conductivity and water temperature were also high based on experience and tolerance intervals.

As previously discussed, there are several TMDLs currently implemented or in development within the San Diego Creek and Newport Bay watersheds. TMDLs have been developed jointly for the San Diego Creek and Newport Bay Watersheds for nutrients, sediment, and toxics, and a TMDL was also developed for fecal coliform in the Newport Bay.

Brief summaries of these TMDLs are provided below. Refer to Table 5.7-3 for a breakdown of the TMDL target dates and waste load allocations.

Nutrients

In 1996 the Newport Bay and San Diego Creek watersheds were placed on the CWA Section 303(d) list as being impaired for nutrients. This listing was in response to excess nutrient loadings in the Newport Bay that resulted in seasonal algal blooms and subsequent impairments to beneficial uses, including recreation, navigation, and habitat uses. The primary source of the algal blooms was identified to be from San Diego Creek discharging nitrogen and phosphorous in the Bay. Sources of these excess nutrients within San Diego Creek included nurseries, groundwater dewatering facilities, urban runoff, agricultural discharges and other undefined sources (open space, atmospheric deposition, etc.).

In 1998, the Santa Ana RWQCB approved Order No. 98-9 (amended by Resolution No. 98-100), establishing targets to reduce the annual load of nitrogen and phosphorous in the Newport Bay by 50 percent and meeting water quality objectives by 2012. A regional monitoring program was also developed to monitor discharges of total nitrogen and total phosphorous, monitor algal blooms, and to track progress towards meeting the TMDL requirements (County of Orange 2009).

Sediments

Excess sediment discharging into the Newport Bay can result in loss of marine aquatic, mudflat, salt marsh, and riparian habitat within and adjacent to the Newport Bay Ecological Reserve and subsequently impairing these and other beneficial uses of the Bay. In March of 1999, the Santa Ana RWQCB adopted a TMDL for sediment in the San Diego Creek and Upper Newport Bay watersheds into the Basin Plan, and established Monitoring and Reporting Program No. 99-74 to require sediment monitoring and maintenance throughout the watershed per the TMDL. In order to meet the TMDL, habitat acreages and marine habitat basin depths must be maintained, and not change as a result of sediment deposition (SARWQCB 2008). In addition, the overall objectives of the TMDL are to reduce the annual average sediment load in the San Diego Creek watershed by 50 percent over a 10-year period. The 125,000 tons per year annual average sediment load target is allocated equally between the San Diego Creek watershed (62,500 tons per year) and the Newport Bay watershed (62,500 tons per year) (County of Orange 2009b). The TMDL also includes an Upstream Monitoring Element for activities that are performed in San Diego Creek upstream of Jamboree Road, and a Newport Bay Monitoring Element to monitor activities in the upper and lower Newport Bay.

Summary of Existing Water Quality Data (County of Orange)

