PROJECT IMPACTS

Water Quality Constituents Analyzed

Classes of constituents were reviewed in relation to the existing and proposed land uses in the RiverPark Specific Plan Area, and in the drainage areas tributary to the Specific Plan Area, to determine which constituents would be affected by the proposed project. Consideration was also given to applicable regulatory standards. A brief description of the constituents selected for evaluation is provided below.

Total suspended solids (TSS) are evaluated to determine changes in sediment loads to the Santa Clara River from surface runoff. TSS is effectively filtered out when surface water infiltrates. For this reason, TSS does not impact groundwater quality and the impact of TSS on groundwater quality is not evaluated.

The Basin Plan has standards for four specific mineral constituents for both surface water and groundwater. These include sulfate, chloride, total dissolved solids (TDS), and boron. As the Basin Plan sets standards for these constituents, all are evaluated.

Among the nutrient constituents, nitrate and ammonia are evaluated as the Basin Plan contains standards for both. The Basin Plan sets objectives for both nitrate and ammonia for surface water and an objective for nitrate for groundwater.

Metallic constituents make up a significant portion of applicable drinking water standards due to their potential impact on human health. Metals selected for evaluation include arsenic, beryllium, cadmium, total chromium, Chromium VI, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc.

Chromium VI, a species of total chromium, is also evaluated in response to recent concerns raised about the human health effects of Chromium VI. At this time there is no defined regulatory standard for Chromium VI. Primary MCLs for total chromium are 50 and 100 µg/L based on state and federal drinking water standards, respectively. The California Department of Health Services ("DHS") has recently requested that the State Office of Environmental Health Hazard Assessment ("OEHHA") establish a specific Public Health Goal ("PHG") for Chromium-VI. The PHG would formally identify a level of Chromium-VI in drinking water that does not pose a significant human health risk. In developing drinking water standards, state law requires DHS to consider economic and technical feasibility as well as the PHG. A blue-ribbon panel of expert scientists from throughout the United States has been established by the University of California ("UC") to review scientific questions concerning the potential of Chromium-VI to cause cancer when ingested. The UC panel's review will provide recommendations to assist OEHHA in the development of a Chromium-VI PHG. Neither river nor groundwater concentration data is available for Chromium-VI as a separate component from the total chromium as currently reported. Regional stormwater quality monitoring studies have not reported concentrations for Chromium-VI because it is not yet included in the Title 22 suite of regulated drinking water constituents. The PHG for total chromium, which is set at 2.5 µg/L, was calculated based on scientific information on the potential carcinogenicity of ingested Chromium-VI, along with an estimate that Chromium-VI comprised about 7 percent of the total chromium in water. However, more recent studies of Chromium-VI in a limited number of California water supplies indicate this percentage can be much higher, perhaps greater than 50 percent.[42] The quantitative analysis of the water quality impacts from Chromium VI are based on the assumption that it constitutes 50 percent of the total chromium concentration.

Due to the presence of agricultural activities, pesticides were selected for inclusion in the water quality analysis. Two particular pesticides were selected as being sufficiently representative based on existing and projected land use. ChemA represents a class of historically used chlorinated pesticides including aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, HCH, endosulfan, and toxaphene. The Santa Clara River estuary, downstream of the project site, is listed as being impaired for both ChemA and toxaphene. Lannate, which is the trade name for the EPA registered compound, methomyl, is an insecticide that is used on a wide variety of crops. Lannate was selected as a representative locally-applied pesticide due to its conservative chemical and toxicological attributes—i.e., high mobility, stability and toxicity. Neither Basin Plan Objectives nor MCLs exist for this compound, although a drinking water standard of 0.85 mg/L has been established using EPA health criteria toxicological calculations.

Given the proximity of the industrial sites in Drainage Area 3 to the RiverPark Specific Plan Area, two hydrocarbon constituents were selected for inclusion in the thresholds of significance. Oil and grease is a general class of hydrocarbons typically associated with wastewater that also has a basin plan objective. This objective is qualitatively called out as "sheen causing" and a surface water threshold has been conservatively estimated as 10 mg/L. Oil and grease is not associated with groundwater and this is reflected in the fact that there are no drinking water standards for this constituent. Subsequently, no groundwater threshold for oil and grease was established.

Methyl tertiary butyl ether (MTBE) is a hydrocarbon that has been added in relatively low concentrations to increase octane ratings in premium grade fuels since the late 1970's. Beginning in the early 1990's MTBE has been added in much higher concentrations (up to 15 percent) to enhance gasoline combustion and reduce tailpipe emissions. MTBE is the most common fuel oxygenate, used in more than 80 percent of oxygenated fuels. Potential and documented contamination of water resources by MTBE has become a cause for major public concern and increasing controversy. MTBE readily dissolves in

42 California DHS. State to Develop Health Goal, Seeks Scientific Review of Chromium-VI in Drinking Water. Press Release. *http://www.dhs.ca.gov/opa/prssrels/2001/18-01.htm*. March 27, 2001.

water, can move rapidly through soils and aquifers, is resistant to microbial decomposition and is difficult to remove via conventional water treatment schemes. The U.S. EPA has classified MTBE as a potential human carcinogen. Finally, MTBE can give water an unpleasant taste and odor. These factors have caused widespread concern that drinking water supplies and human health may be at risk. An EPA-appointed independent blue-ribbon panel of leading experts from the public health, environmental and scientific communities, fuels industry, water utilities, and local and state governments concluded, among other things, that MTBE has primarily caused odor and taste concerns, and that only in rare instances has it been found in drinking water supplies at levels well above health-based drinking water standards.[43] Based on the panel's recommendations, recent federal EPA legislation has been enacted to protect surface and groundwaters from MTBE contamination, including the establishment of primary and secondary drinking water standards. Local standards for surface water quality such as might be included in Basin Plan objectives and California Toxics Rule criteria have not been established for this constituent. Executive Order D-5-99 will phase out the use of MTBE as a gasoline additive in California by no later than December 31, 2002.

Microbial contaminants are the last class of constituents that were included in the thresholds of significance. Thresholds for pathogen indicators such as total coliform, fecal coliform, and fecal streptococci, whose presence can indicate wastewater contamination, were developed. In addition, to these traditional classes of indicator organisms, standards for *Giardia* and *Cryptosporidium* were also developed. *Giardia* and *Cryptosporidium* are two microbial contaminants that have become prominent in recent water quality regulations. Both are pathogenic protozoa that are difficult to enumerate and as such, monitoring for these contaminants is difficult and expensive. Insufficient information exists regarding ambient levels in stormwater runoff and within the Santa Clara River to evaluate impacts from these constituents at this time.

In summary, the following constituents are considered in the water resources analysis:

- Total suspended solids (TSS)
- Minerals
  - Sulfate
  - Chloride
  - Total dissolved solids (TDS)
  - Boron
- Nutrients
  - Nitrate
  - Ammonia
- Metals
  - Arsenic
  - Beryllium
  - Cadmium
  - Total Chromium
  - Chromium VI
  - Copper
  - Iron
  - Lead
  - Manganese
  - Mercury
  - Nickel
  - Selenium
  - Silver
  - Zinc
- Pesticides
  - ChemA
  - Lannate
- Hydrocarbons
  - Oil and grease
  - MTBE (Methyl tert butyl ethylene)
- Microbial Contaminants
  - Total Coliform
  - Fecal Coliform
  - Fecal Streptococci
  - *Giardia*
  - *Cryptosporidium*

43 Blue Ribbon Panel. Blue Ribbon Panel on Oxygenates in Gasoline: Executive Summary and Recommendations. http://www.epa.gov/oar/caaac/mtbe-caaac.html. 1999.

Thresholds of Significance

This water resource analysis addresses potential impacts to groundwater and surface water quality and groundwater recharge and balance. The City of Oxnard reviewed the applicable regulatory and planning standards discussed above to determine appropriate thresholds of significance for this water resource analysis. Based on this review, the following thresholds of significance have been selected for this analysis by the City of Oxnard.

Groundwater

- Any discharges to exposed groundwater in the existing mine pits containing concentrations of selected constituents greater than ambient groundwater concentrations[44] or Basin Plan objectives as measured where the discharged water physically leaves the pits is identified as a significant impact.

- Any discharges to exposed groundwater of water containing pathogen concentrations greater than ambient groundwater concentrations or Basin Plan objectives as measured at the boundary of the Specific Plan Area is identified as a significant impact.[45]

The numerical standards used for the groundwater discharge analysis are presented in **Table 4.5-19**.

Surface Water

- Any discharge to the Santa Clara River exceeding the Basin Plan objectives for sulfate, chloride, total dissolved solids, boron, nitrate, ammonia, fecal coliform, and oil and grease is identified as a significant impact.

- Any discharge to the Santa Clara River exceeding the California Toxics Rule Criteria Maximum Concentrations (CMCs) for freshwater aquatic life for arsenic, cadmium, chromium III, chromium VI, copper, lead, nickel, selenium, silver, and zinc is identified as a significant impact.

- Any discharge to the Santa Clara River exceeding the California Toxics Rule Criteria Maximum Concentrations (CMCs) for human health for mercury is identified as a significant impact.

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44 For the purposes of this analysis ambient groundwater quality is generally defined as the maximum observed pollutant concentrations from UWCD's El Rio Spreading Grounds Wellfield data from 1991 to 2000, or the period of recharge. Chromium VI ambient concentrations are based on 50 percent of the total chromium concentration. For *Giardia* and *Cryptosporidium*, ambient concentrations are based on single samples collected at wells 2N22W21H2 and 2N22W22G1 on April 9, 1997. These concentrations are all at or below drinking water standards and provide a conservative benchmark for comparison without compromising groundwater quality.

45 This approach allows for conservative estimates for settling of particulate contaminants and die-off and dilution of microbial contaminants. Furthermore, it provides a more realistic benchmark for comparison that would not be subject to timing issues (peak versus trailing edge of storm flows) if discharges from individual storm drains were to be used.

- Any discharge to the Santa Clara River exceeding ambient concentrations[46] of iron, manganese, MTBE, total coliform, fecal coliform, fecal streptocooci, giardia and cryptosporidium is identified as a significant impact.

The numerical standards used for surface water discharges are also presented below in **Table 4.5-19**.

Dewatered Groundwater

- Any discharge of groundwater dewatered during construction exceeding the numerical standards for specific water constituents as contained in General NPDES Permit and Waste Discharge Requirements (Order No. 97-045) issued by the LARWQCB is identified as a significant impact.

Table 4.5-19
Thresholds of Significance for Surface Water and Groundwater Quality

		Threshold of Significance			
		Surface Water (1)		Groundwater (2)	
Constituent	**Units**	**Threshold**	**Source**	**Threshold**	**Source**
TSS	mg/l	38,800	Ambient	NS	---
MINERALS					
Sulfate	mg/l	600	Basin Plan Objective	500	CA Primary MCL
Chloride	mg/l	150	Basin Plan Objective	102	Ambient
TDS	mg/l	1,200	Basin Plan Objective	1,000	CA Sec MCL
Boron	mg/l	1.5	Basin Plan Objective	1.0	Ambient
NUTRIENTS					
Nitrate	mg/l	45	Basin Plan Objective	45	CA Pri MCL
Ammonia	mg/l	1.30	Basin Plan Objective	NS	---
METALS					
Arsenic	mg/l	0.34	CA Toxics Rule	<0.05 (4)	Ambient
Beryllium	mg/l	NS	(3)	<0.001 (4)	Ambient
Cadmium	mg/l	0.022	CA Toxics Rule	<0.001 (4)	Ambient
Chromium, total	mg/l	5.4	CA Toxics Rule	<0.01 (4)	Ambient
Chromium VI	mg/l	0.016	CA Toxics Rule	<0.005 (5)	Ambient
Copper	mg/l	0.052	CA Toxics Rule	<0.05 (4)	Ambient
Iron	mg/l	12.5	Ambient	0.13	Ambient
Lead	mg/l	0.48	CA Toxics Rule	<0.005 (4)	Ambient
Manganese	mg/l	0.56	Ambient	0.03	Ambient
Mercury	mg/l	0.000051	CA Toxics Rule	<0.001 (4)	Ambient
Nickel	mg/l	1.5	CA Toxics Rule	0.003	Ambient
Selenium	mg/l	0.005	CA Toxics Rule	0.009	Ambient
Silver	mg/l	0.044	CA Toxics Rule	0.01	Ambient
Zinc	mg/l	0.39	CA Toxics Rule	0.05	Ambient
PESTICIDES					
ChemA (11)	ng/g	100	Nat. Acad. Of Sci.	ND	Ambient
Lannate (10)	mg/l	0.85	EPA Criteria Estimate	<0.005	Ambient

(continues next page)

46 Ambient concentrations for iron and manganese are defined as the maximum concentrations measured by UWCD at the Freeman Diversion Santa Clara River sampling station. Ambient river concentration for total suspended solids is defined as the maximum of observed concentrations from USGS monitoring conducted during 1991 – 1993 at the Montalvo Station. Ambient river concentrations for pathogen indicators is defined as the maximum concentrations measured by the Ventura County Flood Control District at their Ventura River Foster Park sampling station. While this last source of data is not specific to the Santa Clara River, it represents the best source of analogous, local data. Ambient river concentration for MTBE is based on the National Water Quality Assessment "NAWQA" Program data for the Santa Ana Watershed and reflects limited sampling from the Santa Ana River and Warm Creek. Ambient river concentrations for Giardia and Cryptosporidium are based on a single sample collected 500 feet downstream of the Freeman Diversion on November 18, 1996.