Type	Site Name	Date	Time	Physicals						Chemical											Bacteria			Pesticides					Dissolved Metals									
				Dissolved Oxygen	Electrical Conductivity	pH	Water Temperature	Turbidity	Hardness as $CaCO_3$	Phenols	Ammonia as N	Nitrate as N	Surfactsnats (MBAS)	Reactive Phosphorous	Total Chlorine	Total Suspended Solids (TSS)	Oil & Grease	Dissolved Copper	Dissolved Hexa Chrom.	Total Organic Carbon	Total Coliform	Fecal Coliform	Enterococcus	Diazinon	Chlorpyrifos	Malathion	Dimethoate	Disulfoton	Chromium	Nickel	Copper	Zinc	Silver	Cadmium	Lead	Arsenic	Selenium	Mercury
				mg/L	µS/cm		°C	NTU	mg/L	mg/L											CFU/100mL			ng/L					µg/L									
Criterion 1	**Outside Tolerance Interval**			**5.98**		**7.27-8.3**	**23.08**	**15.9**		**0.02**	**1.46**	**5.5**	**0.35**	**2.92**	**0.12**	**46.48**					**300,000**	**80,000**	**52,000**	**125**	**17.44**	**68.5**	**10**			**88**	**13**	**69**		**8.6**	**2.53**			
Criterion 2	Basin Plan Objective			5		6.5-9		20					0.5	0.1		75																					
Criterion 3	Out of Bounds for Site																																				
Criterion 4	Warning Level based on Experience				6000		40			0.02	0.65	10			1																						
Criterion 5	CTR Acute Criterion																											1707.86	1512.89	49.62	379.3	37.44	19.1	280.01			
Criterion 6	CTR Chronic Criterion																											554.01	168.04	29.28	382.4		6.25	10.91			
Criterion 7	LC_{50} for Toxicity Test Organism																							450	570	5000	43000										
	Targeted Site	Random Site																																			
Targeted	IRVF05TBN1	5/25/2007	10:05	6.73	6256	7.27	20.88	0.88	1505	0.02	0.05	3.9	0.16	2.2	0.06	<5	<5	0.11	0.01	10	3,000	1,100	2,300	<2.0	<1.0	<3.0	<3.0	<1.0	0.53	9.4	8.2	12	<0.50	<0.50	<0.50	3.7	5.2	<0.10
Targeted	IRVF05TBN1	6/28/2007	08:50	14.31	2921	7.51	21.69	0.63	1490	0	0	4.7	0.05	2.52		<5	<5	0.04	0.01	7.8	3,000	690	200	<2.0	<1.0	<3.0	<3.0	<1.0	0.57	5.8	7.6	13	1.1	<0.50	<0.50	4.2	8.6	<0.10
Targeted	IRVF05TBN1	7/27/2007	10:10	6.28	901	**6.99**	**23.98**	0.37	1930	0.02	0.02	3.8	0.05	2.25	0.1	6	<5	0.06	0.01	7.1	4,200	600	1,700	<2.0	<1.0	<3.0	<3.0	<1.0	0.53	11	11	33	<0.50	0.72	<0.50	3.3	6.5	<0.10
Targeted	IRVF05TBN1	8/23/2007	10:25	6.45	5412	**6.86**	**26.5**	0.42	1295	0.02	0.02	2.2	0.07	1.89	0.11	<5	<5	0.04	0.02	5.2	400	300	<10	<2.0	<1.0	<3.0	<3.0	<1.0	<0.50	4.7	3.9	8.2	<0.50	<0.50	<0.50	4.3	4.7	<0.10
Targeted	IRVF05TBN1	9/19/2007																																			
Targeted	IRVF05TBN1	9/27/2007	09:29	**5.23**	7946	**7.13**	22.66	0.4	2065	0.02	0.01	0.9	0.14	2.28	0.08	<5	<6	0.04	0.01	7.5	3,000	200	100	<2.0	<1.0	<3.0	<3.0	<1.0	<0.50	10	5.2	61	1.1	<1.00	<1.00	3.4	4.9	<0.10
Targeted	IRVF05TBN1	5/30/2008	10:40	6.29	7753	**7.24**	19.51	0.85	1690		0.1	4.3	0.1	2.63	0.08	<5	<5	0.2	0.05	9.1	>330	40	30	<2.0	<1.0	<3.0	<3.0	<1.0	<0.50	9.2	7	9.5	0.61	<0.50	<0.50	3.3	6.4	<0.10
Targeted	IRVF05TBN1	6/25/2008	09:20	**4.54**	6296	**7.15**	20.62	1.87	1420		0.1	3.2	0.1	2.4	0.09	35	<5	0.2	0.05	16	>15,000	1,900	2,200	<10.0	<10.0	<10.0	<10.0	<10.0	<0.50	8	9.1	15	<0.50	<0.50	<0.50	3.6	4.3	<0.05
Targeted	IRVF05TBN1	7/24/2008	10:03	8.31	7734	**7.24**	22.02	0.44	1675		0.1	1.6	0.1	2.17	0.1	<5	<5	0.2	0.05	7.1	260	120	50	<10.0	<10.0	<10.0	<10.0	<10.0	0.54	7.8	7.7	14	<0.50	<0.50	<0.50	4.8	6.6	<0.05
Targeted	IRVF05TBN1	8/19/2008	11:25	6.77	8851	7.38	22.78	0.42	1910		0.1	2	0.1	2.46	0.1	<5	<5	0.2	0.05	6.7	480	99	140	12	<10.0	<10.0	<10.0	16	<0.50	8.2	6.3	13	0.95	<0.50	<1.00	4.9	8.1	<0.05
Targeted	IRVF05TBN1	9/9/2008	08:50	7.8	8603	7.53	**24.41**	0.75	1830		0.1	2	0.1	2.28	0.07	<5	<5	0.2	0.05	7.4	>920	340	360	<10.0	<10.0	<10.0	<10.0	<10.0	<2.50	8.7	6.8	14	<2.50	<2.50	<2.50	4.2	5.2	<0.05
	n			10	10	10	10	10	10	5	10	10	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Max			14.31	8851	7.53	**26.5**	1.97	2065	0.02	0.1	4.7	0.16	2.63	0.11	35	<6	0.2	0.05	16	>15000	1900	2300	12	<10.0	<10.0	<10.0	16	<2.5	11	11	61	<2.5	<2.5	<2.5	4.9	8.6	<0.10
	Min			**4.54**	901	**6.86**	19.51	0.37	1295	0	0	0.9	0.05	1.89	0.06	<5	<5	0.04	0.01	5.2	260	40	<10	<2.0	<1.0	<3.0	<3.0	<1.0	<0.5	4.7	3.9	8.2	<0.5	<0.5	<0.5	3.3	4.3	<0.05
	Mean			7.271	6267.3	**7.23**	22.505	0.713	1681	0.016	0.06	2.86	0.097	2.308	0.087778	8.1	<6	0.129	0.031	8.39	3059	538.9	709	5.4	<10.0	<10.0	<10.0	5.2	0.717	8.28	7.28	19.27	0.878	0.772	<2.5	3.97	6.05	<0.1
Targeted	IRVF05TBN2	5/31/2007	10:15	11.15	3150	7.46	22.88	0.23	1000	0.02	0.03	**21.8**	0.07	0.86	0.11	<5	<5	0.12	0.02	1.5	330	60	80	<2.0	<1.0	<3.0	<3.0	<1.0	1.3	0.98	1.3	2.8	<0.50	<0.50	<0.50	6.4	35	<0.10
Targeted	IRVF05TBN2	6/28/2007	10:10	13.07	4952	**7.19**	**24.74**	4.76	1545	0	0.32	2.1	0.05	0.45		5	<5	0.06	0.01	6.1	6,800	2,700	400	15.4	<1.0	<3.0	<3.0	<1.0	<0.50	1.9	2	4.2	<0.50	<0.50	<0.50	4.9	4.8	<0.10
Targeted	IRVF05TBN2	7/27/2007	08:45	8.48	3015	7.53	**24.13**	0.16	1105	0.02	0.02	**18.8**	0.07	0.6	0.05	5	<5	0.05	0.01	1.7	2,800	690	920	<2.0	<1.0	<3.0	<3.0	<1.0	1.4	3.9	9	6.8	<0.50	<0.50	<0.50	6.1	39	<0.10
Targeted	IRVF05TBN2	8/23/2007	09:01	6.15	2861	7.32	**24.52**	6.19	920	0.02	0.03	**19.5**	0.05	0.65	0.04	<5	<5	0.04	0.02	2.4	8,000	1,200	4,200	<2.0	<1.0	<3.0	<3.0	<1.0	1.2	1	0.92	<2.00	<0.50	<0.50	<0.50	7.2	40	<0.10
Targeted	IRVF05TBN2	9/19/2007																																			
Targeted	IRVF05TBN2	9/27/2007	10:35	6.33	3133	7.38	**24.48**	0.3	910	0.02	0.05	4.9	0.1	0.5	0.08	<5	<6	0.04	0.01	1.9	3,700	<10	600	<2.0	<1.0	<3.0	<3.0	<1.0	8	3.7	1.4	3.8	<0.50	<0.50	<0.50	5.8	39	<0.10
Targeted	IRVF05TBN2	5/30/2008	09:30	7.39	3141	7.32	22.95	0.12	950		0.1	**19.9**	0.1	0.4	0.03	7	<5	0.2	0.05	1.4	2,000	20	50	<2.0	<1.0	<3.0	<3.0	<1.0	1.2	2.5	1.1	2.3	<0.50	<0.50	<0.50	5.9	33	<0.10
Targeted	IRVF05TBN2	6/25/2008	08:25	6.57	3198	**7.23**	**23.27**	0.3	915		0.1	**20.2**	0.1	0.44	0.03	<5	<5	0.2	0.05	1.5	2,300	80	320	<10.0	<10.0	<10.0	<10.0	<10.0	1.2	2.4	1.5	5.8	<0.50	<0.50	<0.50	5.8	31	0.05
Targeted	IRVF05TBN2	7/24/2008	08:40	**5.4**	3153	**7.07**	**23.96**	0.48	905		0.1	**19.2**	0.1	0.6	0.05	<5	<5	0.2	0.05	1.6	>990	170	160	<10.0	<10.0	<10.0	<10.0	<10.0	1.3	1.4	1.6	3	<0.50	<0.50	<0.50	7	39	<0.05
Targeted	IRVF05TBN2	8/19/2008	10:23	7.24	3209	7.48	**24.13**	0.3	840		0.1	**20.3**	0.1	0.53	0.03	<5	<5	0.2	0.05	1.5	240	30	60	<10.0	<10.0	<10.0	<10.0	15	1.3	1.1	1.6	2.6	<0.50	<0.50	<0.50	7	41	<0.05
Targeted	IRVF05TBN2	9/9/2008	09:55	6.49	3173	7.4	**24.41**	0.3	770		0.1	**19.9**	0.1	0.42	0.03	<5	<5	0.2	0.05	1.7	>770	120	260	<10.0	<10.0	<10.0	<10.0	<10.0	1.2	0.93	1.4	3	<0.50	<0.50	<0.50	6.7	39	<0.05
	n			10	10	10	10	10	10	5	10	10	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Max			13.07	4952	7.53	**24.74**	6.19	1545	0.02	0.32	**21.8**	0.1	0.86	0.11	7	<6	0.2	0.05	6.1	8000	2700	4200	15.4	<10.0	<10.0	<10.0	15	1.3	3.9	9	6.8	<0.50	<0.50	<0.50	7.2	41	<0.1
	Min			**5.4**	2861	**7.07**	22.88	0.12	770	0	0.02	2.1	0.05	0.4	0.03	<5	<5	0.04	0.01	1.4	240	<10	50	<2.0	<1.0	<3.0	<3.0	<1.0	<.5	0.93	0.92	<2.0	0.50	<0.50	<0.50	4.9	4.8	<0.05
	Mean			7.827	3298.5	7.338	**23.947**	1.314	986	0.016	0.095	**16.66**	0.084	0.545	0.05	5.2	<6	0.131	0.032	2.13	2793	506	705	6.54	<10.0	<10.0	<10.0	5.1	1.66	1.981	2.182	3.63	<0.50	<0.50	<0.50	6.28	34.08	0.08
Targeted	IRVF06P08	6/7/2006	09:45	7.47	3075	7.62	20.94	14.2	645	<0.02	0.04	0.8	**0.81**	0.76	0.04	10	<5	<0.04	<0.01	13	**1,380,000**	2,000	**102,000**	45.4	<1.0	**470**	<3.0	<1.0	0.87	8.3	4.9	24	<0.50	<0.50	0.5	4.2	2.4	<0.10
Targeted	IRVF06P08	7/5/2006	09:00	9.09	3920	8.07	**25.02**	**31.1**	1705	<0.02	0.1	**8.2**	**0.39**	0.15	0.04	**44**	<5	<0.04	<0.01	3.5	40,000	3,400	4,000	<2.0	<1.0	<3.0	<3.0	<1.0	<0.50	22	1.7	4.4	<0.50	<0.50	<0.50	2.1	93	<0.10
Targeted	IRVF06P08	8/4/2006	08:50	7.13	3383	**7.19**	22.94	**21.8**	1545	<0.02	0.04	**8.9**	0.1	0.14	<0.02	31	<5	<0.04	<0.01	4	41,000	25,000	6,500	<2.0	<1.0	<3.0	<3.0	<1.0	<0.50	2.2	1.1	3.1	<0.50	<0.50	<0.50	1.9	110	<0.10
Targeted	IRVF06P08	9/12/2006	09:05	**4.86**	2548	8.14	21.49	**62.6**	460	<0.02	<0.02	1.6	**0.65**	1.54	<0.02	**46**	<5	<0.04	0.02	17	280,000	45,000	21,000	27.4	<1.0	**96.5**	<3.0	<1.0	1.1	9.9	4.3	13	<0.50	<0.50	0.7	4.5	1.9	<0.10
Targeted	IRVF06P08	5/11/2007																																			
Targeted	IRVF06P08	5/31/2007	07:45	15.39	815	7.84	20.21	7.84	450	0.02	0.19	2.1	0.17	1.26	0.05	<5	<5	0.04	0.01	5.7	40,000	6,000	**124,000**	<2.0	<1.0	62.1	<3.0	<1.0	0.62	1.3	4.1	5.9	<0.50	<0.50	<0.50	3.6	1.7	<0.10
Targeted	IRVF06P08	7/27/2007	11:50	6.34	2960	7.97	**32.87**	**26.5**	850	0.02	0.78	0.7	0.18	2.61	0.02	23	<5	0.18	0.01	15	17,000	5,000	7,800	67.1	<1.0	<3.0	<3.0	<1.0	0.64	5.1	6.5	8.2	<0.50	<0.50	<0.50	5.2	2.3	<0.10
Targeted	IRVF06P08	8/23/2007																																			
Targeted	IRVF06P08	9/19/2007	12:34	**5.76**	3018	7.99	21.97	**21.5**	690	0.02	0.63	0.5	**0.36**	1.78	0.02	15	<5	0.08	0.01	13	150,000	**110,000**	1,400	84.1	<1.0	<3.0	<3.0	<1.0	0.54	2.8	1.4	12	<0.50	<0.50	<0.50	5	2.1	<0.10
Targeted	IRVF06P08	5/14/2008	07:45	7.17	8758	7.88	18.4	5.28	1340		0.1	2	0.24	1.34	0.06	6	<5	0.2	0.05	20	82,000	3,400	4,900	<2.0	<1.0	<3.0	<3.0	<1.0	<1.00	6.7	6.7	46	<1.00	<1.00	<1.00	4.5	3.5	<0.10
Targeted	IRVF06P08	6/6/2008	07:30	7.58	8584	7.83	19.42	3.44	1345		0.07	1.5	0.17	1.67	0.06	11	<5	0.15	0.06	16	124,000	800	5,200	21	<10.0	<10.0	**93**	<10.0	0.78	6.4	7.7	21	<0.50	<0.50	<0.50	5	3.6	<0.10
Targeted	IRVF06P08	7/8/2008	10:20	7.14	11445	7.93	22.61	4.63	1665		0.1	2	0.15	1.35	0.03	10	<5	0.2	0.05	13	**2,400,000**	18,000	7,900	<10.0	<10.0	<10.0	<10.0	<10.0	0.76	6.5	3.4	14	<0.50	<0.50	<0.50	5.3	2.5	<0.05
Targeted	IRVF06P08	8/5/2008	09:50	7.06	9527	7.99	**23.6**	7.09	1340		0.2	2	0.11	0.95	0.03	17	<5	0.2	0.05	12	**480,000**	38,000	7,800	<10.0	<10.0	<10.0	<10.0	<10.0	0.52	6.2	6.6	9	<0.50	<0.50	<0.50	4.2	2.2	<0.05
Targeted	IRVF06P08	8/28/2008	09:20	6.9	8319	**7.19**	22.54	4.46	1145		0.1	2	0.15	1.72	0.03	<5	<5	0.2	0.05	15	>96,000	14,000	22,000	<10.0	<10.0	<10.0	<10.0	<10.0	<1.00	6.8	3.6	7.2	<0.50	<0.50	<0.50	4	1.8	<0.05
	n			12	12	12	12	12	12	7	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Max			15.39	11445	8.14	32.87	**62.6**	1705	0.02	0.78	**8.9**	**0.81**	2.61	0.06	46	<5	0.2	0.06	20	**2,400,000**	**110000**	**124000**	84.1	<10.0	**470**	**93**	<10.0	1.1	22	7.7	46	<1.0	<1.0	<1.0	5.3	110	<0.1
	Min			**4.86**	815	7.19	18.4	3.44	450	<0.02	<0.02	0.5	0.1	0.14	<0.02	5	<5	<0.04	<0.01	3.5	17,000	800	1400	<2.0	<1.0	<3.0	<3.0	<1.0	<0.5	1.3	1.1	3.1	<0.05	<0.05	<0.05	1.9	1.7	<0.05
	Mean			7.574167	5529.333	7.753333	22.6675	**17.53667**	1098.333	<0.02	0.1975	2.691667	0.29	1.2725	0.035	18.58	<5	0.1175	0.028	12.26667	**427.500**	22550	26175	23.58	<10.0	56.97	**12.25**	<10.0	0.74	7.016667	4.333333	13.98333	<1.0	<1.0	0.58	4.125	18.91667	<0.1
Random	IRVF08P01	7/12/2006	09:15	9.83	1446	8.13	21.54	4.92	275	<0.02	0.06	2.5	0.17	**3.93**	0.07	5	<5	<0.04	<0.01	9.6	61,000	1,800	13,000	<2.0	<1.0	<3.0	<3.0	<1.0	1.4	6.1	**14**	36	<0.50	<0.50	<0.50	3.1	1.4	<0.10
Random	IRVF08P01	9/19/2006	13:15	9.65	1006	7.6	22.66	3.96	300	<0.02	0.05	1.2	0.1	0.96	0.08	6	<5	<0.04	0.03	4.3	43,000	10,000	4,000	<2.0	<1.0	<3.0	<3.0	<1.0	1.2	2.4	4.8	9.6	<0.50	<0.50	<0.50	4.4	1.1	<0.10
Random	IRVF08P01	5/11/2007	10:45	10.74	1495	**8.37**	18.18	7.49	330	0.02	0.02	5.2	0.13	1.87	0.1	<5	<5	0.04	0.01	7.5	53,000	4,000	1,600	<2.0	<1.0	<3.0	<3.0	<1.0	1.4	1.6	6.3	23	<0.50	<0.50	<0.50	2.5	1.1	<0.10
Random	IRVF08P01	6/28/2007	10:05	12.67	1338	8.28	19.96	7.67	340	0.02	0.05	2.8	0.17	**2.94**	0.05	5	<5	0.04	0.01	9.5	130,000	1,200	3,000	<2.0	<1.0	<3.0	<3.0	<1.0	0.99	1.8	7.1	20	<0.50	<0.50	<0.50	2.8	1	<0.10
Random	IRVF08P01	9/26/2007	11:35	9.12	1456	8.12	21.72	8	320	0.02	0.18	0.7	0.05	1.74	**0.45**	8	<6	0.04	0.01	7.2	30,000	1,000	1,000	<2.0	<1.0	<3.0	<3.0	<1.0	1	7.7	5.3	33	<0.50	0.74	<0.50	2.4	1.5	<0.10
Random	IRVF08P01	5/28/2008	10:53	9.1	1567	7.93	18.68	5.35	350		0.1	**8.5**	0.1	**4.76**	**0.26**	5	<5	0.2	0.05	9.1	>3,500	240	740	<2.0	<1.0	<3.0	<3.0	<1.0	1.2	2.6	13	**91**	<0.50	2.7	<0.50	3.2	1.8	<0.10
Random	IRVF08P01	7/24/2008	11:00	11.36	1703	**8.64**	22.34	12	250		0.1	2	0.1	1.14	0.05	10	<5	0.2	0.05	8.3	>9,200	3,700	2,300	<10.0	<10.0	<10.0	<10.0	<10.0	1.9	1.4	10	13	<0.50	1.3	<0.50	2.7	1.1	<0.05
Random	IRVF08P01	8/19/2008	08:59	10.93	2082	**8.44**	20.71	7.79	470		0.1	2	0.12	1.3	0.06	8	<5	0.2	0.05	6.4	24,000	4,800	3,900	<10.0	<10.0	<10.0	<10.0	16	4.7	1.7	6.4	8	<0.50	<0.50	<0.50	2.8	1.1	<0.05
	n			8	8	8	8	8	8	5	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Max			12.67	2082	**8.64**	22.66	12	470	0.02	0.18	**8.5**	0.17	**4.76**	**0.45**	10	<6	0.2	0.05	9.6	130,000	10000	13000	<10.0	<10.0	<10.0	<10.0	16	4.7	7.7	**14**	**91**	<0.5	2.7	<0.5	4.4	1.8	<0.1
	Min			8.12	1006	7.6	18.18	3.96	250	<0.02	0.02	0.7	0.05	0.96	0.05	<5	<5	0.04	0.01	4.3	>3500	240	740	<2.0	<1.0	<3.0	<3.0	<1.0	0.99	1.4	4.8	8	<0.5	<0.5	<0.5	2.4	1	<0.05
	Mean			10.3	1511.625	8.18875	20.72375	7.1475	329.375	0.02	0.0825	3.1125	0.1175	2.33	0.14	6.5	<6	0.1	0.0275	7.4875	39300	3342.5	3692.5	<10.0	<10.0	<10.0	<10.0	4	1.72375	3.1625	8.3625	29.2	<0.5	0.905	<0.5	2.9875	1.2625	<0.10

Note: Highlighted values represent measurements that exceed water quality objectives, warning levels or other criteria for that specific sample.

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Toxics

In 2002, the US EPA established a TMDL for 14 different toxic constituents for the San Diego Creek and Newport Bay. The constituents included organophosphate pesticides (chlorpyrifos & diazinon), organochlorinated compounds (chlordane, dieldrin, DDT, PCBs, & toxaphene), and metals (cadmium, chromium , copper, lead, mercury, selenium, & zinc) (County of Orange 2006b). Table 5.7-6 summarizes which of these constituents apply to the specific water bodies within the San Diego Creek and Newport Bay watersheds.

Table 5.7-6
Water Bodies Subject to the Toxics TMDL

Water Body	Organophosphate Pesticide	Organochlorinated Compound	Element/Metal
San Diego Creek	Chlorpyrifos, Diazinon	Chlordane, Dieldrin DDT, PCBs, Toxaphene	Cd, Cu, Pb, Se, Zn
Upper Newport Bay	Chlorpyrifos	Chlordane, DDT, PCBs,	Cd, Cu, Pb, Se, Zn
Lower Newport Bay	Not Applicable	Chlordane, Dieldrin, DDT, PCBs	Cu, Pb, Se, Zn
Rhine Channel	Not Applicable	Chlordane, Dieldrin, DDT, PCBs	Cu, Pb, Se, Zn, Cr, Hg

Source: OC Watersheds Program. San Diego Creek/Newport Bay Toxics TMDL.

The primary sources of toxic substances that lead to the impairment of the watersheds include agricultural runoff, industrial discharges, groundwater discharges, and urban runoff. For some constituents that are no longer in use today, such as DDT and PCBs, historical discharges and erosion may serve as sources. Due to bioaccumulation, adverse impacts to aquatic organisms as a result of these substances may include (but are not limited to) cellular injury, mutagenic impairment, reduced reproductive success, and carcinogenic responses (USEPA 2002).

Currently, a TMDL for organophosphate pesticides (chlorpyrifos & diazinon) has been approved by the SWRCB and EPA for implementation under Order No. R8-2003-0039, and in 2007, the Santa Ana RWQCB approved the TMDL for organochlorinated compounds (Order No. R8-2003-0039). TMDLs for metals are currently in development by the RWQCB. However, as part of the County's Nitrogen Selenium Management Program (see Groundwater Quality Conditions Section for further details), sources and treatment options for selenium are currently being investigated to be used in the development of the TMDL for selenium.

Fecal Coliform

Due to consistently high bacteria levels in Newport Bay, portions of the Upper Newport Bay has been closed to contact recreational uses (REC1) since 1974. The principal sources contributing to the excess bacteria levels were determined to be urban runoff sources, particularly during wet weather. However, exact sources of the bacteria in urban runoff are undetermined. Additional sources to the Bay include, but are not limited to, manure fertilizers, fecal wastes from humans, pets, birds, and other animals, as well as restaurants and food sources and vessel sanitary wastes. Previous monitoring data has shown that the bacteria concentrations in the Bay are strongly influenced by storm water runoff. In addition, due to the hydrologic and estuarine conditions of the Bay, the bacteria concentrations within the Bay are influenced by tidal mixing, sunlight, and sediment conditions within the Bay. These conditions may increase or decrease the levels, once they reach the Bay from upstream sources (Pednekar, A. M., et al, 2005).

Accordingly, in 1999, Santa Ana RWQCB Resolution No. 99-10 established a TMDL for fecal coliform bacteria in Newport Bay. The TMDL established waste load allocations for both point sources and nonpoint sources in a prioritized phased approach to allow sufficient time for reducing bacteria concentrations. The phased approach allows for revisions to the program or control measures implemented if annual monitoring efforts show that the bacteria levels are not being reduced to the desired levels.

Existing Groundwater Conditions

Regional Drainage

Geographically, the Irvine Business Complex is located within the Irvine Groundwater Management Zone of the lower Santa Ana River basin. As defined in the Basin Plan, the Irvine Groundwater Management Zone is generally bounded by Newport Bay and the San Joaquin Hills to the south/southwest, the Santa Ana Mountains to the east, and the Orange County Groundwater Management Zone to the north.

The project site is situated over the Irvine Subbasin of the Orange County Main Groundwater Basin. The Orange County Water District (OCWD) manages the level of water in the Basin, including the Irvine Subbasin, by regulating the amount of water pumped out and by recharging water into the Basin. The Groundwater Basin provides more than half of the water used within the District (OCWD 2005). The OCWD has an ongoing program for testing water quality in which it tests for both chemical contaminants and microbial pathogens at concentrations of parts per trillion. Water in the Orange County Main Groundwater Basin is of sufficient quality that it is potable when it is pumped out of the ground (DePinto 2007).

As stated above, 95 percent of the existing project site consists of impervious surfaces such as the building and the associated parking lot. Thus, there is very little permeable surface on the site available for groundwater recharge.

Beneficial Uses

The Basin Plan identifies the Irvine Groundwater Management Zone as having four beneficial uses. They are:

- MUN – Municipal and Domestic Supply;
- AGR – Agricultural Supply;
- IND – Industrial Service Supply
- PROC – Industrial Process Supply.

Water Quality Objectives

Specific water quality objectives have been established for the Irvine Groundwater Management Zone to maintain its beneficial uses, and are summarized in Table 5.7-7.

Table 5.7-7
Water Quality Objectives for the Irvine Groundwater Management Zone
(mg/L)

Total Dissolved Solids	Hardness	Sodium	Chloride	Nitrate as Nitrogen	Sulfate
910	--	--	--	5.9	--

Source: Regional Water Quality Control Board (RWQCB) Santa Ana Region. Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995, updated February 2008.
-- No specific water quality objectives established

In addition to specific numeric water quality objectives, narrative objectives for all groundwaters in the Santa Ana Region also apply to the Irvine Groundwater Management Zone. Narrative objectives have been established for the following constituents:

- arsenic
- boron
- cyanide
- MBAS
- oil & grease
- sodium
- total dissolved solids
- bacteria, coliform
- chloride
- fluoride
- metals
- pH
- sulfate
- toxicity
- barium
- color
- hardness (as $CaCO_3$)
- nitrate
- radioactivity
- taste & odor

Groundwater Quality Conditions

Due agricultural activities and the increasing urbanization in the watershed over the past 100 years, shallow groundwater within portions of the San Diego Creek and Newport Bay watersheds contains high levels of nutrients and selenium. The high concentrations in groundwater developed as a result of the draining of the Swamp of the Frogs in the 1960s, a large swamp that was previously disconnected from the Newport Bay. Over time, the swamp accumulated nutrients and selenium in sediments that discharged to the swamp from the adjacent hillsides, and became mobilized in groundwater when the swamp was drained and hydrologic regime of the watershed was changed. Since groundwater levels in portions of the watershed are relatively close to the ground surface, groundwater may come into contact with surface waters by seeping through channel bottoms, cracks in storm drain pipes, and through groundwater dewatering activities. As a result, the high levels of nutrients and selenium in the groundwater may discharge into receiving waters.

The Santa Ana RWQCB recognized the potential treat groundwater discharges may have on surface water quality, and began regulating discharges of groundwater into surface waters through NPDES permits. Due to the concerns from short-term discharges of nitrogen and selenium into surface waters, a separate permit was issued by the RWQCB specific to the San Diego Creek and Newport Bay watersheds. Order No. 2004-0021 recognized that while groundwater contained high levels of selenium, there were no feasible treatment technologies for reducing selenium concentrations in discharges. A Working Group was subsequently formed, and the Orange County Nitrogen Selenium Management Program (NSMP) was developed to investigate alternative compliance approaches and develop an overall understanding and management plan for selenium and nitrogen as a result of groundwater discharges in the watershed. The NSMP Working Group consists of various stakeholders and technical representatives to develop a Work Plan for addressing nitrogen and selenium issues as a result of groundwater discharges in the watersheds. The research and information collected under the NSMP will also be beneficial in the development of the TMDL specific for selenium, as well as improving compliance with the existing TMDL for nutrients. In 2007, Order No. 2004-0021 was superseded by Order No. R8-2007-0041.

5.7.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

HYD-1 Violate any water quality standards or waste discharge requirements.

HYD-2 Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted.

HYD-3 Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in a substantial erosion or siltation on- or off-site.

HYD-4 Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

HYD-5 Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

HYD-6 Otherwise substantially degrade water quality.

HYD-7 Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

HYD-8 Place within a 100-year flood hazard area structures which would impede or redirect flood flows.

HYD-9 Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

HYD-10 Be subject to inundation by seiche, tsunami, or mudflow.

Both Initial Studies, included as Appendices A and B, substantiate that impacts associated with the following thresholds would be less than significant:

- Threshold HYD-9
- Threshold HYD-10

These impacts will not be addressed in the following analyses.

5.7.3 Environmental Impacts

Existing Plans, Programs, and Policies

The following measures are existing plans, programs, or policies (PPPs) that apply to the proposed project and will help to reduce and avoid potential impacts related to hydrology and water quality:

PPP 7-1 Prior to the issuance of precise grading permits, the applicant shall submit a hydrology and hydraulic analysis of the entire site. The analysis shall be prepared by a professional civil engineer versed in flood control analysis and shall include the following information and analysis (Standard Condition A.6):

a. Hydrology/hydraulic analysis of 100-year surface water elevation at the project site to determine building elevation or flood proofing elevation.

b. Analysis of existing and postdevelopment peak 100-year storm flow rates, including mitigation measures to reduce peak flows to existing conditions.

c. An analysis demonstrating that the volume of water ponded on the site and stored underground in the drainage system outside of the building envelope in the proposed condition is greater than or equal to the corresponding volume in the existing condition. The water surface used to determine the ponded volume shall be based on the water surface in the major flood control facility that the site is tributary to.

PPP 7-2 Prior to the issuance of precise grading permits, the applicant shall submit a groundwater survey of the entire site. The analysis shall be prepared by a geotechnical engineer versed in groundwater analysis and shall include the following information and analysis (Standard Condition A.7):

a. Potential for perched groundwater intrusion into the shallow groundwater zone upon buildout.

b. Analysis for relief of groundwater buildup and properties of soil materials on-site.

c. Impact of groundwater potential on building and structural foundations.

d. Proposed mitigation to avoid potential for groundwater intrusion within five feet of the bottom of the footings.

PPP 7-3 This project will result in soil disturbance of one or more acres of land that has not been addressed by an underlying subdivision map. Prior to the issuance of preliminary or precise grading permits, the applicant shall provide the City Engineer with evidence that a Notice of Intent (NOI) has been filed with the State Water Resources Control Board. Such evidence shall consist of a copy of the NOI stamped by the State Water Resources Control Board or the Regional Water Quality Control Board, or a letter from either agency stating that the NOI has been filed (Standard Condition A.10).

PPP 7-4 Prior to the issuance of precise grading permits, the applicant shall submit, and the Director of Community Development shall have approved, a project water quality management plan (WQMP). The WQMP shall identify the best management practices that will be used on the site to control predictable pollutant runoff (Standard Condition A.13).

Project Design Features

There are no specific Project Design Features that relate to potential hydrology and water quality impacts.

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

5.7.3.2 Hydrology

Proposed Drainage

The purpose of the proposed conditions evaluation is to determine impacts associated with the development of the program-level Project and quantify changes to the existing runoff conditions. The proposed Project consists of a General Plan Amendment, Zoning Code Amendment, and Municipal Code Amendment for the adoption and land use changes associated with the Irvine Business Complex Mixed Use Community Vision Plan. The majority of the project will

involve the redevelopment of existing commercial or industrial land uses to mixed use and high-density residential land uses. Since the Project involves an overlay of new land uses only, individual projects within the Irvine Business Complex are not evaluated at a project-specific level.

Since the proposed Project is a redevelopment of existing land uses, drainage patterns and conveyances will remain similar to existing conditions. The existing infrastructure and drainage channels will continue to collect runoff from the redevelopment areas, discharging to Reach 1 of San Diego Creek. New local storm drains may be constructed to improve drainage conditions at the individual project sites; however, the existing backbone storm drain system will remain, and the overall imperviousness of the Irvine Business Complex is anticipated to remain consistent with existing conditions or become slightly less impervious based on the increase in residential uses and landscaping requirements.

Proposed Hydrology Conditions

The existing condition of the Irvine Business Complex consists of mostly commercial buildings, office buildings, and warehouses, with a few residential high rise condominiums. The existing land use codes are predominantly Industrial, Commercial – General Office, and Commercial – Community (see Exhibit 1, Existing Land Use). The proposed Irvine Business Complex Vision Plan and Overlay Zoning Code plans to incorporate a greater density of Residential – High-Rise Density and Residential – High Density land uses in areas currently zoned for Industrial and Commercial. Of the 2,800 acres, an estimated 225 acres (8 percent) of existing/legacy industrial and commercial land use within the IBC is proposed to change to medium-high and high density residential. It is reasonable to assume that the proposed Project will not increase the amount of impervious surfaces in the Irvine Business Complex, as the existing industrial and commercial sites generally have a greater percentage of impervious surfaces in comparison to requirements of the proposed IBC zoning. According to the 1986 Orange County Hydrology Manual, the recommended average values for impervious cover for industrial and commercial land use is 90 percent, and in the IBC, many of the existing commercial and industrial sites appear to have very minimal landscaping and an impervious ratio that actually exceeds 90 percent. The redeveloped IBC zones will have a minimum landscape requirement of 15 percent for residential areas (City of Irvine Zoning Code Chapter 3-15), in addition to other landscaping requirements in any new parking lots and park/recreational areas. Overall, the Project is not anticipated to increase the amount of imperviousness as compared to existing conditions.

The original design capacities of the flood control channels conform to historical design requirements; these facilities do not have the capacity to convey the updated flood control design storm events. The proposed land use overlay is not anticipated to increase the impervious ratio for individual projects and thus it is not anticipated that individual projects will significantly increase peak flow rates or worsen channel deficiencies as compared to existing conditions.