Table 4.5-19 (continued)
Thresholds of Significance for Surface Water and Groundwater Quality

Constituent	Units	Threshold of Significance			
		Surface Water (1)		Groundwater (2)	
		Threshold	Source	Threshold	Source
HYDROCARBONS					
Oil/Grease	mg/l	10	Basin Plan Objective	NS	---
MTBE (8)	mg/L	<0.00049	Ambient	<0.005	Ambient
MICROORGANISMS					
Total Coliform	MPN/100 ml	160,000	Ambient	<1.1 (7)	CA Pri MCL
Fecal Coliform	MPN/100 ml	5,000/200	Ambient/BP Objective	<1.1 (7)	CA Pri MCL
Fecal Streptococci	MPN/100 ml	17,000	Ambient	NS	---
Giardia (9)	cysts/100 L	<1.6	Ambient	<1	Ambient
Cryptosporidium (9)	oocysts/100 L	<1.6	Ambient	<1	Ambient

Notes:

(1) Surface Water Thresholds of Significance Sources include the following:
California Toxics Rule: Criteria maximum concentration (CMC) for freshwater aquatic life. Chromium CMC is divided into 5,405 and 16 ppb for total Ch-III and total Ch-VI, respectively. Mercury CMC unavailable and so human health criteria (for consumption of organisms only) is used. Selenium CMC unavailable and so criteria continuous concentration (CCC) is used.
Basin Plan Objective: LARWQCB Basin Plan Objective for Reach 2 of the Santa Clara River. Ammonia objective conservatively assumes T = 15oC and pH = 8.1 (average Santa Clara River conditions), and Water Designation COLD (4-day avg.). The basin plan objectives for ammonia are currently being considered for revision by the LARWQCB. Oil/grease objective is "sheen-causing," which is conservatively approximated as 10 mg/L.
Ambient: Santa Clara River concentration, based on data associated with flow rates greater than 100 cfs. Pathogen indicator data unavailable for the Santa Clara River; ambient values shown based on 2001 VCFCD data for Foster Park sampling station on the Ventura River. The Ventura River is considered to be sufficiently analogous to the Santa Clara River for the purposes of these water quality analyses. Range of iron and manganese concentrations based on UWCD water quality data for the Santa Clara River at their Freeman Diversion sampling station. TSS concentrations based on 1991-1993 USGS water quality data for the Santa Clara River at their Montalvo sampling station.

(2) Groundwater Threshold of Significance Sources include:
Ambient: Values shown represent the maximum of reported value (1991-2000 data, post-Freeman diversion), that does not exceed drinking water standards, as determined from the United Water Conservation District El Rio wells #1, 2A, 3, 4, 5, 6, 7, 8 and 11 located adjacent to the El Rio spreading basins.
Drinking Water Standards: Where the maximum observed ambient groundwater exceeds, drinking water standards, the Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL) is used as the threshold of significance.

(3) California Toxics Rule criteria for beryllium not yet established.

(4) Upper end of range is an older non-detect result. This occurs as a result of historic sampling which utilized analytical procedures and equipment having higher detection limits than are currently achievable.

(5) Ambient Chromium VI concentration is estimated at 50 percent of the total chromium concentration based on data from the California DHS.

(6) Point of Compliance, as per adopted project water quality thresholds, is established as "point of contact with groundwater beneath pits" for all conservative-behaving constituents (i.e., non-bacteria). These concentrations are identical to those entering the pits ("point of contact with exposed groundwater in pits") for most constituents; however, for metals, the particulate fractions are removed in order to account for sedimentation and filtration mechanisms which will occur in and beneath the pits. Point of Compliance for pathogen indicators is established as "within aquifer at downgradient property line." Removal factor of 5.6 applied to pathogen indicator concentrations at "point of contact with exposed groundwater in pits." This factor is taken from Kennedy/Jenks' Reverse Engineering document (KJ, 2000b) and accounts for dilution, die-off and sorption/filtration removal mechanisms.

(7) The total coliform MCL is based on a standard requiring less than 5 percent of all tests per month to be positive and the fecal coliform MCL is none detected. The standards cited (<1.1 MPN/100 mL) represent the analytical detection limit for total and fecal coliform which are conservative approximations for this analysis.

(8) Ambient surface water concentration for MTBE is based on the National Water Quality Assessment "NAWQA" Program data for the Santa Ana Watershed and reflects limited sampling from the Santa Ana River and Warm Creek. Ambient groundwater concentration for MTBE is based on single samples from wells 2N22W21H2 and 2N22W22G1 as well as samples from the water storage/infiltration basins collected in 1997.

(9) Groundwater thresholds for Giardia and Cryptosporidium are based on ambient conditions as reflected by two samples collected at wells 2N22W21H2 and 2N22W22G1 on April 9, 1997. Surface water thresholds for Giardia and Cryptosporidium are based on ambient conditions as reflected by one sample collected on November 18, 1996, 500 feet downstream of the Freeman Diversion.

(10)Surface water threshold for Lannate is based on an EPA Health Criteria toxicology calculation.

(11)Surface water threshold for Chem A is based on a tissue concentration established by the National Academy of Science.

The numerical standards used for dewatered groundwater are presented in **Table 4.5-20**.

The City of Oxnard has selected the following as the threshold standards for water quality. These thresholds are environmentally conservative and consistent with both the preservation of Basin Plan designated beneficial uses and the SWRCB's Anti-Degradation Policy.

Table 4.5-20
NPDES Dewatering Permit Effluent Limitations

Constituent	Units	Discharge Limitations: Monthly Average	Discharge Limitations: Daily Maximum
EFFLUENT LIMITATIONS			
Total Suspended Solids	mg/L	50	150
Turbidity	NTU	50	150
BOD_5 20°C	mg/L	20	30
Oil and Grease	mg/L	10	15
Settleable Solids	mg/L	0.1	0.3
Sulfides	mg/L	--	1
Detergents as methylene blue active substances (MBAS)	mg/L	--	0.5
pH		at all times between 6.0 and 9.0	
DISCHARGE LIMITATIONS	Units	Maximum Allowable Concentration	
TDS	mg/L	1,200	
Sulfate	mg/L	600	
Chloride	mg/L	150	
Boron (1)	mg/L	1.5	
Nitrogen (2)	mg/L	--	
Phenols	mg/L	1	
Phenolic Compounds (chlorinated)	µg/L	1	
Benzene	µg/L	1	
Toluene	µg/L	15	
Ethylbenzene	µg/L	700	
Xylene	µg/L	1,750	
Ethylene Dibromide	µg/L	0.05	
Carbon Tetrachloride	µg/L	0.5	
Tetrachloroethylene	µg/L	5	
Trichloroethylene	µg/L	5	
1,4-dichlorobenzene	µg/L	5	
1,1-dichloroethane	µg/L	5	
1,2- dichloroethane	µg/L	0.5	
1,1-dichloroethylene	µg/L	6	
Vinyl Chloride	µg/L	0.5	
Arsenic	µg/L	50	
Cadmium	µg/L	5	
Chromium	µg/L	50	
Copper	µg/L	1,000	
Lead	µg/L	50	
Mercury	µg/L	2	
Selenium	µg/L	10	
Silver	µg/L	50	
Total Petroleum Hydrocarbons	µg/L	100	
Methy Tertiary Butyl Ether (MTBE)	µg/L	35	

Source: RWQCB, Order No. 97-045
Notes:
(1) Where naturally occurring boron results in concentrations higher than the stated limit, a site-specific limit may be determined on a case-by-case basis.
(2) Nitrate-nitrogen plus nitrite-nitrogen (NO3-N + NO2-N). The lack of adequate nitrogen data for all streams precluded the establishment of numerical limits for all streams.

Groundwater Recharge and Water Balance

For the purposes of determining the impact of the project on groundwater recharge and water balance, the City of Oxnard is using the following thresholds developed by the County of Ventura:

- Any direct or indirect decrease the net quantity of groundwater in a basin that is overdrafted is a significant adverse impact.

Known Groundwater Quality Impacts – Compare the impacts of each constituent resulting from the proposed land use with the limits for those constituents required to meet the beneficial use stated in the current Basin Plan.

- Non-impacted Basin - In hydrologic units where all groundwater constituents meet the current Basin Plan Standards, the proposed land use that individually or cumulatively causes the hydrologic unit to fail to meet these standards, is a significant adverse impact. Proposed land use that does not individually or cumulatively cause the hydrologic unit to fail to meet Basin Standards has a less than significant impact.
- Impacted Basin – Compare the impacts of each constituent resulting from the proposed land use with the respective Basin Standards for those constituents causing the basin to be impacted. If one or more constituent exceeds the Basin Standards, the impact shall be significant for both the project and cumulative impacts.

Project Impact Analysis

Numerous proposed components of the RiverPark Project have the potential to impact water quantity and quality including reconfiguration of the existing mining pits, abandonment of onsite wells, changes in existing drainage patterns, changes in land use that will effect stormwater runoff, and the future diversion of surface water into the existing mine pits for storage by UWCD. The pits would be reconfigured under the proposed Specific Plan and Mine Reclamation Plan. The existing slopes of the pits will be stabilized and the existing peninsula of fill material in the Vickers Pit and the land bridge separating the Vickers and Brigham Pits. Onsite irrigation and industrial supply wells will be abandoned. The Specific Plan would allow the site to be graded and developed with new land uses supported by a new storm drain system. In addition, the Specific Plan would allow the reclaimed mine pits to be used by UWCD for the storage of surface water. Each of these components of the RiverPark Project that could impact water quantity and quality is briefly described below.

Stormwater Drainage

Currently, runoff drains to the Large and Small Woolsey Pits from the adjacent agricultural and industrial areas. As proposed, the RiverPark project would involve modification of El Rio Retention

Basin No. 1 and the filling of Retention Basin No. 2. El Rio Drainage Basin No. 1 will be partially filled to provide a minimum of 1 foot above historic high groundwater levels and lined, and will continue to function as a detention basin for runoff generated by the agricultural area to the east of Vineyard Avenue (Drainage Area 4). El Rio Drainage Basin No. 2 will be filled in and reclaimed for development with new uses. Two new detention basins, designed as stormwater management systems, would be built to treat runoff from Drainage Areas 2 and 3. These lined detention basins are designed to treat events up to the 10-year frequency storm. Treated stormwater will be released to the Santa Clara River through new storm drains to existing outlets to the Santa Clara River. Runoff from storm events exceeding the 10-year frequency storm capacity of these water quality detention basins will overflow to the pits. The residential component of RiverPark Area 'B' will utilize a similar stormwater management system so that most stormflows will be treated and detained in lined detention basins prior to discharge to the Santa Clara River, while larger stormflows will be diverted directly to the pits.

The proposed RiverPark Specific Plan Area will consist primarily of commercial and residential land uses. The eastern portion of the residential area proposed in RiverPark Area 'B' will slope gradually towards the southeast, away from the Santa Clara River, towards the Brigham-Vickers Water Storage/Recharge Basin. The western portion of the residential area proposed in RiverPark Area 'B' will drain to the southwest. RiverPark Area 'A' will slope gradually towards the southwest, towards the intersection of the Santa Clara River and the Ventura Freeway. The two off-site areas, which currently drain to the Specific Plan Area, will continue to drain into the Specific Plan Area. **Figure 4.5-11** illustrates the location of the drainage areas and the location of the major conveyance and treatment facilities.

A more detailed description of this proposed storm drain and water quality treatment system is provided below.

Drainage Area 1

Stormwater drainage from the southern (primarily commercial) areas of RiverPark A will be treated by a dry swale located in the median of Santa Clara River Boulevard and conveyed in an underlying stormdrain pipeline. This stormdrain pipeline discharges to the existing Stroube stormdrain that, in turn, discharges through the levee to the Santa Clara River. This stormdrain design will accommodate up to the 100-year peak flow event. Catch basin inserts and manhole-accessible centrifugal separator units, with the potential addition of other structural BMPs, are incorporated into the storm drain system to meet Ventura County and City of Oxnard requirements for stormwater discharge.

Drainage Area 2a

Stormdrains from this residential area will discharge to either the North Detention Basin or a pretreatment dry swale located between the eastern side of the Santa Clara River levee and the western border of the RiverPark B residential area. Flows from these storm drains will join with stormflows from Drainage Area 3, which also are routed through the North Detention Basin and the dry swale along the river. This swale will convey stormflows southward to a discharge point to the Santa Clara River located at approximately the RiverPark A-B boundary. Stormflows that exceed the 10-year event peak flow will overtop the swale and be detained in the surrounding cottonwood forest. This riparian buffer strip will therefore serve as a detention basin or floodplain to alleviate flooding during very large stormflow events.

Drainage Area 2b

Storm drains from this residential drainage area either discharge to the South Detention Basin or the pretreatment dry swale located between the eastern side of the RiverPark B residential area and the western edge of the Brigham-Vickers Water Storage/Recharge Basin. The swale will convey stormflows southward to the South Detention Basin, which then drains to a large capacity pipeline for conveyance to the Drainage Area 1 stormdrain pipeline and ultimately to the Santa Clara River. Stormflows that exceed the 10-year event peak flow will bypass directly to the Brigham-Vickers Water Storage/Recharge Basin. The combined storage volume of the Water Storage/Recharge Basins is slightly larger than a 100-year storm event from all the on-site and off-site tributary drainage areas (Haslinger, 2001). This storage capacity estimate assumes a historic high groundwater elevation of 78 feet and allows for 1 foot of freeboard.

Drainage Area 3a

Stormdrains from this industrial drainage area discharge to a dry swale located between the eastern edge of the Large Woolsey Water Storage/Recharge Basin and the western border of the Beedy Street/JJC area. The swale conveys storm flows southward to a large capacity stormdrain that discharges to the North Detention Basin, located on the northern edge of RiverPark B. This north detention basin drains to the Drainage Area 2a dry swale located adjacent to the western edge of the RiverPark B residential area. The swale will convey stormflows southward to a large capacity stormdrain which outlets to the Santa Clara River. Stormflows exceeding the 10-year event peak flow bypass the treatment system via flow bifurcation structures located at the catch basins, and flow directly to the adjacent Large Woolsey Water Storage/Recharge Basin.

Figure 4.5-11

Proposed Stormwater Treatment System Drainage Areas

Drainage Area 3b

Storm drains from this industrial drainage area will discharge to a large capacity storm drain pipeline located between the eastern edge of the Large Woolsey Water Storage/Recharge Basin and the western border of the Montgomery/Lambert Street area. A pretreatment swale is not included here because of insufficient width between the western edge of the industrial area at Lambert Street and the eastern edge of Large Woolsey pit. The stormdrain discharges to the North Detention Basin. The North Detention Basin drains to the Drainage Area 2a dry swale that runs adjacent to the western edge of the RiverPark B residential area. The swale conveys stormflows southward to a large capacity storm drain pipeline which outlets to the Santa Clara River. Stormflows exceeding the 10-year event peak flow bypass the treatment system via flow bifurcation structures located at the catch basins, and flow directly to the adjacent Large Woolsey Water Storage/Recharge Basin.

Drainage Area 4

Stormflows generated from the agricultural area tributary to the project site are conveyed via existing drainage channels into a dry swale located at the drainage area's southern boundary. The swale conveys storm flows westward and across Vineyard Avenue to the East Detention Basin adjacent to the Brigham-Vickers Water Storage/Recharge Basin. Stormflows from the Carnegie Street industrial area (a relatively minor contribution) discharge directly to the East Detention Basin. This detention basin drains to a large capacity stormdrain which discharges into the Drainage Area 1 stormdrain, and ultimately to the Santa Clara River. Stormflows that exceed the 10-year event peak flow will bypass the swale via an existing drainage ditch and discharge directly to the Brigham-Vickers Water Storage/Recharge Basin. A comprehensive description of the proposed stormwater system is provided in **Appendix 4.5-5**.

UWCD Surface Water Diversions

The proposed Specific Plan designates the reclaimed mine pits for use as water storage and recharge basins and allows the pits to be used by the United Water Conservation District (UWCD) as water storage and recharge basins at some future date. As discussed in **Section 2.0, Environmental Setting**, UWCD manages groundwater and delivers water to cities and agricultural uses within a large part of Ventura County. The Freeman Diversion project was constructed in 1991 by UWCD to divert water from the Santa Clara River for groundwater recharge and agricultural use. UWCD currently operates spreading grounds to the north of this project site in Saticoy and to the east of the site in El Rio.

The District's current ability to recharge the local aquifer system is limited after about four weeks of precipitation in wet years due to the limited capacity of the existing spreading grounds. In addition, UWCD does not divert water from the river immediately after a storm due to the high level of silt. As a result, UWCD is not able to divert the full amount of water from Santa Clara River to which it is currently entitled. UWCD has expressed interest in using the existing mine pits within the Specific Plan Area, after implementation of the proposed reclamation plan, for the storage of water diverted from the Santa Clara River at the Freeman Diversion structure. Water stored in the pits would be allowed to infiltrate in the basins to recharge the aquifer or transferred to other UWCD facilities for recharge or delivery to customers for use. It is anticipated that over time, the Large Woolsey and Brigham / Vickers Water Storage / Recharge Basin bottoms will silt up and function primarily as storage facilities. UWCD will need to prepare engineering and environmental studies and secure funding before the mine pits could be used for this purpose. At this time, UWCD has not secured funding for design, construction or operation of the mine pits for this purpose and no schedule has been determined for these future actions by UWCD. This analysis focuses on the use of the pits allowed by the proposed RiverPark Specific Plan.

Construction Characteristics

The reclamation plan for the RiverPark Specific Plan area addresses the reclamation of the existing mine pits and the stockpile and plant areas. The reclamation of the mine pits[47] encompasses the stabilization of basin slopes to improve stability and reduce lateral movement under static and seismic conditions. Slope stabilization will allow for the development of appropriate setbacks from adjacent structures and will accommodate the construction of the stormwater treatment systems and a proposed perimeter road. Stabilization is expected to be achieved through a combination of grading and mechanical reinforcement methods. Revegetation of the slopes following stabilization is also planned.

Reclamation of the stockpile area will include the excavation, removal, and recompaction of uncertified fills, where present. In order to perform this work, dewatering of the excavation area may be necessary depending on the groundwater level at the time of construction. Specific details regarding dewatering operations will not be known until the stockpile excavation begins. Groundwater levels at the time of construction would have the greatest impact influence on the specifics of the dewatering operation. Additionally, the methodology of the grading contractor, i.e., the size of the excavation, also will influence the scope of the dewatering operation. A preliminary dewatering evaluation estimated that a wellpoint dewatering system could generate as much as 110 to 130 acre-feet per day of

47 West Coast Environmental and Engineering. *RiverPark Reclamation Plan. Prepared for Hanson Aggregates West, Inc.* August 1, 2001.

discharge, if the groundwater level was at or below about 55 feet msl and excavation down to about 35 feet msl was required.

Potential discharge points for this water include the Large Woolsey Mine Pit, the Vulcan (previously CalMat) Ferro Pit (located immediately north of the Large Woolsey Pit, the UWCD El Rio Spreading Basins, or the Santa Clara River. Dewatering is anticipated to last for 3 to 4 months, based on the anticipated groundwater levels, to accommodate the grading activities for the reclamation of the stockpile area.

Discussions with Regional Board staff[48] indicate that discharges of the dewatered groundwater to the mine pits or the Santa Clara River would be subject to a National Pollutant Discharge Elimination System (NPDES) Permit and waste discharge requirements. Although there is a general permit, the quantity of flow that may be extracted would require application for an individual permit. Individual permits generally follow the same guidelines as the general permit with special provisions included to address unique aspects of the project.

Depending on the water level at the time of construction, the volume of dewatering could be substantial. Selection of a specific discharge point would be dependent on the amount of groundwater required to be dewatered and the relative location of the area to be dewatered to the discharge point to avoid mounding effects.

Impacts on Water Quantity

Construction

The dewatering that will occur during construction could impact groundwater quantities depending on the actual amount of dewatering required and the method of discharge. If a substantial amount of groundwater is discharged to the Santa Clara River, this would result in a negative impact on groundwater quantities. This potential impact could be mitigated by allowing the dewatered groundwater to percolate back to groundwater. This could be achieved, if feasible, by discharging the groundwater to the mine pits if a small amount of dewatering is necessary or to the El Rio Spreading Grounds or the Ferro Pit if larger withdrawals are required. This impact is considered significant.

RiverPark Project Impacts

Impacts to groundwater quantity from the RiverPark Specific Plan were estimated by examining the site's interaction with the groundwater system over a 20-year period on a project basis and then

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48 Nye, L.B. (Regional Water Quality Control Board). Personal Communication. September 17, 2001.

comparing the results to the existing conditions. The methodology used to analyze the project impacts was generally consistent with the methodology used for the existing conditions analysis. Because the project will result in land use changes, some additional elements were added to the water balance to reflect inflows and outflows to groundwater. Components of the RiverPark Project that will impact groundwater quantity include:

- Residential and commercial development that will change the amount and location of pervious acreage available for surface water infiltration and potential groundwater recharge;
- Abandonment of onsite wells including 4 irrigation wells and 2 industrial water supply wells;
- Reconfiguration of existing mine pits including slope stabilization and modification of the land bridge between the Brigham and Vickers pits;
- Diversion of onsite and offsite stormwater runoff into a series of grass-lined swales and detention basins for conveyance to the Santa Clara River;[49]
- Overflow of detention basins into the mine pits if surface water runoff volume exceeds the capacity of the drainage system (10-year storm event); and
- Diversion of surface water into mine pits for recharge and storage by UWCD.

To determine the impact of the RiverPark Project on the groundwater basin, the net amount of groundwater extraction resulting from the Project is compared to the historical groundwater extraction for the Specific Plan Area.

Project Site Water Balances

To evaluate the project's impact to groundwater quantity, three analyses were conducted. One consisted of estimating a water balance for the reconfiguration of the existing mine pits, incorporating surface water diversions by UWCD. The second involved an estimate of groundwater recharge associated with irrigated landscape and open areas of the site where potential infiltration could occur. The third analysis considered the changes to the surface water drainage system whereby stormwater runoff will be diverted to the Santa Clara River via a system of dry swales, detention basins, and drain pipes. These project conditions are illustrated in the conceptual cross-section on **Figure 4.5-12**. Data and analyses are included as Attachments 5, 6, and 7 in **Appendix 4.5-3** and summarized below.

Reconfigured Mine Pits with UWCD Diversions. The RiverPark Specific Plan will leave the existing mine pits open and unfilled, with only minor reconfiguration. One of the proposed pit modifications

49 Integrated Water Resources. *Design and Technical Analysis of the Proposed Stormwater Quality Treatment System for RiverPark.* November 12, 2001.

Figure 4.5-12

RiverPark Post-Project Water Balances

involves the partial removal of material comprising a land bridge between the Brigham and Vickers pits and the fill peninsula between the Vickers and Small Woolsey pits down to an approximate elevation of 50 feet msl (compare pit geometry in **Figure 4.5-8** with **Figure 4.5-12**. This revised pit geometry was used for creating a project water balance for the open mine pits. Acreage within each of the topographic contours on the grading plan was calculated to estimate the area of groundwater exposed to evaporation in the pits. The surface water was varied in the analysis as water levels rose and fell over the 20-year period.

Under the existing conditions analysis, stormwater runoff currently diverted into the mine pits was incorporated into the water balance. As part of the RiverPark Specific Plan, the newly constructed drainage system will divert these flows to the Santa Clara River with only infrequent overflow into the pits. Because historical precipitation and runoff data indicate that the overflow into the pits would not have occurred over the study period, runoff is not incorporated into this water balance.

Anticipated amounts of surface water that could be diverted into the RiverPark pits from the Santa Clara River were estimated by UWCD[50] and provided for this study. These estimates considered historic diversion and streamflow data, rejected recharge from mounding at spreading basins that could be diverted to RiverPark, and the capacity of the mine pits. Estimated annual diversions to the RiverPark pits averaged 7,022 AFY on a water-year basis. UWCD also provided monthly allocation percentages to apply to the estimated annual diversions. For purposes of the water balance analysis, estimated diversion amounts were added first into available capacity at Large Woolsey pit (total capacity of approximately 2,200 AF) with overflow into Vickers and Brigham pits. The amount of diverted water that could be stored in the pits at any given time varied with the elevation of exposed groundwater in the pits. Because UWCD plans to pump out the stored water to make room for additional diversions, stored water amounts were not carried forward in the water balance from month to month.