5.7.3.3 Water Quality

Construction Activities

Clearing, grading, excavation and construction activities associated with the individual projects under the Irvine Business Complex may impact water quality due to sheet erosion of exposed soils and subsequent deposition of particulates in local drainages. Grading activities, in particular, lead to exposed areas of loose soil, as well as sediment stockpiles, that are susceptible to uncontrolled sheet flow. Although erosion occurs naturally in the environment primarily from weathering by water and wind action, improperly managed construction activities can lead to substantially accelerated rates of erosion that are considered detrimental to the environment.

Prior to the issuance of grading permits, the applicants shall provide evidence that the development of the projects as part of the Irvine Business Complex shall comply with the most current General Construction Permit (GCP) and associated local NPDES regulations to ensure that the potential for soil erosion is minimized on a project-by-project basis. In accordance with the updated GCP (Order No. 2009-0009-DWQ), the following Permit Registration Documents (PRDs) are required to be submitted to the SWRCB prior to commencement of construction activities:

- Notice of Intent (NOI)
- Risk Assessment (Standard or Site-Specific)
- Particle Size Analysis (if site-specific risk assessment is performed)
- Site Map
- SWPPP
- Post-Construction Water Balance Calculator (not required – project is covered under the North Orange County MS4 permit Order No. R9-2009-0030)
- Active Treatment System (ATS) Design Documentation (if ATS is determined necessary)
- Annual Fee & Certification

In accordance with the existing and updated GCP, construction SWPPPs must be prepared and implemented at the project sites, and revised as necessary, as administrative or physical conditions change. The SWPPPs must be made available for review by the RWQCB, upon request, and must describe construction BMPs that address pollutant source reduction and provide measures/controls necessary to mitigate potential pollutant sources. These include, but are not limited to: erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices (CASQA 2003). The above-mentioned BMPs for construction activities are briefly discussed below.

- Erosion control BMPs, such as hydraulic mulch, soil binders, and geotextiles and mats, protect the soil surface by covering and/or binding the soil particles. Temporary earth dikes or drainage swales may also be employed to divert runoff away from exposed areas and into more suitable locations. If implemented correctly, erosion controls can effectively reduce the sediment loads entrained in storm water runoff from construction sites.
- Sediment controls are designed to intercept and filter out soil particles that have been detached and transported by the force of water. All storm drain inlets on the project site or within the project vicinity (i.e., along streets immediately adjacent to the project boundary) should be adequately protected with an impoundment (e.g., gravel bags) around the inlet and equipped with a sediment filter (e.g., fiber rolls). They should also be placed around areas of soil disturbing activities, such as grading or clearing.
- Stabilize all construction entrance/exit points to reduce the tracking of sediments onto adjacent streets and roadways. Wind erosion controls should be employed in conjunction with tracking controls.
- Non-storm water management BMPs prohibit the discharge of materials other than storm water, as well as reduce the potential for pollutants from discharging at their source. Examples include avoiding paving and grinding operations during the wet season where feasible, and performing any vehicle equipment cleaning, fueling and maintenance in designated areas that are adequately protected and contained.
- Waste management consists of implementing procedural and structural BMPs for collecting, handling, storing and disposing of wastes generated by a construction project to prevent the release of waste materials into storm water discharges.

Prior to commencement of construction activities, the individual project-SWPPP will be prepared in accordance with the site-specific sediment risk analyses based on the final rough grading plans and erosion and sediment controls proposed for each phase of construction for each project. The phases of construction will define the maximum amount of soil

disturbed, the appropriate sized sediment basins and other control measures to accommodate all active soil disturbance areas, and the appropriate monitoring and sampling plans.

Post-Construction Activities

With the proposed land use changes, redevelopment of the Irvine Business Complex may result in long-term impacts to the quality of storm water and urban runoff, subsequently impacting downstream water quality. Redevelopments similar to the proposed Irvine Business Complex can potentially create new sources for runoff contamination through changing land uses. As a consequence, the projects associated with the Irvine Business Complex have the potential to increase the post-construction pollutant loadings of certain constituent pollutants associated with the proposed land uses and their associated features, such as landscaping.

In accordance with the requirements of the City of Irvine LIP and consistency with OC DAMP and third-term MS4 permit, new development and significant redevelopment projects must incorporate site design and source control BMPs to address post-construction storm water runoff management. In addition, projects that are identified as Priority Projects are required to implement site design/LID and source control BMPs applicable to their specific priority project categories, as well as implement treatment control BMPs. Selection of treatment control BMPs is based on the pollutants of concern for the specific project site and the BMP's ability to effectively treat those pollutants, in consideration of site conditions and constraints. Further, both Priority and Non-Priority projects must develop a project-specific Water Quality Management Plan (WQMP) that describes the menu of BMPs chosen for the project site, as well as include operation and maintenance requirements for all structural and treatment control BMPs. The third-term permit development requirements will be superseded as soon as the Model WQMP is adopted next year. In the mean time, the City will be requiring that new developments and significant redevelopments (that did not have their entitlements as of May 22, 2009) implement LID principles on-site to the maximum extent practicable standard and any storm water that cannot be retained on-site using infiltration, capture and reuse or evapotranspiration techniques, must be treated by conventional City-approved treatment control BMPs prior to being discharged into the storm drain.

Predicted Pollutants and Sources

The pollutants of concern for water quality are those pollutants that are anticipated (expected) or potentially could be generated by the project, based on past and proposed land uses, along with those pollutants that have been identified by regulatory agencies as potentially impairing beneficial uses in receiving water bodies. Based on the various land uses for the Irvine Business Complex, the pollutants of concern can be divided up into anticipated pollutants and potential pollutants. Table 5.7-8, derived from the Countywide Model WQMP, summarizes typical pollutants of concern for major land uses and project categories, including those that are proposed for the Irvine Business Complex.

Table 5.7-8
Anticipated and Potential Pollutants Generated by Land Use Type

Priority Project Categories and/or Project Features	Bacteria/ Virus	Heavy Metals	Nutrients	Pesticides	Organic Compounds	Sediment	Trash & Debris	Oxygen Demanding Substances	Oil & Grease
Detached Residential	X		X	X		X	X	X	X
Attached Residential	P		X	X		X	X	P[1]	P[2]
Commercial/ Industrial	P[3]	P	P[1]	P[1]	P[5]	P[1]	X	P[1]	X
Automotive Repair Shops		P			X[4,5]		X		X
Restaurants	X						X	X	X

Hillside Development >10,000ft[2]	X		X	X		X	X	X	X
Parking Lots	P[6]	X	P[1]	P[1]	X[4]	P[1]	X	P[1]	X
Streets, Highways & Freeways	P[6]	X	P[1)]	P[1]	X[4]	X	X	P[1]	X

Source: County of Orange Flood Control District, 2003 Drainage Area Master Plan, Table 7-1.3, July 1, 2003.
X = Anticipated
P = Potential
1 A potential pollutant if landscaping or open area exist on-site.
2 A potential pollutant if the project includes uncovered parking areas.
3 A potential pollutant if land use involves food or animal waste products.
4 Including petroleum hydrocarbons.
5 Including solvents.
6 Analyses of pavement runoff routinely exhibit bacterial indicators.

Bacteria/Pathogens. Elevated pathogens are typically caused by the transport of human or animal fecal wastes from the watershed. Runoff that flows over land such as urban runoff can mobilize pathogens, including bacteria and viruses. Even runoff from natural areas can contain pathogens (e.g., from wildlife, plant matter, and soils). Other sources of pathogens in urban areas include pets and leaky sanitary sewer pipes. The presence of pathogens in runoff can impair receiving waters. Total and fecal coliform, enterococcus bacteria, and *E. coli* bacteria are commonly used as indicators for pathogens due to the difficulty of monitoring pathogens directly.

Metals. The primary sources of trace metals in storm water are metals typically used in transportation, buildings and infrastructure and also paints, fuels, adhesives and coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, mercury are typically not detected in urban runoff or are detected at very low levels (LACDPW 2000). Trace metals have the potential to cause toxic effects on aquatic life and are a potential source of groundwater contamination.

Nutrients. Nutrients are inorganic forms of phosphorous and nitrogen. The main sources of nutrients in urban areas include fertilizers in lawns, pet wastes, failing septic systems, and atmospheric deposition from automobiles and industrial operations. The most common impact of excessive nutrient input is eutrophication of the receiving water body, resulting in excessive algal production, hypoxia or anoxia, fish kills and potential releases of toxins from sediment due to changes in water chemistry profiles.

Oil and Grease. The most common sources of oil and grease in urban runoff stem from spilled fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff can contain leachate from roads, breakdown of tires/rubber and deposition of automobile exhaust. Some petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can bioaccumulate in aquatic organisms and are toxic at low concentrations. Hydrocarbons can be measured in a variety of ways including petroleum hydrocarbons, oil and grease, or as individual groups such as PAHs. Hydrocarbons can persist in sediment for long periods of time in the environment and can result in adverse impacts on the diversity and abundance of benthic communities.

Organic Compounds. Organic compounds are carbon-based, and are typically found in pesticides, solvents, and hydrocarbons. Dirt, grease, and other particulates can also adsorb organic compounds in rinse water from cleaning objects, and can be harmful or hazardous to aquatic life either indirectly or directly.

Oxygen Demanding Substances. Oxygen-demanding substances include biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds, such as proteins, carbohydrates, fats, as well as ammonia and hydrogen sulfide. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions, resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds.

Pesticides. Pesticides (including herbicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide or impractical application of pesticides (i.e., right before rain events) may result in runoff containing toxic levels to receiving water bodies and the microorganisms.

Sediment. Sheet erosion and the transport and deposition of sediment in surface waters can be a significant form of pollution that may result in water quality problems. Increases in runoff velocities and volumes can cause excessive stream erosion and sediment transport altering the sediment equilibrium of a stream or channel. Excessive fine sediment, such as total suspended solids, can impair aquatic life through changes to the physical characteristics of the stream (light reduction, temperature changes, etc.).

Trash and Debris. Improperly disposed or handled trash such as paper, plastics and debris including the biodegradable organic matter such as leaves, grass cuttings, and food waste can accumulate on the ground surface where it can be entrained in urban runoff. The large amount of trash and debris can have significant negative impacts on the recreational value of water body. Excessive organic matter can create a high biochemical oxygen demand in a stream and lower its water quality.

Site Design / Low Impact Development BMPs

Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments. In general, site design objectives include a combination of factors that may include: minimization of impervious surfaces including roads and parking lots; preservation of native vegetation and root systems; minimization of erosion and sedimentation from susceptible areas such as slopes; incorporation of water quality wetlands, biofiltration swales, etc. where such measures are likely to be effective and technically and economically feasible; and minimization of impacts from storm water and urban runoff on the biological integrity of natural drainage systems and water bodies. In accordance with the most current version of the MS4 Permit, OC DAMP and City of Irvine LIP, new development and redevelopment projects are required to implement site design BMPs to minimize directly connected impervious areas and promote infiltration of runoff. The OC DAMP identifies example site design BMPs to be implemented where applicable and feasible. Site design measures are listed below that may be applicable to the redevelopment projects within the Irvine Business Complex, including:

- Maximize the permeable area. This can be achieved in various ways, including, but not limited to increasing building density (number of stories above or below ground) and increasing the amount of landscaping versus the existing condition. Decreasing the project's footprint can reduce the project's impacts to water quality and hydrologic conditions

- Construct walkways, trails, patios, overflow parking lots, alleys, driveways, low-traffic streets and other low-traffic areas with open-jointed paving materials or permeable surfaces, such as pervious concrete, porous asphalt, unit pavers, and granular materials;

- Construct streets, sidewalks and parking lot aisles to the minimum widths necessary, provided that public safety and a walk able environment for pedestrians are not compromised;

- Incorporate landscaped buffer areas between sidewalks and streets;

- Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought tolerant trees and large shrubs;

- Where soils conditions are suitable, use perforated pipe or gravel filtration pits for low flow infiltration;

- Where landscaping is proposed, drain rooftops into adjacent landscaping prior to discharging to the storm drain. Drain impervious sidewalks, walkways, trails, and patios into adjacent landscaping;

- Increase the use of vegetated drainage swales in lieu of underground piping or imperviously lined swales;
- Design driveways with shared access, flared (single lane at street) or wheel strips (paving only under tires); or, drain into landscaping prior to discharging to the municipal storm drain system; and/or
- Other design concepts that are comparable and equally effective.

Many of the site design BMPs may also be considered low impact development (LID) features. The goal of using LID features is to mimic the sites existing hydrology by using design measures that capture, filter, store, evaporate, detain and infiltrate runoff, rather than runoff flowing directly to piped or impervious systems. This includes directing runoff to vegetated areas and reducing the amount of impervious surfaces. The incorporation of site design BMPs and LID features may reduce the need and/or sizing of treatment control BMPs needed for the site. These features must also be designed in accordance with the OC DAMP sizing requirements to use in conjunction with treatment control BMPs. In addition, the emphasis on the use of LID features is of greater importance in the re-issued MS4 permit (fourth term permit), and may be used to replace the use of structural or proprietary treatment control BMPs as primary treatment BMPs upon suitable site conditions. LID features that may also serve as treatment control BMPs are briefly described below.

Bioretention / Rain Gardens

Bioretention cells (also known as rain gardens or biocells) are vegetated basins that promote filtration of storm water runoff. They combine shrubs, grasses, and flowering perennials in depressions (approximately 6 to 8 inches deep) that allow water to pool, infiltrate, evaporate and/or slowly drain out within 48 to 72 hours. Additional design details include a soil planting depth between 18 inches to 4 feet deep (depending on plants selected), with a 2- to 3-inch mulch layer on top to protect from erosion. Perforated underdrains may be provided for soils with low infiltration rates and in areas with high groundwater levels to discharge treated water back into the storm drain system.

Bioretention systems function as a soil and plant-based filtration devices that remove pollutants through a variety of physical, biological, and chemical treatment processes. Pollutants removed by adsorption include metals, phosphorus, and hydrocarbons. Filtration occurs as runoff passes through the bioretention area media, such as the plant cover and planting soil which aids in dropping out particulates, sediment and pollutants adsorbed onto sediment (including, for example certain pesticides and pathogens). Nitrogen is removed by nitrifying and denitrifying bacteria, while aerobic bacteria are responsible for the decomposition of the organic matter.

Bioswales

Bioswales (also known as vegetated swales) are treatment BMPs that provide filtration through a grassed or vegetated bottom and the vegetation provides a mechanism for retarding surface runoff and filtering flows to drop sediments, fines, debris, and organics. Due to the slow velocity of runoff through the swale, fine particulates can settle in the bottom of the channel and the runoff will infiltrate into the soil profile where the vegetation will uptake nutrients (e.g., nitrogen and phosphorous), microbial contaminants, oil and grease, and pesticides. Swales also provide treatment of runoff within the upper soil zone where biological and chemical reactions occur to absorb pollutants entering from the top soil.

Bioswales are designed using several factors in order to achieve water quality benefits without additional channelization or excess flooding. Factors included in the design are the residence time of runoff in the swale, depth of flow, flow velocity, longitudinal and side slopes, and Manning's Roughness Coefficient (n). An impervious liner is recommended at a depth of approximately 2-5 feet below the swale to minimize potential impacts to groundwater.

Flow-Through Planters

Flow-through planters are structural, vegetated planters that receive storm water runoff and allow pollutants to filter and settle out prior to discharging off-site. These planters receive runoff from roof downspouts or sheet flow, and allow it to filter through a minimum of 18 inches of soil where vegetation will uptake nutrients, microbial contaminants, oil and grease, and pesticides, and sediments and fine particulates can settle out (LFR and Dan Cloak Environmental Consulting

2005). Treated runoff is drained at the bottom of a planter through a gravel layer and perforated underdrain system. Planters may be constructed above-ground in elevated structures, such as a concrete planter box, or below the paved surface grade. Elevated planters are typically designed to intercept roof runoff, and below grade planters treat surface runoff from paved surfaces.

Flow-through planters can contain a variety of vegetation, including trees, shrubs, perennials and wetland vegetation, and can be proprietary structures or design-build. An example of a proprietary tree-box filter is Filterra® by Americast. Filterra units feature a specially designed media filter mixture within a below-grade concrete box. One tree or large shrub is planted within the media to provide additional pollutant removal, and function similar to bioretention cells (Americast [n.d.]).

Flow-through planters can also contain wetland vegetation to increase pollutant removal efficiency of nutrients and bacteria in storm water runoff. Examples of proprietary wetland planters include MWS-Linear Filtration Systems by Modular Wetland Systems Inc. and StormTreat Wetlands by Bio Clean Environmental Services, Inc. These systems contain multi-stage treatment processes constructed below-grade in a concrete box, with wetland vegetation above grade. A catch basin inlet filter, settling chamber, perimeter media filter, and a sub-surface wetland provide the multi-stage treatment of storm water runoff (MWS Inc. 2009).

Pervious Pavement

Pervious pavement, such as permeable pavers, grass pavers, porous concrete, and porous asphalt, provides a surface suitable for light-loads and parking areas in which water can drain through pore spaces to an underlying rock reservoir (approximately 1-3 feet deep) underneath. The sub-surface base allows for physical and microbial filtering processes to take place thereby removing pollutants such as particulates, organics, hydrocarbons and total suspended sediments, including attached heavy metals.

It should be noted that the OC DAMP recommends that infiltration BMPs, such as pervious pavement, should not be used where the seasonal high water table is less than 10 feet below the base of the gravel layer, unless an underdrain is installed. Since in portions of the Irvine Business Complex area the depth to groundwater may be less than 10 feet below ground surface (bgs), an underdrain system would be appropriate at these locations. The principal is similar to that which the County recommends for septic leach fields—maintaining a separation between the zone of infiltration and the water table.

Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench that temporarily stores storm water runoff within the void spaces between the stones, and allows it to infiltrate into the subsoil. Infiltration trenches usually do not contain an outlet or underdrain system, and as a result, are highly effective at treating the majority of storm water pollutants since low flow/first flush runoff is not discharged into receiving waters. However, infiltration trenches are not recommended for use in areas with low infiltrating soils and high groundwater tables, due to the risk of contaminating groundwater.[5]

Drywells

Drywells are underground storage facilities that receive runoff and allows it to infiltrate to soil via gravity. Drywells typically consist of a structural chamber or vertical perforated pipe. Systems may incorporate a pretreatment chamber to trap sediment, trash and debris, and oil and grease. Pretreated flows are then diverted to the drywell and surrounding soil for final treatment. With the incorporation of pretreatment and infiltration treatment mechanisms, drywells have high removal effectiveness for all storm water pollutants of concern. However, similar to other infiltration-based systems, drywells are not recommended for use in areas with low infiltrating soils and high groundwater tables, due to potential risks of contaminating groundwater (Torrent Resources 2004).

[5] California Stormwater Quality Association. (2003, January). *Stormwater Best Management Practices Handbook for New Development and Redevelopment*. Retrieved January 27, 2009, from http://www.cabmphandbooks.com

Source Control BMPs

The second phase of water quality management includes source control BMPs. Source control BMPs effectively minimize the potential for typical urban pollutants to come into contact with runoff, thereby limiting water quality impacts downstream. This includes both non-structural measures, such as activity restrictions, maintenance, and training practices, and structural measures, such as material storage area and loading dock design features. A list of potential source control measures are provided below as identified in the Countywide Model WQMP:

- *(N1) Education for Property Owners, Tenants, and Occupants.* Educational materials related to urban runoff can be provided to tenants/homeowners (via project owner, HOA, and/or POA) and employees to reduce pollutants from reaching the storm drain system. Examples of environmental awareness materials include, but are not limited to: guidelines for landscaping and gardening, tips for pet care, vehicle cleaning, and proper disposal of household hazardous waste.

- *(N2) Activity Restrictions.* Activity restrictions can be developed to restrict activities that have the potential to create adverse impacts on water quality. Activities include but are not limited to: the handling and disposal of contaminants, trash management and litter control, irrigation and landscaping practices, vehicle and equipment cleaning, fertilizer applications and household waste management practices.

- *(N3) Common Area Landscape Management.* Common area landscape management that includes minimizing fertilizer and pesticide application, use of slow-release fertilizers, maintenance activities, providing education to homeowners and tenants (via project owner, HOA and/or POA), and providing education and training for employees on management of landscape materials and storm water management.

- *(N4) BMP Maintenance.* In accordance with the City LIP and OC DAMP, the project owners, HOAs and/or POAs of the individual project sites will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its landscape contractor and any other necessary maintenance contractors for the project site. In addition, the project owner will be required to verify treatment control BMP implementation and ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season, and in accordance with frequencies outlined in the project-specific WQMP prepared for the project site.

- *(N5) Title 22 CCR Compliance.* Where applicable, project sites shall comply with Title 22 of the California Code of Regulations and relevant sections of the California Health and Safety Code regarding hazardous waste management, which will be enforced by County Environmental Health on behalf of the State.

- *(N7)*[6] *Spill Contingency Plan.* Any facilities that store liquid materials or wastes shall maintain procedures for spill response and cleanup activities. Emergency spill kits shall be kept on-site at all times. Activities will be coordinated between the respective departments and the Police and Fire departments in the event of a spill.

- *(N8) Underground Storage Tank Compliance.* Any underground storage tanks proposed shall meet applicable federal, state, county, and local regulations.

- *(N9) Haz-Mat Disclosure Compliance.* Any projects that store or utilize hazardous wastes, where applicable, shall comply with the County of Orange Fire Authority hazardous material disclosure requirements.

[6] *(N6) Local Water Quality Permit Compliance.* The City of Irvine does not issue water quality permits, and therefore this BMP is not applicable.

- *(N10) Uniform Fire Code Implementation.* The owner, HOA and/or POA shall ensure all structures comply with Article 80 of the Uniform Fire Code, City codes, County of Orange Fire Authority, and local standards.

- *(N11) Common Area Litter Control.* Includes regular litter control for the entire project area including trash pick up and sweeping of littered common areas, as performed by the maintenance crew. In addition, pet waste receptacles should be provided throughout the project site where applicable.

- *(N12) Employee Training.* Employees of the owner, HOA and/or POA, as well as any contractors of the aforementioned entities will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain.

- *(N13) Housekeeping of Loading Docks.* Loading dock housekeeping measures will be implemented where applicable to keep the areas clean and orderly condition.

- *(N14) Common Area Catch Basin Inspection.* Includes routine maintenance of all catch basins, grate inlets, etc. for debris and litter removal. All on-site catch basins inspected and cleaned prior to the rainy season, no later than October 1st each year.

- *(N15) Street Sweeping Private Streets and Parking Lots.* Street sweeping of all impervious streets and parking lots performed at a frequency that reduces or prevents sediment and debris from entering receiving waters and prior to the rainy season.

- *(N17)*[7] *Retail Gasoline Outlets.* Any retail gasoline outlets proposed shall implement, where feasible, the following measures: (1) maintaining clean fuel-dispensing areas, (2) appropriately designed fueling areas to minimize storm water exposure, (3) minimization of pooling of water, (4) utilization of fueling safeguards, (5) regular inspections of fueling equipment, (6) spill kits on-site (7) underground storage tanks fit with spill containment and overflow prevention systems that meet regulations of Section 2635(b) of Title 23 of the Code of California Regulations, (8) canopy to eliminate direct precipitation and grade breaks to reduce runoff and runoff, and (9) a posted notice to remind employees not to top off fuel tanks. Additionally, the fueling stations shall have an oil/water separator to treat pollutants discharged into the sewer system.

- *Storm Drain Stenciling and Signage.* Storm drain stenciling or signage on all catch basins with highly visible source control messages (e.g., "no dumping drains to ocean").

- *Proper Outdoor Hazardous Material Storage Design.* Any areas proposed for outdoor hazardous material storage shall be paved accordingly and storage bins will include sidewalls to contain the materials. There will be a drainage grate along the front of the storage bins with an outlet screen that traps material to prevent pollutants from entering the storm drain. Any hazardous materials shall be stored in storage cabinets, sheds or enclosures that meet all applicable regulations.

- *Trash Enclosures.* All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. The storage areas shall be paved, and either be sloped or include a barrier to keep drainage out of the storm drain.

- *Efficient Irrigation Systems and Landscape Design***.** Installing and maintaining efficient irrigation systems designed to minimize water by eliminating overspray to hardscape areas, and setting irrigation timing and cycle lengths in accordance with water demands, given time of year, weather, and day and night temperatures. Where feasible, incorporation of native tolerant species for landscaping, protection of slopes and efficient irrigation. May be used in conjunction with educational materials to homeowners and tenants as well as activity restrictions.

[7] There is no BMP with the designation N16.

- *Protect Slopes and Channels.* The site drainage design shall include appropriate BMPs to decrease the potential for erosion of slopes and/or channels. The design shall be consistent with Federal, State, and local standards (e.g., RWQCB, ACOE, CDFG). Where feasible, the following principles shall be considered: 1) convey runoff safely from the tops of slopes, 2) avoid disturbing steep or unstable slopes, as well as natural channels, 3) implement a permanent stabilization BMP on disturbed slopes and channels as quickly as possible, such as native vegetation, and 4) install energy dissipaters at the outlets of new storm drains, culverts, or channels.

- *Loading Dock Areas.* Any new loading docks shall be built at-grade, generally draining away from the buildings towards the drive aisles. In addition, loading dock housekeeping measures shall be implemented where applicable to keep the areas clean and orderly condition.

- *Maintenance Bays.* Any maintenance bays proposed shall be designed in accordance with City and OC DAMP standards. Examples include locating facilities indoors, and draining nuisance flows to an oil/water separator that is connected to the sanitary sewer system.

- *Equipment Wash Areas.* Any equipment wash areas proposed shall be designed in accordance with OC DAMP standards. Examples include designing the area to be self-contained and covered, preventing the runoff from entering the storm drain system with berms or containment structures, and collecting runoff in a sump for disposal. Discharge from an equipment wash area to the storm drain system is prohibited.

- *Vehicle Wash Areas.* Any vehicle wash areas proposed shall be designed in accordance with City and OC DAMP standards. Vehicle wash areas shall be self-contained or covered, equipped with a wash rack and clarifier or other pretreatment facility. Discharge from a vehicle wash area to the storm drain system is prohibited.