The project Reconfigured Mine Pits water balance employs the same data and methodology as the Existing Mine Pits water balance. Surface water diversions were added to the pits and allowed to evaporate with the groundwater, which was exposed for most of the study period. Under existing conditions, water levels dropped below the bottoms of all four pits during 34 months of the 240-month study period. With the addition of UWCD diversions in project conditions, the pits are expected to be dry only 12 months of the 240-month study period or less depending on how the project is operated. For

50 *United Water Conservation District. RiverPark Water Availability (spreadsheet). June 26, 2001.*

purposes of the analysis, it was assumed that diverted water would be exposed to evaporation during the month that diversion occurred due to insufficient vadose zone and/or reduced infiltration rates.

As a result of increased groundwater exposure, overall evaporation increased from existing conditions to project conditions. However, the increase in evaporation is minor with respect to the other components of the water balance. On an average basis over the 20-year study period, evaporation from the exposed water in the mine pits increased from 352 AFY during existing conditions to 416 AFY during project conditions, an increase of approximately 64 AFY (compare annual Qelake totals in Attachment 1 to Qelake totals in Attachment 5, **Appendix 4.5-3**).

The water balance for the Reconfigured Mine Pits is presented in Attachment 5 in **Appendix 4.5-3** and summarized in **Table 4.5-21**.

Table 4.5-21
RiverPark Site Water Balances - Project Analysis

Water Year	Project		
	Reconfigured Gravel Pits Water Balance (AFY)	Average Irrigation Recharge (AFY)	Project Total (AFY)
1979-1980	14,792	195	14,986
1980-1981	7,165	195	7,359
1981-1982	7,703	195	7,898
1982-1983	13,763	195	13,958
1983-1984	3,329	195	3,524
1984-1985	-113	195	81
1985-1986	11,055	195	11,249
1986-1987	2,264	195	2,459
1987-1988	2,359	195	2,553
1988-1989	438	195	633
1989-1990	75	195	269
1990-1991	3,695	195	3,890
1991-1992	13,204	195	13,398
1992-1993	15,099	195	15,294
1993-1994	9,469	195	9,664
1994-1995	13,905	195	14,100
1995-1996	9,398	195	9,593
1996-1997	8,775	195	8,969
1997-1998	5,401	195	5,596
1998-1999	2,860	195	3,054
Minimum	-113	195	81
Maximum	15,099	195	15,294
20-Year Ave	7,232	195	7,426

As shown in **Table 4.5-21**, the annual water balance at the mine pits ranges from a loss of -113 AFY to a gain of 15,099 AFY. A net loss is predicted for one water year (1984-85) when precipitation (194 AFY) and diversion amounts (304 AFY) were lower than evaporation from the exposed water table in the mine pits (552 AFY). Gains to the groundwater system result from the large surface water diversion amounts added to the mine pits. Because this water is added directly to the water table under most conditions and will recharge local groundwater through the pit walls (and, during some conditions, the pit bottoms), it is considered an increase in groundwater for the purposes of this analysis. It is acknowledged that the diversions may result in decreased infiltration along the Montalvo Forebay reach of the Santa Clara River where annual infiltration averaged about 9,360 AFY (**Table 4-5.2**) However, because diversions are anticipated to occur when streamflow is high, much of that water would likely have continued as streamflow to the Pacific Ocean. It is also acknowledged that diverted and stored water will likely be removed from the pits for either recharge or direct use in the Oxnard Plain. However, both of these uses benefit the groundwater basin and are not considered to create substantial losses to the water balance. If the UWCD proposed diversions are removed from the water balance, results are similar to the existing conditions water balance results with the exception of decreased stormwater runoff into the pits. Using the 20-year historical record of water levels, water table exposure in the pits, UWCD anticipated diversions, evaporation, and precipitation, project conditions are predicted to result in an average net gain of approximately 7,232 AFY at the reconfigured mine pits (**Table 4.5-21**).

Irrigated Acreage. The second project analysis incorporates water demand factors for the pervious areas of the RiverPark development including irrigated parks, fields, and landscaping. These areas cover approximately 446 acres, or about 64 percent of the RiverPark property. The area does not include the open mine pits, which were analyzed separately in the Reconfigured Mine Pits water balance described above. These areas will be irrigated with water provided by the City of Oxnard.

The analysis assumes a landscape/park irrigation efficiency of 80 percent and predicts that 20 percent of the demand will recharge the groundwater system in the form of return flows. Using an irrigation demand factor of 2.1815 AFY/acre[51] and a pervious irrigated acreage of 446 acres, the average total irrigation demand is estimated at 973 AFY. Of that 973 AFY, 20 percent, or 195 AFY, is estimated to recharge groundwater (Attachment 6, **Appendix 4.5-3**). Irrigation demand is an average estimate and is not modified to incorporate changes in hydrologic conditions. It is assumed that changes in precipitation and irrigation amounts will counterbalance to meet the irrigated area demand and that recharge beneath the area will be relatively consistent over time whether from irrigation return flows or precipitation infiltration. As such, the average annual recharge amount is kept constant at 195 AFY for every year in the 20-year analysis (**Table 4.5-21**). This simplification likely underestimates groundwater recharge in wet years and is assumed to be conservative for the purposes of estimating the RiverPark development's impacts on groundwater quantity.

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51 Tetra Tech/ASL Consulting Engineers. 2000.

Stormwater Drainage System. Currently, surface water runoff from the areas located east of the Large Woolsey and north of the Small Woolsey Mine Pits drains into these pits. As previously described, the project proposes to reroute this offsite runoff to the Santa Clara River via a system of dry swales, detention basins, and drain pipes.[52] The dry swales will also contain drainage pipes to effectively convey water into and, in some areas, out of the lined detention basins. Since these pipes are expected to limit infiltration of surface water runoff, the dry swales are not considered to be areas of recharge in the water balance. Infiltration is also expected to be negligible in the detention basins since they will be lined and used only as temporary collection points. As such, the detention basins are not considered recharge points in the water quantity analysis.

Both offsite and onsite stormwater runoff will ultimately be conveyed to the Santa Clara River near the southern end of the property. This is closer to the reach of the river where streamflow infiltration is minimal due to underlying clays. As a conservative assumption with respect to the analysis of water quantity, all of the stormwater runoff conveyed to the river is assumed to leave the Montalvo Forebay without recharging groundwater.

The drainage system is designed to hold and convey all runoff up to amounts associated with a 10-year storm event.[53] This capacity equates to precipitation of approximately 5.53 cumulative inches on a 24-hour basis.[54] Should runoff volumes exceed this capacity, excess runoff will be diverted into the reclaimed mine pits.[55] An examination of daily precipitation events for the 20-year study period indicates that the highest 24-hour precipitation amount that has been measured at the El Rio station since 1979 was 4.98 inches (on 12-06-97). Since this amount is lower than the proposed design capacity of the drainage system, it is assumed that no runoff water would have overflowed into the mine pits during the 20-year study period. Assuming similar hydrologic conditions for the future, data predict that if any water overflowed into the pits, it would likely occur on an infrequent basis and only after a sufficient period of precipitation to exceed the system capacity. Therefore, as a conservative assumption with respect to water quantity, no groundwater recharge from stormwater runoff is included in the project water balance. Daily precipitation data from the El Rio Station 239E are sorted and listed as Attachment 7 in **Appendix 4.5-3**.

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52 Integrated Water Resources. Design and Technical Analysis of the Proposed Stormwater Quality Treatment System for RiverPark. November 12, 2001.

53 Integrated Water Resources. *Design and Technical Analysis of the Proposed Stormwater Quality Treatment System for RiverPark.* November 12, 2001.

54 Alan Eide, Tetra Tech / ASL Consulting Engineers. Personal Communication. May 23, 2001.

55 Integrated Water Resources. *Design and Technical Analysis of the Proposed Stormwater Quality Treatment System for RiverPark.* November 12, 2001.

Project Impacts to Groundwater Quantity

As shown in **Table 4.5-21**, the combined project analyses predict a large net recharge to groundwater for the entire 20-year study period as a result of the UWCD diversions into the pits. Recharge to the groundwater system ranges from 81 AFY to 15,294 AFY. Under average conditions, approximately 7,426 AFY is added to the groundwater system beneath the site for project conditions.

The significance threshold for groundwater quantity is based on a comparison of the water balances for the existing conditions to that of the project conditions. If there is a decrease in the water balance, then there is a significant impact. If there is no change in the water balance or an increase, then there is no impact or a beneficial impact. Existing condition and project water balance data are summarized in **Table 4.5-22**. As shown in the table, the project results in a net gain to the groundwater system in all 20 years of the study period. This gain is largely controlled by the estimated surface water diversions planned by UWCD (diversions average 7,022 AFY) and, to some extent, the elimination of groundwater pumping for agricultural and industrial supply (which consumed up to –1,172 AFY of groundwater) during project conditions.

Table 4.5-22
Project Impacts on Water Quantity

Water Year	Existing Conditions Water Balance (AFY)	Project Water Balance (AFY)	Project Comparison With Existing Conditions (AFY)
1979-1980	216	14,986	14,770
1980-1981	-461	7,359	7,820
1981-1982	-880	7,898	8,778
1982-1983	-414	13,958	14,372
1983-1984	-1,489	3,524	5,013
1984-1985	-1,160	81	1,241
1985-1986	-455	11,249	11,704
1986-1987	-1,185	2,459	3,644
1987-1988	-785	2,553	3,338
1988-1989	-668	633	1,301
1989-1990	-583	269	852
1990-1991	-516	3,890	4,406
1991-1992	-28	13,398	13,426
1992-1993	136	15,294	15,158
1993-1994	-852	9,664	10,516
1994-1995	99	14,100	14,001
1995-1996	-780	9,593	10,373
1996-1997	-867	8,969	9,836
1997-1998	343	5,596	5,253
1998-1999	-1,130	3,054	4,184
Minimum	-1,489	81	852
Maximum	343	15,294	15,158
20-Year Average	-573	7,426	7,999

The maximum increase in recharge as a result of the project is 15,158 AFY with an average recharge of 7,999 AFY (**Table 4.5-22**). Therefore, the RiverPark Specific Plan has no significant impacts with respect to groundwater quantity and in fact results in a benefit to the groundwater balance.

Water Quality

Construction

From a water quality perspective, the groundwater extracted during the dewatering operation will reflect the ambient quality of the groundwater. For this reason, the impact of this extracted groundwater is evaluated based on ambient groundwater data for the area. **Table 4.5-23**, below, presents a comparison of dewatered groundwater (ambient water) quality with the NPDES permit standards being used as significance thresholds in this analysis. Of the listed constituents, only TDS and sulfate concentrations exceed the established thresholds of significance. Observed TDS concentrations have been as high as 1,710 mg/L in comparison to the threshold limit of 1,200 mg/L. Observed sulfate concentrations have been as high as 740 mg/L in comparison to the threshold limits of 600 mg/L. These exceedances are based on maximum observed values; average values for these constituents are below the standards and are not anticipated to be a significant impact, particularly if the water is recharged to the groundwater basin. Although no data exists for several constituents, including $BOD_{5,20}$, oil and grease, settleable solids, and sulfides, these are constituents typically associated with wastewater and not groundwater. These constituents are not included among the drinking water MCL or SMCL standards and are therefore expected to be lower than the NPDES permit concentrations.

Because nitrate concentrations vary both with location and hydrologic conditions, there is a potential for the dewatering operations to temporarily alter groundwater flow patterns and result in higher nitrate levels at UWCD's El Rio Spreading Ground wells. This potential impact could be mitigated, if feasible, by discharging the dewatered groundwater to the El Rio Spreading Ground recharge basins. This would develop a mound that should attenuate the impacts of the dewatering operations. This impact is considered significant.

Table 4.5-23
Comparison of Dewatered Groundwater Quality with NPDES Standards

Constituent	Units	Dewatered Groundwater Quality Range (1)	NPDES Standard
Total Suspended Solids	mg/L	<50 (5)	50
Turbidity	mg/L	<0.2 - 6.2	50
BOD_5, 20°C	mg/L	<20 (5)	20
Oil and Grease	mg/L	<10 (5)	10
Settleable Solids	mg/L	<0.1 (5)	0.1
Sulfides	mg/L	<1 (5)	1
Methylene blue active substances (MBAS)	mg/L	<0.02 - <0.2	0.5
pH	–-	7.1 - 8.3	6.0 to 9.0
TDS (3)	mg/L	570 - **1,710**	1,200
Sulfate (4)	mg/L	255 – **740**	600
Chloride	mg/L	21 – 102	150
Boron	mg/L	0.4 - 1.0	1.5
Nitrogen	mg/L	<0.1 - 29	–
Phenols	µg/L	<5 (1)	1
Phenolic Compounds (chlorinated)	µg/L	<0.5 (1)	1
Benzene	µg/L	<0.1 (1)	1
Toluene	µg/L	<0.1 (1)	15
Ethylbenzene	µg/L	<0.1 (1)	700
Xylene	µg/L	<0.1 (1)	1,750
Ethylene Dibromide	µg/L	<0.02 (1)	0.05
Carbon Tetrachloride	µg/L	<0.1 (1)	0.5
Tetrachloroethylene	µg/L	<0.1 (1)	5
Trichloroethylene	µg/L	<0.1 (1)	5
1,4-dichlorobenzene	µg/L	<0.5 (1)	5
1,1-dichloroethane	µg/L	<0.1 (1)	5
1,2- dichloroethane	µg/L	<0.1 (1)	0.5
1,1-dichloroethylene	µg/L	<0.1 (1)	6
Vinyl Chloride	µg/L	<0.1 (1)	0.5
Arsenic (2)	µg/L	<0.5 - <50	50
Cadmium (2)	µg/L	<0.2 - <1	5
Chromium (2)	µg/L	<1 - <10	50
Copper (2)	µg/L	<10 - <50	1,000
Lead (2)	µg/L	<0.2 - <5	50
Mercury	µg/L	<0.2 - <1	2
Selenium	µg/L	<5 - 9	10
Silver (2)	µg/L	<1 - <10	50
Total Petroleum Hydrocarbons	mg/l	NS	100
Methyl Tertiary Butyl Ether (MTBE)	µg/L	<3	35

Notes:
(1) Where only a single "less than" value is reported, the constituent was never detected.
(2) The upper range represents the largest non-detect value for these constituents. The highest detected value for these constituents are: arsenic - 5 µg/L; cadmium - 0.3 µg/L; chromium - 5 µg/L; lead - 3.8 µg/L; and silver - 0.6 µg/L. Copper has been detected positively once over the period of review, but the sample point was discarded as it appears to be an anomaly.
(3) TDS exceeded the NPDES standard in 88 of 247 samples, with an overall average of 1,000 mg/L.
(4) Sulfate exceeded the NPDES standard in 10 of 297 samples, with an overall average of 457 mg/L.
(5) Sampling data for these constituents is not available. Given that these specific constituents are typically not found in groundwater, no impacts are anticipated.

RiverPark Specific Plan Impacts

Expected runoff constituent concentrations have been estimated utilizing data corresponding to land uses (**Tables 4.5-17** and **4.5-18**). Calculations of removal efficiencies for BMP treatment elements in the proposed treatment system are presented below in **Table 4.5-24**. In addition to the proposed treatment system, the particulate fraction of the metal constituents is expected to settle in the Water Storage/Recharge basins for storm events greater than 10-years in frequency and would not impact downgradient water quality.[56] Metals concentrations for the stormwater reaching groundwater under the Water Storage/Recharge basins are assumed to consist entirely of the dissolved fraction. Particulate fractions for the various metals were taken from sampling conducted in Ventura County,[57] Los Angeles County,[58] Santa Monica,[59] and Fresno.[60] Preference in assigning particulate fractions was given to the most analogous sources of data. Filtration is assumed to be the primary removal mechanism, but surface adsorption is also anticipated to enhance particulate removal as the suspended solids loading to the Water Storage/Recharge basins increases. Estimates of discharge quality to the Santa Clara River and to groundwater exposed in the Water Storage/Recharge basins for the proposed RiverPark Specific Plan are based on the mix of land use in the respective drainage areas. These levels are compared to the significance thresholds and are listed below in **Tables 4.5-25** and **4.5-26**.

Impacts to groundwater quality resulting from the recharge of surface water are expected to be negligible. There is little potential for surface water runoff to recharge groundwater while in the Santa Clara riverbed. The Stroube Drain outfall, the discharge point for the majority of the RiverPark Specific Plan Area, is very close to the southern edge of the Montalvo Forebay boundary providing only a short reach of the Santa Clara River that could recharge the aquifer. Under the flow conditions in which substantial amounts of discharge are expected (high river flow rates), the percolation rates would be reduced and negligible impacts to groundwater quality from the recharge of surface water are expected. Therefore, impacts to groundwater quantity from the infiltration of surface runoff will not be significant.

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56 *Settling of the particulate fraction is based on the premise that the water storage/infiltration basins will behave similar to a percolation basin used in soil aquifer treatment. As indicated in Groundwater Recharge Using Waters of Impaired Quality (Committee on Groundwater Recharge, 1994), "Trace elements present in suspended matter generally are removed during SAT by filtration and do not migrate. [...] Smaller suspended particulates that can move through soil pores without becoming trapped are also attenuated by sorption to mineral surfaces in the soil matrix." Similar findings were evidenced in work by A.C. Chang and A.L. Page (Chapter 21, Soil Deposition of Trace Metals during Groundwater Recharge Using Surface Spreading.) and Henry F.H. Ku and Dale L. Simmons (Effect of Urban Stormwater Runoff on Ground Water Beneath Recharge Basins on Long Island, New York. U.S. Geological Survey Water-Resources Investigations Report 85-4088. 1986.). Copies of these articles are contained in* ***Appendix 4.5-7***.

57 Ventura Countywide Stormwater Quality Management Program. *Ventura Countywide Stormwater Quality Management Plan: Application for Reissuance of Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit.* 1999.

58 Los Angeles County Department of Public Works. *Los Angeles County 1994 to 2000 Integrated Receiving Water Impacts Report.* 2000.

59 Woodward-Clyde. *Santa Monica Bay Area Municipal Stormwater/Urban Runoff Pilot Project – Evaluation of Potential Catch Basin Retrofits. Prepared for Santa Monica Cities Consortium.* 1998.

60 Oltmann, R.N. and Shulters, M.V. *Rainfall and Runoff Quantity and Quality Characteristics of Four Urban Land-Use Catchments in Fresno, California October 1981 to April 1983. U.S. Geological Survey Water-Supply Paper 2335.* 1989.

Table 4.5-24
Anticipated BMP Removal Efficiencies

Constituent	Removal Efficiencies		
	Dry Swale	**Detention Basin**	**Centrifugal Separator Unit**
TSS	90%	65%	40%
MINERALS			
Sulfate	20%	0%	0%
Chloride	0%	0%	0%
TDS	0%	0%	0%
Boron	75%	55%	20%
NUTRIENTS			
Nitrate	75%	0%	0%
Ammonia	20%	0%	0%
METALS			
Arsenic	75%	55%	20%
Beryllium	75%	55%	20%
Cadmium	75%	55%	20%
Chromium, total	75%	55%	20%
Chromium VI	75%	55%	20%
Copper	75%	55%	20%
Iron	75%	55%	20%
Lead	75%	55%	20%
Manganese	75%	55%	20%
Mercury	75%	55%	20%
Nickel	75%	55%	20%
Selenium	75%	55%	20%
Silver	75%	55%	20%
Zinc	75%	55%	20%
PESTICIDES			
ChemA	90%	65%	40%
Lannate	0%	0%	0%
HYDROCARBONS			
Oil/Grease	80%	0%	40%
MTBE	0%	0%	0%
BACTERIAL INDICATORS			
Total Coliform	80%	70%	20%
Fecal Coliform	80%	70%	20%
Fecal Streptococci	80%	70%	20%
Giardia	80%	70%	20%
Cryptosporidium	80%	70%	20%

Notes and Assumptions:
1. Dry swale removal rates for sulfate and ammonia were estimated based upon an assumption that their behaviors as ionic species are similar to that of nitrate, only perhaps more conservative.
2. Oil & grease removal rates were estimated based upon an assumption that their behavior is similar to that of sediments because of their affinity for adsorption. Detention basin removal (i.e., via sedimentation processes) is considered negligible because oil & grease are present primarily as a floatable sheen.
3. ChemA constituents are likely to be entirely associated with sediments given the very high partitioning coefficients of these chlorinated pesticides; therefore, their removal behavior is assumed to be similar to that of sediments.
4. Centrifugal separator unit removal rates based on manufacturer's information which cites 80 percent TSS removal, and assuming that 50 percent of Drainage Area #1 stormflows are routed through these devices.

Table 4.5-25
RiverPark Project Stormwater Discharges to Santa Clara River

Constituent Concentrations					Thresholds of Significant Impact	
			Post-Project Conditions			
Constituent	**Units**	**Existing Conditions**	**Raw Stormwater**	**Post Treatment Stormwater**	**Water Quality Threshold**	**Water Quality Criteria Applied**
TSS	mg/l	885	649	70	38,800	Ambient
MINERALS						
Sulfate	mg/l	287	169	137	600	Basin Plan Obj.
Chloride	mg/l	35	33	33	150	Basin Plan Obj.
TDS	mg/l	681	428	428	1200	Basin Plan Obj.
Boron	mg/l	0.43	0.32	0.06	1.50	Basin Plan Obj.
NUTRIENTS						
Nitrate	mg/l as NO3	43.7	26.2	6.9	45	Basin Plan Obj.
Ammonia	mg/l as NH3	2.16	1.60	1.30	1.3	Basin Plan Obj.
METALS						
Arsenic	mg/l	0.012	0.009	0.002	0.34	CA Toxics Rule
Beryllium	mg/l	0.001	0.001	0.000	NS	---
Cadmium	mg/l	0.004	0.004	0.001	0.022	CA Toxics Rule
Chromium, total	mg/l	0.096	0.059	0.009	5.4	CA Toxics Rule
Chromium VI (3)	mg/l	0.048	0.029	0.004	0.016	CA Toxics Rule
Copper	mg/l	0.078	0.062	0.016	0.052	CA Toxics Rule
Iron	mg/l	3.61	3.26	1.15	12.500	Ambient
Lead	mg/l	0.031	0.027	0.007	0.48	CA Toxics Rule
Manganese	mg/l	0.18	0.14	0.03	0.560	Ambient
Mercury	mg/l	0.000128	0.000163	0.000048	0.000051	CA Toxics Rule
Nickel	mg/l	0.073	0.053	0.01	1.5	CA Toxics Rule
Selenium	mg/l	0.007	0.006	0.001	0.005	CA Toxics Rule
Silver	mg/l	0.007	0.007	0.001	0.044	CA Toxics Rule
Zinc	mg/l	0.345	0.310	0.083	0.39	CA Toxics Rule
PESTICIDES						
ChemA	ng/g	ND	ND	ND	100	Nat. Acad. of Sci.
Lannate	mg/l	NA	NA	NA	0.85	EPA Criteria Est.
HYDROCARBONS						
Oil/Grease	mg/l	3	11	3	10	Basin Plan Obj.
MTBE	mg/l	ND	0.0003	0.0003	<0.00049	Ambient
MICROORGANISMS						
Total Coliform (1)	MPN/100ml	209,180	143,819	25,918	160,000	Ambient
Fecal Coliform (1) (2)	MPN/100ml	26,150	19,653	**2,027**	5,000 / 200	Ambient/BP Obj.
Fecal Streptococci (1)	MPN/100ml	70,085	51,992	8,653	17,000	Ambient
Giardia	cysts/100 L	NA	NA	<1.6	<1.6	Ambient
Cryptosporidium	oocysts/100L	NA	NA	<1.6	<1.6	Ambient

ND: Not Detectable. Concentrations below analytical detection limits.
NA: Not available. Data not available for these constituents.
(1) Pathogen indicator data unavailable for the Santa Clara River; ambient values shown based on 2001 Ventura River VCFCD data at Foster Park sampling station.
(2) Threshold of Significant Impact shown with both Basin Plan Objective and Ambient values to document existing river water quality exceedences of Basin Plan Objective. Project discharges are compared to the Basin Plan Objective.
(3) Chromium VI concentrations estimated at 50 percent of the total chromium concentration.