- *Outdoor Processing Areas.* Any outdoor processing areas proposed shall be designed in accordance with City and OC DAMP standards. Areas shall be enclosed and covered to preclude storm water, and not be allowed to discharge into the storm drain system.

- *Fueling Areas.* Any fueling areas proposed shall be designed in accordance with City and OC DAMP standards. Any fueling areas proposed for the project site shall implement, where feasible the following measures: (1) maintaining clean fuel-dispensing areas, (2) appropriately designed fueling areas to minimize storm water exposure, (3) minimization of pooling of water, (4) utilization of fueling safeguards, (5) regular inspections of fueling equipment, (6) spill kits on-site (7) underground storage tanks fit with spill containment and overflow prevention systems that meet regulations of Section 2635(b) of Title 23 of the Code of California Regulations, (8) canopy to eliminate direct precipitation and grade breaks to reduce runoff and runoff, and (9) a posted notice to remind employees not to top off fuel tanks. Additionally, the fueling stations shall have an oil/water separator to treat pollutants discharged into the sewer system.

- *Hillside Landscaping.* The owner shall be responsible for the vegetative establishment on all manufactured or disturbed slopes with a mixture of native species and approved ornamentals by the City of Irvine.

- *Wash Water Controls for Food Preparations Areas.* Any food preparation facilities proposed shall meet all health and safety, building and safety and any other applicable regulations, codes requirements. Discharge of wash water from food preparation areas to the storm drain system is prohibited.

- *Community Car Wash Racks.* Any community car wash racks proposed shall be designed in accordance with City and OC DAMP standards. Wash waters from area may be directed to the sanitary sewer (with approval), to an engineered infiltration system, or an equally effective alternative. Discharge from a wash area to the storm drain system is prohibited.

Treatment Control BMPs

The third component to sound water quality management is incorporating treatment control BMPs designed to reduce the impacts of urban development on downstream water bodies to the MEP. The purpose of treatment control BMPs is to remove the pollutants typically associated with each type of urban land use, including the designated residential and commercial land uses, prior to discharging into receiving waters.

In keeping consistent with local water quality treatment requirements and the requirements of the OC DAMP, treatment control BMPs shall be designed to infiltrate, filter, and/or treat runoff from the individual project footprints to one of the numeric sizing treatment standards listed below. Structural treatment BMPs may be located on- or off-site, used singly or in combination with other treatment controls, or shared by multiple projects.

In accordance with the OC DAMP, volume-based BMPs (e.g., detention basins, infiltration trenches) shall be designed to mitigate (infiltrate, filter, or treat) either:

- The volume of runoff produced from a 24-hour 85th percentile storm event, as determined from the local historical rainfall record; or
- The volume of runoff produced by the 85th percentile 24-hour runoff event, determined as the maximized capture urban runoff 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
- The volume of annual runoff based on unit basin storage volume, to achieve 90 percent or more volume treatment by the method recommended in California Stormwater Best Management Practices Handbook – Industrial/ Commercial, (1993); or
- 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 85th percentile 24-hour runoff event.

Flow-based BMPs (e.g., vegetated swales, media filters, hydrodynamic separators) shall be designed to mitigate (infiltrate, filter, or treat) either:

- The maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour for each hour of a storm event; or
- The maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two; or
- The maximum flow rate of runoff, 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 85th percentile hourly rainfall intensity multiplied by a factor of two.

Selection of treatment control BMPs is based on the pollutants of concern of the project site (identified under Table 5.7-8) and the BMP's ability to effectively mitigate those pollutants, in consideration of site conditions and constraints (such as low-permeable soils or high groundwater table). In particular, the selected BMPs should be capable of treating pollutants that have been listed as impaired on the CWA 303(d) list or have TMDLs established should be treated to a medium-to-high effectiveness level. Table 5.7-9 provides general pollutant removal efficiencies for treatment control BMP categories (derived from the Countywide Model WQMP).

Table 5.7-9
Treatment Control BMP Selection Matrix

Pollutant of Concern	Biofilters[1]	Detention Basins[2]	Infiltration Basins[3]	Wet Ponds or Wetlands	Filtration	Hydrodynamic Separators[4]
Sediment/ Turbidity	H/M	M	M	H/M	H/M	H/M (L for Turbidity)
Nutrients	L	M	H/M	H/M	L/M	L
Organic Compounds	U	U	U	U	H/M	L
Trash & Debris	L	M	U	U	H/M	H/M
Oxygen Demanding Substances	L	M	H/M	H/M	H/M	L
Bacteria & Viruses	U	U	H/M	U	H/M	L
Oil & Grease	H/M	M	U	U	H/M	L/M
Pesticides (non-soil bound)	U	U	U	U	U	L

Source: Excerpted, with minor revision, from the Orange County Model Water Quality Management Plan. September 26, 2003.
L: Low removal efficiency H/M: High or medium removal efficiency U: Unknown removal efficiency
1 Includes grass swales, grass strips, wetland vegetation swales, & bioretention
2 For detention basins with minimum 36-48-hour drawdown time. Includes extended/dry detention basins with grass lining or impervious lining
3 Includes infiltration trenches, infiltration basins, & pervious/porous pavements
4 Includes hydrodynamic separators, baffle boxes, swirl concentrators, & cyclone separators

There are several types of treatment control systems that are commonly used today, including natural systems and proprietary systems. Several treatment control BMPs are also considered LID features. The features listed below were previously described under the Site Design / LID BMPs section of this report.

- Bioretention / Rain Gardens
- Bioswales
- Flow-Through Planters
- Permeable Pavement
- Infiltration Trenches
- Dry Wells

Although use of site design and LID features are recommended for use at project sites where feasible, there may be instances where based on existing site drainage and sizing constraints, the use of LID features may not be sufficient for providing adequate water quality treatment. In these instances, other structural treatment control BMPs may be utilized to specifically target the pollutants of concern from the individual project sites. Additional treatment control BMPs that are not considered LID features are briefly described below. Use of these features will require approval by the City of Irvine during the preparation of individual project-specific WQMPs. All treatment control BMPs implemented will be sized to adequately treat first flush runoff from the project drainage areas.

Catch Basin Inserts

Catch basin inserts, also commonly called water quality inlets, consist of one or more chambers that promote sedimentation of coarse materials and separation of free oil from storm water. A typical catch basin insert/water quality inlet consists of a sedimentation chamber, an oil separation chamber, and a discharge chamber. Catch basin inserts are typically effective at removing trash, course sediment and oil and grease from storm water, and are moderate to low

effective at removing fine particulates, nutrients, metals, bacteria and organics (CASQA 2003). Specific pollutant removal efficiencies depend on the type of unit installed.

Downspout Filters

Downspout filters are building-mounted filters designed to collect particulates, debris and metals from rooftop storm water runoff. The chambers typically contain geotextile fabric liners that encapsulate an adsorbent which is easily replaced and provides for flexibility, ease of maintenance and economy. They are designed to collect particulates and debris, as well as metals and petroleum hydrocarbons. Filters also contain a bypass that allows for effective treatment at low flow and first flush rates while safely bypassing high flows.

Hydrodynamic Separators

Hydrodynamic separators (also known as vortex separators or swirl concentrators) are pre-cast vault systems that are installed underground in the storm drain system. They typically contain a round chamber where particulates and suspended solids are removed via centrifugal force. Some units may contain additional baffles, weirs, and/or screens to allow settling and further capture pollutants in storm water runoff. Additional oil adsorbents may be used within the unit to capture oil and grease. Examples of hydrodynamic separators include Continuous Deflective Separation (CDS) units and Vortechs® systems by Contech Stormwater Solutions, Inc., and Stormceptor® by Rinker Group, Ltd., among others (CASQA 2003).

Media Filtration Units

Media filter units (e.g., StormFilter® by Contech Stormwater Solutions, Inc., Bay Filter™ by Bay Saver Inc., and others) are proprietary, structural BMPs installed underground within the storm drain system. They typically consist of a pre-cast vault storm drain insert containing media-filled cartridges to trap and adsorb particulates and pollutants in storm water runoff. Typical media types include perlite, zeolite, activated carbon, activated alumina, and leaf media. Targeted pollutants include total suspended solids (TSS), oil & grease, soluble metals, nutrients, organics, and trash and debris.

Sand and Media Filters

Sand filters are typically a two-chambered system that temporarily store storm water runoff and allow it to filter through a layer of sand for treatment before discharging downstream. There are several design variations for sand filters, including Austin Sand Filters, Delaware Sand Filters, and underground filters. In general, sand filters feature a pre-treatment basin or chamber to allow large particulates to settle out, and a filtration chamber where storm water runoff is filtered through a layer of sand (typically 18 inches deep at a minimum). Other variations include utilizing a mixture of organic compost or peat within the sand layer (organic filter) and combining the sand filter layer within the pre-treatment basin (pocket sand filter). Further, sand filters may also be designed without an impermeable bottom to allow infiltration into the subsoil where feasible (Claytor and Schueler 1996).

Regional Treatment Programs

Alternatively, projects may participate in regional or watershed-based treatment programs in lieu of site-specific treatment control BMPs. Regional programs are designed to provide large scale treatment solutions for new developments and redevelopments, and can treat runoff from multiple project areas (depending on program design). Thus, they are ideal in that off-site and existing runoff conditions are considered. Projects that utilize regional treatment BMPs, however, are still required to implement all applicable site design/LID and source control BMPs identified in the regional plan, City LIP, or OC DAMP. Regional or watershed programs that plan to incorporate treatment control BMPs to support new development or significant redevelopment projects must be approved by each Permittee utilizing the program (i.e., City of Irvine or County of Orange; County of Orange 2003).

In accordance with the OC DAMP, the regional or watershed treatment control BMPs must be sized and selected to meet the following criteria:

- The regional or watershed treatment control BMP(s) collectively must have the capacity to treat more than the cumulative volume (or flow rate) of runoff from all new development or significant redevelopment projects included in the regional or watershed plan, calculated using the applicable project-based water quality design volume or flow rate from each project.

- Treatment control BMP selection will be determined as part of the regional or watershed program planning. regional or watershed treatment control BMPs must be selected to address pollutants of concern in the downstream receiving waters and anticipated to be generated from the type of new development or significant redevelopment within the watershed. In the alternative, individual projects that intend to rely on the regional or watershed treatment facility must incorporate site-specific BMPs to address any specific pollutant of concern from that project that is not addressed by the regional or watershed treatment control BMPs

Common treatment control BMPs that are utilized for regional programs include detention basins, infiltration basins, and constructed wetlands. Brief descriptions are provided below.

Detention Basins and Wet Ponds

Detention basins are frequently used for flood control; however, they can provide treatment of stormwater runoff when properly designed as a water quality facility. In general, these are constructed basins that are designed to pond stormwater runoff to depths 3–5 feet and allow it to slowly discharge or infiltrate over a period of 48–72 hours to reduce potential for mosquito breeding. Sedimentation is the primary treatment mechanism for basins, and may also include infiltration and vegetative uptake depending on the design.

There are several types of water quality detention basins, including dry detention facilities, wet ponds, and infiltration basins. Wet ponds are basins that have a permanent pool of water throughout most of the year, but differ from constructed wetlands by having greater ponding depths. Dry detention basins are similar to wet ponds, but do not have a permanent pool and go dry between storm events. Infiltration basins are basins designed to temporarily pond stormwater runoff within the basin, and allow it to infiltrate into the soils below the basin, rather than discharge it downstream.

Constructed Wetlands

Constructed wetlands are typically considered one of the most effective systems at treating pollutants in water. Constructed wetlands can also provide several other benefits, including vegetative and wildlife habitat, groundwater recharge, flood attenuation, and provides aesthetic values to the area. They are shallow basins that differ from detention basins by having shallower ponding depths, a permanent water source, and greater vegetation coverage. In addition, wetlands feature a more complex microtopography, with varying zones of shallow (less than 6 inches) and moderately shallow (less than 18 inches) water ponding depths, and utilize berms to create varying zones and flow paths through the wetland.

It should be noted that constructed wetlands for stormwater treatment differ from utilizing natural wetlands for stormwater treatment. Although natural wetlands provide some attenuation of pollutants, the practice is not recommended for new development and redevelopment projects as natural wetlands are protected under the CWA and the US Army Corps of Engineers.

Wetlands utilize several processes to treat or remove pollutants from stormwater, including physical, chemical, and biological processes, and as a result, are able to effectively treat the majority of typical pollutants in stormwater runoff. Because of the extremely slow water velocity in the wetland, sedimentation is the primary process for removing larger pollutants, including sediment, suspended solids, particulate nitrogen, and heavy metals. Metals, phosphorous, and some hydrocarbons are removed by adsorption to sediments and the wetland vegetation. The vegetation also traps trash, debris, floatables and particulates, and removes settled nutrients and metals through their roots. Nitrogen is removed by nitrifying and denitrifying bacteria, and aerobic bacteria help decompose organic matter in the water. In addition, soluble phosphorous and ammonia are partially removed by plankton and benthic algae.