Table 4.5-26
RiverPark Project Stormwater Discharges to Water Storage/Infiltration Basins

Constituent Concentrations				**Thresholds of Significant Impact**	
Constituent	**Units**	**Project Stormwater Discharge**	**At Point of Contact with Groundwater Beneath Pits**	**Water Quality Threshold**	**Water Quality Criteria Applied**
TSS	mg/l	54	0	NS	---
MINERALS					
Sulfate	mg/l	147	147	500	CA Primary ML
Chloride	mg/l	13	13	102	Ambient
TDS	mg/l	334	334	1,000	CA Sec MCL
Boron	mg/l	0.23	0.16	1.0	Ambient
NUTRIENTS					
Nitrate	mg/l as NO3	6.4	6.4	45	CA Pri MCL
Ammonia	mg/l as NH3	0.53	0.53	NS	---
METALS					
Arsenic	mg/l	0.004	0.002	<0.05	Ambient
Beryllium	mg/l	0.001	0.0004	<0.001	Ambient
Cadmium	mg/l	0.001	0.0006	<0.001	Ambient
Chromium, total	mg/l	0.006	0.001	<0.01	Ambient
Chromium VI (2)	mg/l	0.003	0.001	<0.005	Ambient
Copper	mg/l	0.034	0.013	<0.05	Ambient
Iron	mg/l	1.34	**0.21**	0.13	Ambient
Lead	mg/l	0.010	0.004	<0.005	Ambient
Manganese	mg/l	0.146	**0.05**	0.03	Ambient
Mercury	mg/l	0.00004	0.00000	<0.001	Ambient
Nickel	mg/l	0.011	**0.007**	0.003	Ambient
Selenium	mg/l	0.001	0.001	0.009	Ambient
Silver	mg/l	0.001	0.000	0.01	Ambient
Zinc	mg/l	0.134	0.035	0.05	Ambient
PESTICIDES					
ChemA	mg/l	ND	ND	NS	---
Lannate	mg/l	NA	NA	<0.005	Ambient
HYDROCARBONS					
Oil/Grease	mg/l	2	2	NS	---
MTBE (1)	mg/l	0.0003	0.0003	<0.005	Ambient
MICROORGANISMS		**Project Stormwater Discharge**	**Within Aquifer At Downgradient Property Line**		
Total Coliform	MPN/100ml	163,046	<1.1	<1.1	CA Pri MCL
Fecal Coliform	MPN/100ml	24,402	<1.1	<1.1	CA Pri MCL
Fecal Streptococci	MPN/100ml	58,142	<2	NS	---
Giardia	Cysts/ 100 L	NA	NA	<1	Ambient
Cryptosporidium	Oocysts/100 L	NA	NA	<1	Ambient

ND: Not Detectable. Concentrations below analytical detection limits.
NA: Data Not Available. Constituents not sampled or tested for.
(1) MTBE has not been detected in groundwater, Freeman Diversion water, or in samples from the pits. It has been assumed that the concentration of MTBE in the runoff is below the analytical detection limit (0.0003 mg/L) and therefore is listed as non-detects (ND).
(2) Chromium VI concentrations are based on 50 percent of total chromium.

Constituents with No Significant Impacts

As indicated in **Tables 4.5-25** and **4.5-26**, the following constituent concentrations were below their respective thresholds of significance:

- Total suspended solids (TSS)
- Minerals
  - Sulfate
  - Chloride
  - Total dissolved solids (TDS)
  - Boron
- Nutrients
  - Nitrate
  - Ammonia
- Metals
  - Arsenic
  - Beryllium
  - Cadmium
  - Total Chromium
  - Chromium VI
  - Copper
  - Iron (surface water discharges only)
  - Lead
  - Manganese (surface water discharges only)
  - Mercury
  - Nickel (surface water discharges only)
  - Selenium
  - Silver
  - Zinc
- Pesticides
  - ChemA
- Hydrocarbons
  - Oil and grease
  - Methyl
- Microbial Contaminants
  - Total Coliform
  - Fecal Coliform (groundwater discharges only)
  - Fecal Streptococci
  - Giardia
  - Cryptosporidium

Based on several recent samples from UWCD El Rio wells, MTBE has not been detected in local groundwater (analytical detection limit = 3 µg/L). Even at a reporting limit of just 0.2 µg/L, MTBE was detected in 21 percent of 480 wells located in areas of the nation that use MTBE in gasoline to abate air pollution; in the rest of the nation, MTBE detection frequency in groundwater was just 2 percent.[61] The State DHS has reported MTBE detection frequencies of 0.65 and 4.5 percent for ground and surface waters based on a 3 µg/L detection limit, 0.4 percent and 1.4 percent exceeding 5 µg/L (State secondary MCL), and 0.2 percent and 0.3 percent exceeding 13 µg/L (State primary MCL).[62] Basin Plan objectives and CTR criteria have not been established for this constituent.

MTBE concentrations in groundwater greater than 30 µg/L usually can be attributed to a leaking tank or pipeline facility. Low MTBE concentrations, less than 3 µg/L, are more likely to result from atmospheric sources.[63] Groundwater sampling in rural areas has a low frequency of detection, and concentrations of MTBE are generally low when detected. In California and in other States there is a high correlation between urban land use, motor vehicle traffic and population density, and the frequency of detection and water concentrations of MTBE.[64] This is as expected given that gasoline is the only source of MTBE.

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61 USGS. MTBE in the Nation's Ground Water. *http://sd.water.usgs.gov/nawqa/vocns/brp-pjs-handout.html*. 1999.

62 California DHS. MTBE in California Drinking Water.

63 Squillace, P.J., Pankow, J.F., Korte, N.E. and Zogorski, J.S. *Environmental Behavior and Fate of Methyl tert-Butyl Ether. USGS NAWQA Fact Sheet FS-203-96.* 1998.

64 Squillace, P.J., Zogorski, J.S., Wilber, W. and Price, C.V. A Preliminary Assessment of the Occurrence and Possible Sources of MTBE in Groundwater of the United States, 1993-1994. USGS Open-File Report 95-456. 1995.

In a NAWQA investigation of MTBE in stormwater,[65] MTBE was detected in 6.9 percent of the 592 stormwater samples collected from 16 U.S. cities and metropolitan areas at an analytical detection limit of 0.2 µg/L. When detected, concentrations ranged from 0.2 to 8.7 µg/L, with a median of 1.5 µg/L. Based on the results of this comprehensive nationwide stormwater monitoring study, MTBE concentrations are not anticipated to exceed the California DHS primary MCL of 10 µg/L. Therefore, MTBE is not anticipated to impact local ground or surface waters as a result of stormwater discharges from the RiverPark project.

As previously discussed, there is evidence of Benzene and MTBE in groundwater on an adjacent property in the Carnegie Street industrial area as a result of leaks from gasoline pumps. The Carnegie Street industrial area is located between Vineyard Avenue and the Small Woolsey/Brigham Mine Pit. This site is located approximately 3,800 feet east of the stockpile area on the Hanson Aggregates mine site. Dewatering during construction will be required in this stockpile area. Depending on groundwater levels at the time of construction, this dewatering operation could be required for 4-6 months. The potential for the dewatering operation to effect the movement of this existing groundwater contamination is not considered to be likely for several reasons. First, the contamination at this site consists largely of Total Petrochemical Hydrocarbon (TPH) (gas) compounds, which are relatively immobile and contained onsite. Investigations of this site to date have determined that the mass of MTBE, Benzene and TPH in the groundwater on the site has been largely immobile since the early 1990s. Active remediation with a pump and treat system will begin in the next 60 days. Based on the volume of contamination on this site, 50 percent containment will likely be achieved in the next 12 months. The proposed dewatering of the stockpile area could begin in the Fall of 2002 for a duration of up to 6 months. The pump and treat system on the Poole site will create a local groundwater capture zone that will restrict the migration of contaminants offsite. In addition, groundwater modeling completed indicates that the open Small Woolsey/Brigham/Vickers mine pits will significantly dampen the lateral extent, configuration, and the magnitude of water declines from the dewatering operation.[66] For these reasons, the dewatering operation will not impact this existing contamination or result in a significant impact on groundwater quality related to this contamination.

Constituents with Significant Impacts

As indicated in **Tables 4.5-25** and **4.5-26**, the concentrations of fecal coliform in surface water discharge and the concentrations of iron, manganese and nickel in runoff that will be discharged to the mine pits

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65 Delzer, G.C., Zogorski, J.S., Lopes, T.J. and Bosshart, R.L. *USGS Water Resources Investigations Report 96-4145*. 1996.

66 Fugro West, Inc. Construction Dewatering in Stockpile Area, Environmental Issues. November 27, 2001.

will be higher than the significance thresholds for these constituents and are identified as significant impacts. Each of these impacts is described below.

Fecal Coliform

Discharges to the Santa Clara River are anticipated to have a fecal coliform concentration of 2,027 MPN/ 100 mL based on analogous runoff data. The threshold of significance being used in this analysis is 200 MPN/ 100 mL based on Basin Plan standards. The fecal coliform threshold is based on a Basin Plan Objective that is lower than what has been observed historically in the Ventura River during rainfall events that would be expected to generate such runoff. The anticipated runoff concentration is substantially less than the maximum observed ambient river concentration of 5,000 MPN/100 mL. As the estimated concentrations exceed the significance threshold being used, this impact is significant.

Metals

Iron. Ambient groundwater conditions were used to characterize the threshold of significance for iron. The maximum observed groundwater concentration for iron was 0.13 mg/L. Discharges to the exposed groundwater in the pits were estimated to have a concentration of 0.21 mg/L. As the estimated concentrations exceed the significance threshold being used, this impact is significant.

Manganese. Ambient groundwater conditions were used to characterize the threshold of significance for manganese. The maximum observed groundwater concentration for manganese was 0.03 mg/L. Discharges to the exposed groundwater in the pits were estimated to have a concentration of 0.05 mg/L. As the estimated concentrations exceed the significance threshold being used, this impact is significant.

Nickel. Ambient groundwater conditions were used to characterize the threshold of significance for nickel. The maximum observed groundwater concentration for nickel was 0.003 mg/L. Discharges to the exposed groundwater in the pits were estimated to have a concentration of 0.007 mg/L. As the estimated concentrations exceed the significance threshold being used, this impact is significant.

Frequency of Impacts to Groundwater

Based on a statistical review of historical rainfall data at El Rio Station 239, the Ventura County Flood Control District was able to develop duration and depth relationships with storm-frequency.

These values are tabulated in **Table 4.5-27**. The stormwater conveyance and treatment systems have been designed to handle up to the 10-year peak runoff flowrates before allowing runoff to overflow into the Water Storage/Recharge basins. The criteria for the 10-year storm event and the subsequent 10-year peak runoff flowrates are based on hydrologic calculations in conformance with Ventura County Flood Control District design standards and are dependent on land use and soil type. The mass rainfall total used as a basis for the design for a 24-hour event was 5.53 inches. This value exceeds historically observed daily data (1979 – 1999) at El Rio Station 239, and indicates that over the 20-year period reviewed, no runoff would reach the Water Storage/Recharge basins. This is a positive benefit of the proposed project as it would substantially reduce the amount of pollutant loading to the Water Storage/Recharge basins, particularly from the early storm period or "first flush," in comparison to existing conditions.

Table 4.5-27
Rainfall Depth-Duration-Frequency at El Rio Station 239

Return Period, Years	Maximum Precipitation for Indicated Duration, inches		
	1 Day	2 Day	5 Day
2	2.29	2.9	3.74
5	3.41	4.53	5.92
10	4.14	5.64	7.32
20	4.82	6.69	8.62
25	5.04	7.02	9.02
50	5.68	8.03	10.24
100	6.31	9.02	11.42
PMP	20.54	29.55	39.44

Source: Ventura County Flood Control District
PMP – Probable Maximum Precipitation

Historical data does not preclude the possibility that some runoff could reach the Water Storage/Recharge basins. However, by designing the treatment and conveyance systems to handle up to and including the 10-year volume, the project is reducing the amount of runoff that could reach the basins. **Figures 4.5-13** through **4.5-16** show the 2-year, 10-year, 25-year, and 100-year hydrographs for drainage areas 2B, 3A, 3B, and 4 (drainage areas that could runoff to the Water Storage/Recharge basins), respectively. Runoff in excess of the 10-year event cumulative volume is the volume of water that could reach the Water Storage/Recharge basins. **Table 4.5-28** compares the existing and project runoff quantities for each of the drainage areas tributary to the Water Storage/Recharge basins. As the table illustrates, there is a substantial reduction in the volume of runoff sent to the Water Storage/Recharge basins.

Table 4.5-28
Existing and Project Runoff Quantities Tributary to the Water Storage/Infiltration Basins

Drainage Area (1)	Runoff to the Water Storage/Infiltration Basins, AF							
	2-Year Event		10-Year Event		25-Year Event		100-Year Event	
	Existing	Project	Existing	Project	Existing	Project	Existing	Project
2B	6.4	0	27.8	0	33.7	5.7	48.8	20.8
3A +3B (2)	13.2	0	57.6	0	69.7	6.7	101	38
4	22.9	0	100.2	0	121.3	22.3	175.8	76.8
Total	42.5	0	185.6	0	224.7	34.7	325.6	135.6

Notes:
(1) Drainage Areas 1 and 2A do not drain to the water storage/infiltration basins.
(2) Drainage Areas 3A and 3B drain to the same detention basin and are considered collectively.