One example of a regional treatment control BMP program is the Irvine Ranch Water District's (IRWD) Natural Treatment System (NTS) Program for the San Diego Creek watershed. To help improve water quality in San Diego Creek and its major tributaries, IRWD proposes a network of constructed water quality treatment wetlands at 31 sites throughout the watershed as part of the program. The proposed wetlands are generally categorized into three configurations: 1) off-line facilities adjacent to existing stream channels, 2) in-line facilities constructed within existing channels, and 3) wetlands that are incorporated into existing and proposed flood control basins. All of the proposed facilities are designed to treat dry weather and low flows from San Diego Creek; however, several of the facilities are also designed to treat runoff from small storm events (Geosyntec Consultants 2005).

IMPACT 5.7-1: DEVELOPMENT PURSUANT TO THE PROPOSED PROJECT WOULD NOT INCREASE THE AMOUNT OF IMPERVIOUS SURFACES ON THE SITE AND WOULD THEREFORE NOT IMPACT OPPORTUNITIES FOR GROUNDWATER RECHARGE. [THRESHOLD HYD-2]

Impact Analysis: As previously stated in Section 5.7.3.1 and in Figure 5.7-1, the existing land use codes of the Irvine Business Complex are predominantly Industrial, Commercial – General Office, and Commercial – Community. The proposed Irvine Business Complex Vision Plan and Overlay Zoning Code plans to incorporate a greater density of Residential – High-Rise Density and Residential – High Density land uses in areas currently zoned for Industrial (see Figure 5.7-2). It is reasonable to assume that the proposed General Plan amendment will not increase the amount of impervious surfaces in Irvine Business Complex, but more likely reduce the imperviousness, as industrial sites generally have a greater percentage of impervious surfaces in comparison to residential sites. Additionally, as discussed in Section 5.7.1.2, groundwater is relatively shallow within portions of the project area, and due to the Types C and D soils, portions of the site may not be conducive to infiltration of runoff. Therefore, redevelopment of the Irvine Business Complex is not anticipated to reduce groundwater recharge opportunities as compared to existing conditions, and impacts are considered less than significant.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. As described above, impacts are less than significant.

IMPACT 5.7-2: DEVELOPMENT PURSUANT TO THE PROPOSED PROJECT WOULD SLIGHTLY ALTER THE EXISTING DRAINAGE PATTERN OF THE SITE, BUT WOULD NOT RESULT IN EROSION OR SILTATION ON- OR OFF-SITE. [THRESHOLDS HYD-3]

Impact Analysis: The proposed Project involves a General Plan Amendment and zone change for the adoption of the Irvine Business Complex Vision Plan and Mixed Use Overlay Zoning Code. Currently, the Irvine Business Complex area is predominately built-out. The proposed redevelopments will result in minor changes to the existing drainage patterns and peak flows with the minor alterations in impervious surfaces, but in general, the drainage areas, discharge points, and peak flow discharges will be consistent with existing conditions. This is also consistent in that the majority of the individual projects are the replacement of one structure for another, while maintaining the existing utilities, edge conditions and drainage facilities. In addition, all runoff from the project site drains into existing MS4 systems and improved channels maintained by the City of Irvine and OCFCD. Lastly, any drainage improvements performed under the individual redevelopment projects will be subject to the design guidelines and capacities required by the City of Irvine and OCFCD to control discharges to the existing runoff conditions to reduce any additional impacts. PPP 7-1 would ensure that applicants for new development are subject to the design guidelines and capacities required by the City of Irvine and OCFCD to control discharges to the existing runoff conditions to reduce any additional impacts. Based on the proposed hydrology analysis and flood controls within the project site, erosion and siltation on or off-site are considered less than significant.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. As described above, impacts are less than significant with incorporation of the PPP 7-1.

IMPACT 5.7-3: DEVELOPMENT PURSUANT TO THE PROPOSED PROJECT WOULD NOT INCREASE THE AMOUNT OF IMPERVIOUS SURFACES ON THE SITE AND WOULD THEREFORE NOT INCREASE SURFACE WATER FLOWS INTO DRAINAGE SYSTEMS WITHIN THE WATERSHED. [THRESHOLDS HYD-4 AND HYD-5]

Impact Analysis: As discussed in the previous sections and impact statements, It is reasonable to assume that the proposed Project will not increase the amount of impervious surfaces in the Irvine Business Complex, as industrial and commercial sites generally have a greater percentage of impervious surfaces in comparison to requirements of the proposed IBC zoning. According to the 1986 Orange County Hydrology Manual, the recommended average values for impervious cover for industrial and commercial land use is 90 percent, and in the IBC, many of the existing commercial and industrial sites appear to have very minimal landscaping and an impervious ratio that actually exceeds 90 percent. The redeveloped IBC zones will have a minimum landscape requirement of 15 percent for residential areas, in addition to landscaping requirements in any new parking lots and park areas. Overall, the Project is not anticipated to increase the amount of imperviousness as compared to existing conditions.

In addition, all individual projects must demonstrate their post-development peak flow runoff rates do not exceed existing condition peak runoff rates pursuant to PPP 7-1. Therefore, the potential impact by the proposed change in impervious surfaces to the Irvine Business Complex is considered less than significant.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. As described above, impacts are less than significant with incorporation of the PPP 7-1.

IMPACT 5.7-4: PORTIONS OF THE PROJECT SITE PROPOSED FOR DEVELOPMENT ARE LOCATED WITHIN A 100-YEAR FLOOD HAZARD AREA. [THRESHOLDS HYD-7 AND HYD-8]

~~***Impact Analysis:*** As discussed in Section 5.7.1.1, according to the FIRMs produced for the Irvine Business Complex area, the 100-year floodplain is conveyed within the existing drainage channels and the remainder of the areas are within Zone X, which is defined as areas determined to be outside the 500-year floodplain. However, as part of the Irvine Business Complex Master Drainage Study, several portions of the channels were found to be insufficient for containing the 100-year storm flows based on the updated Orange County Hydrology Manual methodologies. The proposed habitable spaces within a SFHA will need to be placed or flood-proofed a minimum one foot above the 100-year water surface based on a site-specific analysis for each project. Final elevations will be verified by the City of Irvine. In addition, for areas that are subject to generalized ponding and flooding as indicated in the Irvine Business Complex Master Drainage Study, individual projects must demonstrate that they will not increase the ponding on adjacent properties. This shall be demonstrated by comparing the existing and proposed ponded water volumes stored outside of the building footprints under the water surface (assumed level) in the major facility that the individual project drains to. The proposed site storage volume shall match or exceed the existing site storage volume and include the volume of all underground drainage systems. The project applicant may as its discretion perform a volume analysis, reviewed by the~~

~~City of Irvine, of the regional flood control facility to which it is tributary in order to more precisely define the volume of water that is diverted into storage within the IBC. This could result in a lower ponded water surface.~~

~~As required by PPP 7-1, by designing each project to be elevated or flood-proofed one foot above the anticipated 100-year flood elevation, while maintaining or exceeding the volume of stormwater stored on-site during the 100-year storm event, impacts related to flood zones are considered less than significant.~~

Impact Analysis: As discussed in Section 5.7.1.1, according to the FIRMs produced for the Irvine Business Complex area, the 100-year floodplain is conveyed within the existing drainage channels and the remainder of the areas are within Zone X, which is defined as areas determined to be outside the 500-year floodplain. However, as part of the Irvine Business Complex Master Drainage Study, several portions of the channels may be insufficient for containing the 100-year storm flows based on the updated Orange County Hydrology Manual methodologies. It should be noted that while the Irvine Business Complex Master Drainage Study includes calculations of flood inundation and proposed flood proofing elevations, these calculations are considered preliminary and are subject to verification. Final elevations will be verified by the City of Irvine, based on site-specific studies prepared by applicants' engineers which will be reviewed in conjunction with individual projects. Individual projects must demonstrate that they will not increase ponding on adjacent properties. As required by PPP 7-1, by designing each project to be elevated or flood-proofed one foot above the anticipated 100-year flood elevation, impacts related to flood zones are considered less than significant.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. As described above, impacts are less than significant with incorporation of the PPPs and PDFs.

IMPACT 5.7-5: DEVELOPMENT PURSUANT TO THE PROPOSED PROJECT WOULD NOT VIOLATE ANY WATER QUALITY STANDARDS OR WASTE DISCHARGE REQUIREMENTS. [THRESHOLD HYD-1]

Impact Analysis: Based on the incorporation of site design/LID features and BMPs as required under the City LIP and OC DAMP, the individual projects under the Irvine Business Complex will treat runoff prior to exiting the sites. As a result, water quality exceedances are not anticipated, and pollutants are not expected in Project runoff that would adversely affect beneficial uses in the San Diego Creek and Newport Bay. Individual Assessments are provided below:

Sediment

Sediments are typically characterized into two main categories: course sediment that includes large sand grains, pebbles, etc. and fine particulate sediments that include total suspended solids. Of concern to water quality are the fine particulate sediments that are more typically associated with sheet erosion (i.e., existing dirt parking lots) and or land use activities that result in fine particulates (i.e., brake dust accumulation in parking lots). Pollutants tend to adsorb to these fines including nutrients, heavy metals, some pesticides, organics and bacteria.

Although individual project sites may alter the amount of impervious surfaces of the site as compared to existing conditions, overall, the Irvine Business Complex Project will not result in increasing impervious surfaces compared to existing conditions. In addition, the Irvine Business Complex Project will not significantly alter hydrologic conditions, and is not anticipated to increase sheet erosion potential. Where individual projects result in an overall decrease in impervious surfaces as compared to existing conditions, the exposed areas will be vegetated and stabilized to reduce erosion potential. Furthermore, total suspended solids (TSS) from impervious areas of the individual projects, such as the paved parking lots and rooftops, will be collected by the local storm drain system and treated by site design/LID, source

control and treatment control BMPs for the project per the OC DAMP and City LIP requirements. The majority of LID features and treatment control BMPs available for use, such as storm drain inserts, vegetated swales, and bioretention areas are considered effective for targeting TSS and other pollutants typically associated with these types of impervious surfaces (see Table 5.7-9). As a result, it is expected that TSS in runoff will not increase, that water quality standards will not be exceeded and that beneficial uses will not be adversely affected. Moreover, the applications of these BMPs are designed to reduce TSS in runoff and result in less than significant impacts from TSS in the San Diego Creek and Newport Bay.

Trash & Debris

Urban development can generate significant amounts of trash and debris if not properly managed. The Irvine Business Complex is not expected to increase the amount of potential trash and debris generated on the individual project sites as compared to existing conditions. However, the individual projects will implement additional measures, such as source control measures and treatment BMPs, to minimize the adverse impacts of trash and debris. Source control measures such as periodic sweeping, litter patrol, and storm drain stenciling will be effective in reducing the amount of trash and debris leaving the site. Site design/LID features and treatment control BMPs also possess moderate to high removal effectiveness for trash and debris. Based on these proposed features, impacts from trash and debris for the Irvine Business Complex are less than significant.

Oil & Grease

Oil and grease limits are defined as a qualitative standard (e.g., no film on surface waters) due to the difficulties in setting single limit or composite sampling water quality standards. However, national monitoring data collected from communities around Los Angeles County demonstrated that the majority of samples taken from open space contain non-detect levels of oil and grease (>80 percent) and that hydrocarbons intermittently observed in runoff from developed areas and when observed, the levels are relatively low (Pitt, Maestre, and Morquecho 2003).

The individual projects as part of the Irvine Business Complex can implement several source control measures to reduce the amount of oil and grease in storm water from the project sites. Maintenance activities, vehicle and equipment fueling and waste handling that have the potential to introduce oil and grease related compounds will be strictly prohibited in outdoor areas where they could potentially come into contact with rain. In addition, pervious pavements and other LID and treatment control measures are effective at removing oil and grease from storm water runoff. Based the incorporation of source control and treatment control BMPs, levels of oil and grease or other hydrocarbons such as PAHs that could adversely affect beneficial uses of the Project's receiving waters or exceed water quality standards are not anticipated. Impacts on water quality, as a result of the proposed Irvine Business Complex, are less than significant.

Bacteria/Pathogens

Based on the existing conditions, and land use/pollutant categories, the existing and proposed Project may be a source of pathogens, especially during storm water runoff conditions. There are numerous potential natural and anthropogenic sources of bacteria indicators including birds, other wildlife, soils and plant material, domesticated animals and pets, human sources from outdated septic systems, and improper human waste disposal. Since natural sources of pathogens are difficult to control (such as wild animal waste), the focus of the source control measures for the project sites is on human-related (anthropogenic) and residential sources. In order to reduce the proposed pathogen contributions from the project site, the following source control measures are recommended for implementation:

- Landscaping with efficient irrigation design at the project sites to control runoff and allowing for maximum infiltration opportunities;
- Proper monitoring and maintenance of landscaped areas to remove accumulated dead plant material and debris;
- Landscape maintenance activities that include the removal of animal feces;

- Activity restrictions on outdoor mat washing and equipment cleaning related to restaurant and dining activities, which potentially contribute bacteria entrained in storm water, as well as waste accumulation and disposal methods; and

- Site design/LID features (e.g., pervious pavements, bioretention) and treatment control BMPs (e.g., water quality basins) further treat bacteria in storm water runoff via filtration and infiltration.

The available data on the effectiveness of the treatment control BMPs for bacteria indicators is limited. The 2003 California BMP Handbook rates bioretention areas and infiltration BMPs as having high removal efficiencies for bacteria and organics (CASQA 2003). Based on these considerations for the individual project sites, the pathogen runoff potential for the proposed Irvine Business Complex is less than significant.