Impacts from UWCD Use of the Water Storage/Recharge Basins

UWCD monitoring data was used to estimate the quality of water from the Santa Clara River that would be diverted to the Water Quality/Recharge Basins. Monitoring data was available for sulfate, chloride, TDS, boron, nitrate, ammonia, copper, iron, manganese, and zinc. Data from other sources was used to estimate concentrations of other constituents not included in the monitoring data. The City of Ventura monitors the Santa Clara River upstream of the Harbor Street Bridge and data from this source was used for lead and nickel. This data source was qualified to include only those samples collected when flows at the Freeman Diversion exceeded 250 cubic feet per second to ensure that the sample was reflective of conditions when UWCD might be diverting streamflow. Two comprehensive samples were collected from the Santa Clara River in August and September 2001. Based on a review of UWCD sampling, there does not appear to be a strong relationship between flow and metals concentration, so the sample results were used for arsenic, beryllium, cadmium, chromium, selenium, and silver. Ventura County Flood Control District's (VCFCD) Countywide Stormwater Quality Management Program data were also used for mercury, ChemA constituents, oil and grease, total coliform, fecal coliform, and fecal streptococcus. This program consists of stormwater monitoring from specific land uses and specific receiving waters throughout the county. No monitoring on the Santa Clara River has been conducted to date, but VCFCD staff has indicated that a sampling station is being constructed at the Freeman Diversion and should be ready to collect data in the upcoming year. This past year, the VCFCD conducted monitoring on the Ventura River. This data represents the most analogous data source currently available. **Table 4.5-29**, below, presents the projected water quality of the diverted water and the source of the data.

Figure 4.5-13

Drainage Area 2B Hydrographs

Figure 4.5-14

Drainage Area 3A Hydrographs

Figure 4.5-15

Drainage Area 3B Hydrographs

Figure 4.5-16

Drainage Area 4 Hydrographs

Table 4.5-29
Projected Concentrations for Diverted Santa Clara River Water

Constituent	Units	Concentration	Source (1)	Particulate Fraction	Source
TSS	mg/l	1,790	USGS (4)	--	---
MINERALS					
Sulfate	mg/l	446	UWCD (2)	--	---
Chloride	mg/l	45	UWCD (2)	--	---
TDS	mg/l	964	UWCD (2)	--	---
Boron	mg/l	0.68	UWCD (2)	30%	LA County
NUTRIENTS					
Nitrate	mg/l as NO3	6.4	UWCD (2)	--	---
Ammonia	mg/l as NH3	0.28	UWCD (2)	--	---
METALS					
Arsenic	mg/l	0.002	IWR Sample (5)	76%	VCFCD
Beryllium	mg/l	0.0002	IWR Sample (5)	ND	---
Cadmium	mg/l	0.0002	IWR Sample (5)	94%	VCFCD
Chromium, total	mg/l	0.004	IWR Sample (5)	98%	VCFCD
Chromium VI	mg/l	0.002	IWR Sample (5)	98%	VCFCD
Copper	mg/l	0.052	UWCD (2)	37%	VCFCD
Iron	mg/l	0.542	UWCD (2)	84%	LA County
Lead	mg/l	0.005	City of Ventura (3)	50%	VCFCD
Manganese	mg/l	0.062	UWCD (2)	64%	Fresno
Mercury	mg/l	0.00006	VCFCD (6)	96%	VCFCD
Nickel	mg/l	0.037	City of Ventura (3)	91%	VCFCD
Selenium	mg/l	0.006	IWR Sample (5)	41%	VCFCD
Silver	mg/l	0.001	IWR Sample (5)	0%	VCFCD
Zinc	mg/l	0.055	UWCD (2)	69%	VCFCD
PESTICIDES					
ChemA	mg/l	ND	VCFCD (6)	--	---
Lannate	mg/l	NA	--	--	---
HYDROCARBONS					
Oil/Grease	mg/l	<3	VCFCD (6)	--	---
MTBE	mg/L	<0.00049	Ambient	--	---
MICROORGANISMS					
Total Coliform	MPN/100ml	52,600	VCFCD (6)	--	---
Fecal Coliform	MPN/100ml	2,100	VCFCD (6)	---	---
Fecal Streptococci	MPN/100ml	8,700	VCFCD (6)	---	---
Giardia	cysts/100 L	NA	---	---	---
Cryptosporidium	oocysts/100L	NA	---	---	---

Notes:
NA - Not Applicable
(1) The cited concentrations represent several sources of data due to the lack of a complete constituent profile. These sources consist of (in order of application): UWCD sampling at the Freeman Diversion (1991 - 2000); City of Ventura, Santa Clara River monitoring data (May 1996 - June 2001); USGS, Montalvo Monitoring Station Data (1991 - 1993); IWR Santa Clara River sample (August 21, 2001); and Ventura County Flood Control District, Ventura River, Foster Park monitoring station data (February 2001 - March 2001).
(2) Anticipated diverted river water quality, based on UWCD data from their Freeman Diversion sampling station. Since mineral concentrations are known to be a function of flowrate, regression relationships were established relating sulfate, chloride, TDS (TFR method) and boron to River flowrates. From these regression equations, conservative representative values were then calculated assuming a minimum river flow of 250 cfs during diversion periods. For nitrate, ammonia, copper, iron, manganese and zinc, the mean UWCD value was used.
(3) Anticipated diverted river water quality based on City of Ventura monitoring of the Santa Clara River is based on samples collected with a streamflow greater than 250 cfs as measured at the Freeman Diversion.
(4) USGS, Montalvo monitoring station data (1991 - 1993) was used for total suspended solids (TSS).
(5) IWR collected a sample from the Santa Clara River at the Freeman Diversion on August 21, 2001 and had it analyzed for several metals. This approach was used to fill in data gaps based on the observation that other metals in the UWCD sampling did not exhibit a relationship between concentration and river flowrate.
(6) VCFCD data (2001) for the Ventura River from their Foster Park monitoring station (mean values shown, except for pathogen indicators, for which log-mean values were used) was used as the closest analogous source.

Because the diverted water is expected to be higher in silt load than the water currently accepted for diversion to either the Saticoy or El Rio Spreading Grounds, it will bypass the existing siltation basin and be delivered to the Water Storage/Recharge basins untreated. **Table 4.5-30**, below, presents the diverted water quality relative to the established significance thresholds for each of the groundwater constituents. Since many of the metal constituents in the diverted river water have a substantial particulate fraction, these would be expected to settle out similar to the stormwater runoff discharges from the RiverPark development. The concentration of metal constituents as measured with groundwater beneath the pits is based on the average dissolved fraction concentration determined by the VCFCD sampling of the Ventura River. When this data was not available, average dissolved fraction concentrations were extracted from other analogous sources. Microbial constituents were compared to the significance threshold at the boundary of the Specific Plan Area, as these concentrations will be attenuated during subsurface saturated-zone transport via mechanisms of dilution, adsorption/filtration and die-off.

As **Table 4.5-30** indicates, there are no significant impacts resulting from the UWCD diversion of Santa Clara River water.

Waste Load Calculations

Runoff generated by the project will increase as a result of implementing the proposed treatment system and converting open space/agricultural lands to residential and commercial uses. **Table 4.5-31**, below, lists the estimated runoff quality generated by the project during a historic wet year (water year 1997/98) and a historic dry year (1989/90). Comparing the projected constituent concentrations in the runoff to the surface water discharge thresholds of significance (ambient river concentrations), no significant impacts are noted. Total suspended solids, total coliform, fecal coliform, and fecal streptococci concentrations are all calculated to be substantially less than the thresholds of significance. ChemA and toxaphene are not expected to be the runoff as the records kept by the County Agricultural Commissioner shows these materials have not been applied in the area and all stormwater data collected and analyzed did not show the presence of ChemA constituents.[67] No change, therefore, is expected.

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67 Integrated Water Resources. Design and Technical Analysis of the proposed Stormwater Quality Treatment System for RiverPark. November 12, 2001.

Table 4.5-30
UWCD Santa Clara River Diversion Water Quality Analysis

Constituent	Units	Diverted Santa Clara River	At Point of Contact with Groundwater Beneath Pits (1)	Thresholds of Significant Impact	
				Water Quality Threshold	Water Quality Criteria Applied
TSS	mg/l	1790	0	NS	---
MINERALS					
Sulfate	mg/l	446	446	500	CA Primary ML
Chloride	mg/l	45	45	102	Ambient
TDS	mg/l	964	964	1,000	CA Sec MCL
Boron	mg/l	0.68	0.68	1.0	Ambient
NUTRIENTS					
Nitrate	mg/l as NO3	6.4	6.4	45	CA Pri MCL
Ammonia	mg/l as NH3	0.28	0.28	NS	---
METALS					
Arsenic	mg/l	0.002	<0.05	<0.05	Ambient
Beryllium	mg/l	0.0002	<0.001	<0.001	Ambient
Cadmium	mg/l	0.0002	<0.001	<0.001	Ambient
Chromium, total	mg/l	0.002	<0.01	<0.01	Ambient
Chromium VI	mg/l	0.001	<0.005	<0.005	Ambient
Copper	mg/l	0.052	<0.05	<0.05	Ambient
Iron	mg/l	0.542	0.085	0.13	Ambient
Lead	mg/l	0.005	<0.005	<0.005	Ambient
Manganese	mg/l	0.062	0.022	0.03	Ambient
Mercury	mg/l	0.00006	<0.001	<0.001	Ambient
Nickel	mg/l	0.037	0.003	0.003	Ambient
Selenium	mg/l	0.006	0.004	0.009	Ambient
Silver	mg/l	0.001	0.001	0.01	Ambient
Zinc	mg/l	0.055	0.017	0.05	Ambient
PESTICIDES					
ChemA	mg/l	ND	---	NS	---
Lannate	mg/l	ND	---	<0.005	Ambient
HYDROCARBONS					
Oil/Grease	mg/l	3	3	NS	---
MTBE	mg/L	<0.00049	<0.00049	<0.005	Ambient
MICROORGANISMS		**Diverted Santa Clara River**	**Within Aquifer at Downgradient Property Line**		
Total Coliform	MPN/100ml	52,600	<1.1	<1.1	CA Pri MCL
Fecal Coliform	MPN/100ml	2,100	<1.1	<1.1	CA Pri MCL
Fecal Streptococci	MPN/100ml	8,700	0	NS	---
Giardia	Cysts/100 L	NA	NA	<1	Ambient
Cryptosporidium	Oocysts/100 L	NA	NA	<1	Ambient

Notes:
ND - Below detection limits
NS - No standard
NA - Data not available
(1) The concentration at the point of contact represents the anticipated diverted river water quality assuming 100 percent particulate fraction removal (applicable only to metals) and no blending with pit water. This latter assumption is a highly conservative one considering that (1) there will nearly always be water in the pits (which has been shown to approximately reflect the quality of adjacent groundwaters), and that (2) complete discharge short-circuiting to pit outflow areas is unlikely. The values shown represent the reported dissolved concentrations for metals (which was estimated for those values based on UWCD Santa Clara River data as this data set does not include dissolved information). Where concentrations are listed as "<" a value, the value represents the current analytical detection limit.

Table 4.5-31
Project Stormwater Concentrations and Loads for TMDL-Related Constituents

	Concentration		Mass Load		Ambient River Concentration	
Constituent	**Units**	**Ave. Concentration**	**Units**	**Loading**	**Units**	**Concentration**
RiverPark Specific Plan						
Total Coliform	MPN/100 mL	21,811	MPN/day	7.56E+14	MPN/100 mL	160,000
Fecal Coliform	MPN/100 mL	4,643	MPN/day	1.61E+14	MPN/100 mL	5,000
Fecal Streptococci	MPN/100 mL	12,915	MPN/day	4.48E+14	MPN/100 mL	17,000
Total Suspended Solids	mg/L	44	lbs/day	3,401	mg/L	38,800
Chem A	µg/L	ND	lbs/day	---	µg/L	ND
Toxaphene	µg/L	ND	lbs/day	---	µg/L	ND
Cumulative Impacts						
Total Coliform	MPN/100 mL	52,640	MPN/day	8.37E+14	MPN/100 mL	160,000
Fecal Coliform	MPN/100 mL	**13,760**	MPN/day	2.19E+14	MPN/100 mL	5,000
Fecal Streptococci	MPN/100 mL	**38,640**	MPN/day	6.14E+14	MPN/100 mL	17,000
Total Suspended Solids	mg/L	94	lbs/day	3,281	mg/L	38,800
Chem A	µg/L	ND	lbs/day	---	µg/L	ND
Toxaphene	µg/L	ND	lbs/day	---	µg/L	ND

Notes:
Cumulative impacts for project conditions include the El Rio Areas east and west of Vineyard Avenue (runoff to Stroube Drain).