Pesticides

Pesticides can be of a concern based on potential uses as well as previous uses in the past. Using only native drought-tolerant species for landscaping purposes minimizes the use of pesticides and uses less irrigation that could potentially runoff. Low demand irrigation systems should also be used on-site to ensure minimal runoff from irrigation that has the potential to transport pesticides in runoff. In addition, source control measures such as provisions against applying pesticides prior to expected rain events, and the use of properly certified pesticide workers are recommended. As a result of these and similar source control measures, it is anticipated that water quality standards for pesticides will not be exceeded, and potential pesticide impacts are less than significant.

Nutrients

Nutrients, particularly nitrogen and phosphorous found within common fertilizers, can be of a concern based on the potential for over-application and over use. Similar to the source control measures for pesticides, using only native drought-tolerant species for landscaping purposes typically requires less fertilizers and irrigation and thereby reduces runoff potential. Low demand irrigation systems with slow release fertilizers are recommended to be used on-site to ensure minimal runoff from irrigation that has the potential to transport nutrients in runoff. Slow-release fertilizers are inorganic fertilizers that slowly release nutrients at a slower rate and are less susceptible to leaching and loss of fertilizer in runoff from rain events. In addition, source control measures such as provisions against applying fertilizers proximate to expected rain events are also recommended. Further, filtration and infiltration-based treatment control BMPs (e.g., rain gardens, sand filters, pervious pavements, etc.) are effective at reducing nutrient concentrations in runoff.

Through the proper implementation of source control design measures, there is no expected increase of nutrients in runoff from the project site. Nutrients will not be contained in Project runoff at levels that could adversely affect water quality or beneficial uses in downstream receiving waters, and potential nutrient impacts are less than significant.

Metals

Copper, lead and zinc are the most common metals found in urban runoff. Other trace metals such as chromium, mercury and nickel are not usually detected in urban runoff or are measured at very low levels. The proposed Irvine Business Center Project will not result in increases in metals since the amount of streets and parking will remain similar to existing conditions. In addition, the incorporation of the site design/LID features and treatment control BMPs throughout the individual projects site will provide a means for the settling of metals attached to particulates as well as vegetative uptake of metals. Additional source control measures, such as street and parking lot sweeping, will also reduce the potential for metals to reach the storm drain system. As a result, it is anticipated that water quality standards will not be exceeded, and potential impacts from metals are less than significant.

Oxygen Demanding Substances

Oxygen-demanding substances include all organic materials, which consume oxygen as they decompose. Animal droppings, sewage overflows, fallen leaves, and grass clippings are a few examples of oxygen-demanding substances. The combination of LID features, source control measures and treatment control BMPs are aimed at reducing the

potential for these types of substances to be created on the individual project sites, and the structural measures including the treatment control BMPs will provide a means to remove the potential for these substances to enter the downstream water bodies. Impacts of oxygen demanding substances are considered less than significant.

Dry Weather Flow

Although the previous discussions have focused on wet weather flows, dry weather flows are also important. Dry weather flows due to anthropogenic sources have the potential to impact local receiving water bodies. Dry weather flows are typically low in course sediment due to the low flow rates but pollutants associated with suspended solids such as phosphorous, trace metals, pesticides) are typically found in low concentrations in dry weather flows. The Irvine Business Center Project is not expected to generate significant amounts of dry weather flows due to the drought tolerant landscaping, the use of efficient irrigation systems, the lack of high intensive water use activities on-site, and the use of integrated storm water landscaping features to collect, hold and treat these flows and eliminate dry flow discharges from the individual project sites (site design/LID features and treatment control BMPs). Therefore, there are no significant impacts anticipated with respect to water quality as a result of dry weather flows.

Vector Control

The use of integrated storm water landscaping (e.g., LID features, water quality basins) for storm water treatment may increase the potential for vector issues due to the potential for standing water in these features. The potential for mosquito breeding is considered a risk when ponding water exists greater than 72 hours. Thus, the site design/LID features and treatment control BMPs will be designed to infiltrate and/or discharge from the facility within 24-36 hours, in accordance with City and OC DAMP requirements. In the event additional vector control is needed, a number of abatement measures will be used, including habitat reduction (reconfiguring of plant palettes), temporary flooding and drying (draining) of the ponds, trapping and killing pests, and biochemical pesticides (i.e., the bacteria *Bacillus sphaericus* [Bs] and *Bacillus thuringiensis israeliensus* [Bti]).

Groundwater Impacts

Literature regarding infiltration BMPs indicates that most pollutants in infiltrated water are effectively treated in the uppermost soil layers of infiltration type BMPs. A component of the Nationwide Urban Runoff Program Project conducted in Fresno, CA, indicated that chemicals tend to absorb to particulates (e.g., trace metals) are effectively removed in the upper few centimeters of the soil column. This study was supplemented by a more recent study that also concluded that even chemicals such as organochlorine pesticides and polycyclic aromatic hydrocarbons in an industrial catchment in Fresno were found to be adsorbed in the upper 4 centimeters of sediment (Schroeder 1995).

Based on previous geotechnical investigations performed in the region of the Irvine Business Complex, groundwater may occur at depths ranging from 5 to 10 feet below ground surface (bgs) for portions of the project sites. Since infiltration BMPs, such as pervious pavement and infiltration trenches, require a depth of 10 feet or greater to groundwater to minimize impacts from storm water pollutants, infiltration BMPs are not proposed to serve as primary treatment BMPs for storm water runoff in areas with high groundwater. Any pervious pavement used at these sites will require impermeable linings and underdrain systems to eliminate contact with groundwater and reduce the potential for ponding water on the surface. For sites with greater than 10 feet depth to groundwater, infiltration BMPs may be utilized on-site for water quality treatment. Based on these findings, no pollutants from the Irvine Business Complex are expected to reach groundwater, and groundwater quality impacts are expected to be less than significant.

Dewatering may be required during the construction phase of projects involving subterranean parking to lower the water table at the site of the foundation to make construction of the foundation possible. Any dewatering would be temporary and would only occur during the construction phase of the project. As discussed in Section 5.5, *Geology and Soils*, prior to the issuance of precise grading permits, the applicant shall submit a groundwater survey of the entire site. The analysis shall include information on any potential impact of groundwater on building and structural foundations and include proposed mitigation to avoid potential for groundwater intrusion within five feet of the bottom of the footings. Before water collected by a dewatering system could be discharged into municipal storm drains, individual projects would be required to obtain a permit pursuant to Order Number 98-67 that the Santa Ana Regional Water Quality Control Board

(RWQCB) adopted on July 10, 1998. The requirement to obtain a permit from the RWQCB to allow discharge of water from dewatering operations into storm drains would be incorporated into the Storm Water Pollution Prevention Plan for the project.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. Dewatering will be required for Avalon Jamboree II, Irvine Technology Center, and Kilroy. However, as described above, impacts are less than significant with incorporation of the PPP 7-2 through 7-4.

IMPACT 5.7-6: DURING THE CONSTRUCTION PHASE OF THE PROPOSED PROJECT, THERE IS THE POTENTIAL FOR SHORT-TERM UNQUANTIFIABLE INCREASES IN POLLUTANT CONCENTRATIONS FROM THE SITE. AFTER PROJECT DEVELOPMENT, THE QUALITY OF STORM RUNOFF (SEDIMENT, NUTRIENTS, METALS, PESTICIDES, PATHOGENS, AND HYDROCARBONS) MAY BE ALTERED. [THRESHOLDS HYD-1 AND HYD-6]

Impact Analysis: Clearing, grading, excavation and construction activities associated with the proposed projects with the Irvine Business Complex could impact water quality due to sheet erosion of exposed soils and subsequent deposition of particles and pollutants in drainage ways or introduction of construction-related pollutants. Under the Statewide GCP (Order 2009-0009-DWQ or subsequent update), the individual project proponents will submit a Notice of Intent (NOI) and associated PRDs to the SWRCB prior to commencement of construction activities that disturb 1 acre or greater of soil. In addition, a SWPPP will be prepared and implemented at the project sites, and revised as necessary as administrative or physical conditions change. The SWPPP shall describe construction BMPs meeting the BAT/BCT standards required by the GCP and address pollutant source reduction, and will ensure that water quality standards are not exceeded in downstream receiving waters due to construction activities. These include, but are not limited to erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices. The SWPPPs shall be developed in accordance with the construction plans, and shall provide construction BMPs that are to be maintained for the duration of the construction as well as measures that are specific to each phase of construction.

Due to potentially shallow groundwater depths within portions of the Irvine Business Complex, groundwater may be encountered during construction activities associated with the Irvine Business Complex projects, and may require dewatering. Prior to the commencement of any discharges of extracted groundwater waste, the proponents of the individual projects will apply for coverage under Santa Ana RWQCB Order No. R8-2006-0065 for short-term discharges, and Order No. R8-2006-0004 for other dewatering activities, as applicable. Any dewatering activities shall be performed in accordance with the terms and conditions of the applicable Order, and pollutant concentrations in the discharge shall not cause violation of any applicable water quality objectives for the receiving waters, including discharge prohibitions. Implementation of the appropriate BMPs per the GCP will result in less than significant impacts to surface water quality and groundwater quality during the construction phase of the project sites.

Subsequent Development Pursuant to the Proposed Project

The proposed project also includes 2,250 pending units identified in Section 3, *Project Description*, for which applications are on file with the City. Impacts associated with the individual development projects—Martin Street Condos, 2851 Alton, Avalon Jamboree II, Irvine Technology Center, Kilroy, Alton/Millikan Apartments, and 2852 Kelvin—would not differ significantly from the IBC Vision Plan, as identified above. As described above, impacts are less than significant with incorporation of the PPP 7-2 through 7-4.

5.7.4 Cumulative Impacts

The Irvine Business Complex area is predominantly built out. The proposed redevelopments would result in minor changes to the existing drainage patterns and peak flows with minor alterations in impervious surfaces, but in general, the drainage areas, discharge points, and peak flow discharges will be consistent with existing conditions. Any drainage improvements performed under the individual redevelopment projects would be subject to the design criteria and capacities required by the City of Irvine and OCFCD to correct any deficiencies identified in the existing conditions. Additionally, individual projects would have to submit a WQMP that would identify BMPs that will be used on the site to control predictable pollutant runoff.

Additionally, cumulative flows would be evaluated and addressed in terms of the Flood Control Master Plan, which is specifically intended and designed to define the flood control system necessary to accommodate runoff from future area wide development. As such, the cumulative impacts related to hydrology would be less than significant.

5.7.5 Level of Significance Before Mitigation

Upon implementation of PPPs 7-1 through 7-4, the following impacts would be less than significant: 5.7-1, 5.7-2, 5.7-3, 5.7-4, 5.7-5, and 5.7-6.

Impact 5.7-1

Because industrial land uses generally have a greater percentage of impervious surfaces in comparison to residential sites, the proposed project would not increase the amount of impervious surfaces. Groundwater is relatively shallow within portions of the project area, and due to the Types C and D soils, portions of the site may not be conducive to infiltration of runoff. Therefore, redevelopment of the Irvine Business Complex is not anticipated to reduce groundwater recharge opportunities as compared to existing conditions, and impacts are considered less than significant.

Impact 5.7-2

The proposed redevelopments will result in minor changes to the existing drainage patterns and peak flows with the minor alterations in impervious surfaces. PPP 7-1 would ensure that applicants for new development are subject to the design guidelines and capacities required by the City of Irvine and OCFCD to control discharges to the existing runoff conditions to reduce any additional impacts. Based on the proposed hydrology analysis and flood controls within the project site, erosion and siltation on or off-site are considered less than significant.

Impact 5.7-3

Because industrial land uses generally have a greater percentage of impervious surfaces in comparison to residential sites, the proposed project would not increase the amount of impervious surfaces. Groundwater The redeveloped IBC zones will have a minimum landscape requirement of 15 percent for residential areas, in addition to landscaping requirements in any new parking lots and park areas. Pursuant to PPP 7-1, all individual projects must demonstrate their post-development peak flow runoff rates do not exceed existing condition peak runoff rates. Therefore, the potential impact by the proposed change in impervious surfaces to the Irvine Business Complex is considered less than significant.

Impact 5.7-4

Applicants for new developments are required to be elevated or flood-proofed one foot above the anticipated 100-year flood elevation. In addition, pursuant to PPP 7-1, hydrologic and hydraulic studies are required in accordance with the design guidelines of the City of Irvine and OCFCD. Therefore, applicants for new development would be required to maintain or exceed the volume of storm water stored on-site during the 100-year storm event. Impacts related to flood zones are considered less than significant

Impact 5.7-5

PPP 7-2, 7-3, and 7-4 would require evaluation and implementation of BMPs to reduce the potential for surface and groundwater contamination. Consequently, impacts would be less than significant.

Impact 5.7-6

Implementation of the appropriate BMPs per the GCP (PPP 7-3 and 7-4) would result in less than significant impacts to surface water quality and groundwater quality during the construction phase of the project sites.

5.7.6 Mitigation Measures

No mitigation measures are necessary.

5.7.7 Level of Significance After Mitigation

No significant impacts have been identified and no mitigation measures are required.

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