The amount of runoff will significantly increase as a result of runoff diverted from the Water Storage/Recharge basins. **Table 4.5-32** lists the range of stormwater flows for historic wet and dry years.

Table 4.5-32
Existing Conditions and Project Runoff Comparison

	Runoff Amounts, AFY		
Scenario	**Wet Year (1)**	**Average Year (3)**	**Dry Year (2)**
RiverPark Specific Plan			
Existing	687	300	99
Project	23,474	10,263	3,376
Change in Runoff	22,787	9,962	3,277
Cumulative Impacts			
Existing	0	0	0
Project	10,761	4,704	1,547
Change in Runoff	10,761	4,704	1,547

Notes:
(1) Wet weather is the data from water year 1997/98.
(2) Dry weather is the data from water year 1989/90.
(3) Average year is based on the historical average from 1979/80 to 1998/99

Percolation decreases as a result of the project since the runoff from Drainage Areas 3 and 4 are now diverted to the Santa Clara River. The amount of the decrease varies with the hydrologic condition. **Table 4.5-33** shows the range for historic wet and dry years.

Table 4.5-33
Existing Conditions and Project Percolation Comparison

Scenario	**Percolation Amounts, AFY**		
	Wet Year (1)	**Average Year (3)**	**Dry Year (2)**
RiverPark Specific Plan			
Existing	45,029	19,686	6,475
Project	20,533	8,977	2,953
Change in Percolation	-24,496	-10,709	-3,522
Cumulative Impacts			
Existing	16,555	7,238	2,381
Project	7,503	3,280	1,079
Change in Percolation	-9,052	-3,957	-1,302

Notes:
(1) Wet weather is the data from water year 1997/98.
(2) Dry weather is the data from water year 1989/90.
(3) Average year is based on the historical average from 1979/80 to 1998/99

Table 4.5-34, below, shows the estimates for changes to groundwater and surface water contributions under historic drought conditions and 10-year, 50-year, and 100-year rainfall events. Discussions with RWQCB staff[68] regarding the calculations further indicated a desire to establish nuisance (dry-weather run-off) flow rates. Because the stormwater treatment system will use detention basins and low flow outlets, nuisance flows from drainage areas 3 and 4 should be captured within the detention basins and would likely evaporate before reaching the Santa Clara River. Nuisance flows would be confined to those generated by the residential and commercial portions of the RiverPark Specific Plan area. Since these are newly developed areas, proper planning, construction, operation, and maintenance of irrigation systems and other outdoor water features would minimize the amount of nuisance water flows to the Santa Clara River. Therefore, no significant increase in pollutant loads will occur.

68 Elizabeth Erickson. Los Angeles Regional Water Quality Control Board. Personal communication, October 22, 2001.

Table 4.5-34
Existing and Project Groundwater and Surface Water Net Contributions Comparison

	Estimate of Contribution					
	Existing Conditions		Project Conditions		Net Change	
Scenario	Groundwater	Surface Water	Groundwater	Surface Water	Groundwater	Surface Water
RiverPark Specific Plan						
Historic drought conditions, AFY	6,475	99	2,953	3,376	-3,522	3,277
10-year event, AF/event	4,910	75	2,239	2,559	-2,671	2,485
50-year event, AF/event	6,736	103	3,072	3,512	-3,664	3,409
100-year event, AF/event	7,483	114	3,412	3,901	-4,071	3,787
Cumulative Impacts						
Historic drought conditions, AFY	2,381	0	1,079	1,547	-1,302	1,547
10-year event, AF/event	1,805	0	818	1,173	-987	1,173
50-year event, AF/event	2,476	0	1,122	1,610	-1,354	1,610
100-year event, AF/event	2,751	0	1,247	1,788	-1,504	1,788

Notes:
(1) Historic drought conditions are based on rainfall data from 1989/90.
(2) 10-year, 50-year, and 100-year event rainfall totals are based on historical records from El Rio Monitoring Station 239.

CUMULATIVE IMPACTS

Of the related projects considered in the cumulative impact analysis, two are located north of the Ventura Freeway in the vicinity of the project. One is residential project proposed on a 4-acre site located immediately east of the Specific Plan Area between Stroube Street and Sycamore Street in the El Rio West Neighborhood. The residential project would involve the development of a 4-acre vacant site. This site would likely drain to the south Sycamore Street and then south and east to Vineyard Avenue. Development of this small site would reduce groundwater recharge from infiltration to a small degree.

The second related project is the County of Ventura Juvenile Justice Complex. This project is under construction on a 29.5 acre agricultural site located east of the Large Woolsey Mine Pit and west of Vineyard Avenue. The County has chosen to site the new Juvenile Justice Center (JJC) on agricultural fields located to the southeast of the Large Woolsey Pit. The proposed project will include a 540-bed detention and commitment facility and a building with six courtrooms and various administrative offices. A portion of the site will not be used and will be maintained as open space. As designed, the JJC will retain and percolate all stormwater runoff in a detention basin on the project site. This is considered a mitigation measure for replacing pervious agricultural lands with impervious paved areas that may reduce groundwater recharge. Approximately 19 acres of the JJC site will be developed, 9.5 acres will remain undeveloped and 1 acre will contain the detention basin.

Overall, the JJC project will result in a net increase in groundwater recharge averaging 39 AFY.[69]

Given the characteristics of these two related projects no cumulative impacts to surface or groundwater quality will result.

MITIGATION MEASURES

Construction

4.5-1 Groundwater extracted as a result of dewatering during construction shall be discharged to the UWCD El Rio Spreading Ground recharge basins, if feasible, to mitigate potential impacts on groundwater quantity and quality.

Operation

Mitigation of the identified significant impacts would require that the concentrations of fecal coliform, iron, manganese, and nickel in runoff be reduced below the numeric thresholds of significance selected for this analysis. Treatment options for mitigation of these impacts are discussed below.

Fecal Coliform

Fecal coliform is most effectively treated through a disinfection processes. Four potential disinfection treatment alternatives have been identified to reduce fecal coliform concentrations in runoff that will reach the Santa Clara River. These methods include chlorination treatment, hydrogen peroxide treatment, filtration through constructed wetlands, and treatment with ultraviolet light. Each of these available treatment methods is discussed below.

Chlorination

Chlorination is the addition of gaseous or liquid chlorine to a liquid stream for the purpose of disinfection. Pathogen disinfection is proportional to the concentration of chlorine. This mitigation measure could reduce fecal coliform impacts to a level that is less than the numerical significance thresholds used in this analysis but would result in additional impacts. Specifically, chlorination would result in the potential production of trihalomethanes (THM), a group of known carcinogenic

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69 **Table 4.5-35**, Appendix 4.5-8

compounds that include chloroform, bromodichloromethane, dibromochloromethane, and bromoform. This concern also eliminated bromine and ozone disinfection. A further concern would be the potential introduction of chlorine into the Santa Clara River aquatic environment that could detrimental to aquatic life. To avoid this potential impact, an additional treatment process, dechlorination, would be needed. Additional cost and treatment area would be required for dechlorination. For these reasons, chlorination is not considered a feasible mitigation measure.

Hydrogen peroxide

Hydrogen peroxide is another available disinfectant that could reduce fecal coliform concentrations. Hydrogen peroxide is a strong oxidizing agent that does not have a residual that could cause impacts downstream. However, relative to other disinfectants, such as chlorine or ozone, it is not as efficient in reducing pathogen concentrations. Use of hydrogen peroxide for disinfection purposes is an innovative approach, but there is a lack of information at this time that would be necessary to develop an effective fecal coliform treatment system. For these reasons, hydrogen peroxide is not considered to be a feasible mitigation measure.

Constructed Wetlands

The use of constructed wetlands to mitigate fecal coliform impacts could be accomplished by incorporating wetland vegetation into the landscaping of the proposed dry swales. Wetland vegetation promotes the reduction of nitrates, and increases filtration that would reduce downstream metal concentrations. The vegetation would also encourage increased settling of suspended matter, which is often associated with microbial contaminants including fecal coliform. Constructed wetlands offer a more natural alternative to the mechanical treatment systems. In addition to reducing fecal coliform levels, constructed wetlands would also reduce ammonia and nitrate levels and would enhance metals and pesticide removal. However, implementation of constructed wetlands vegetation would necessitate rerouting of the drainage to wetlands along the edge of the mine pits and along the western edge of the Specific Plan Area. The area required for constructed wetlands would be large given the volume of runoff that needs to be treated. Maintenance of these constructed wetlands would be an issue as the volume and velocity of runoff from large storm events could erode and damage the wetland areas. Constructed wetlands could remove an estimated 95 percent of the fecal coliform concentration, but this represents only an increase of 25 percent above what would be achieved by the proposed water quality treatment detention basins.[70] Fecal coliform concentrations for discharges to the Santa Clara River

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70 Integrated Water Resources. Wetlands Mitigation. July 19, 2001.

were calculated at 1,042 MPN / 100 mL, which is still higher than the Basin Plan objective of 200 MPN / 100 mL. Constructed wetlands would not, therefor, reduce fecal coliform concentrations below the level of significance being used in this analysis. Subsequently, constructed wetlands are not considered to be a feasible mitigation measure.

Ultraviolet Light Disinfection

Ultraviolet light disinfection (UV disinfection) involves the use of ultraviolet light to disrupt the reproductive capability of pathogens. Irradiation with UV light for a specified contact time (given dose for a given length of time) alters the DNA of the pathogen, rendering it unable to reproduce. UV disinfection is being used with increasing regularity in the water reclamation industry. UV disinfection is capable of destroying fecal coliform bacteria without producing THMs or any residual that may impact the aquatic life of the Santa Clara River.

In order to be effective, however, the water being treated with UV must be low in turbidity to prevent shielding of the fecal coliform from the UV light. To achieve this, tube settlers followed by sand filtration would be required. In addition, UV disinfection requires a minimum exposure time to be effective. This requires that UV disinfection equipment be sized to accommodate the peak flow rate or that flow equalization with subsequent pumping be provided to reduce equipment capacity. A system would need to provide a compromise between these competing needs. For the purposes of developing this potential mitigation measure for analysis, the following assumptions were made:

1. A single, centralized treatment facility will be developed to treat fecal coliform.
2. Only the flow from Drainage Areas No. 1 and 2A must be flow equalized. The discharge from the other drainage areas can be regulated by the detention basin low flow outlets. Discharges from the three detention basins would be routed to the flow equalization structure and would match the downstream treatment capacity to avoid need for further flow equalization volume.
3. Treatment would be provided in 1,000 gallon per minute modules.

Based on these assumptions, a potential treatment system would consist of the following:

1. Approximately 23 million gallon flow equalization tank (approximate dimensions – 433 feet long by 433 feet wide by 16 feet deep).
2. 1,000 gallon per minute tube settler (approximate dimensions – 49 feet long by 23 feet wide by 15 feet deep).
3. 1,000 gallon per minute sand filter (approximate dimensions – 23 feet long by 23 feet wide by 16 feet deep).
4. 1,000 gallon per minute UV disinfection system (approximate dimensions – 30 feet long by 2 feet wide by 3 feet deep).

The surface water treatment system outlined above is estimated to have a cost of $24,155,000 and would require an area of 4.3 acres.[71] A properly maintained and operated UV disinfection system should be more than adequate to reduce the fecal coliform in stormwater to below the 200 MPN / 100 mL numeric level of significance used in this analysis. Annual inspection and maintenance would be required to ensure that the treatment system would be operational when needed. The amount of storage needed would result in 59.1 days of treatment time using a 1,000 gallon per minute disinfection system. This is of concern from a vector standpoint because the breeding cycle for mosquitoes ranges between 7 and 10 days. In order to reduce the treatment time to less than 7 days, it would be necessary to increase the capacity of the treatment system from 1,000 gallons to 9,000 gallons. This would result in a subsequent reduction in storage volume from 22.9 million gallons to 10.9 million gallons. The cost of the system, using the modular data would drop from $24,155,000 to $21,300,000 and the acreage required would drop from 4.3 acres to 2.4 acres.

Although the system should be effective in reducing fecal coliform levels to below the numerical threshold limits used in this analysis, this measure is not feasible as the estimated cost for this system is approximately $21,300,000 and 2.4 acres of land would be required. The cost and amount of land required make this system infeasible. In addition, it should be noted that this system would result in a relatively small decrease in the level of coliform in relation to the cost.

Iron, Manganese, and Nickel

Two treatment options to reduce iron, manganese and nickel concentrations in runoff from storms greater than a 10-year storm event that would be discharged to the Water Storage / Recharge Basins have been identified. These treatment methods are chlorine oxidation / filtration and manganese green sand filtration with continuous regeneration by potassium permanganate. Both of these available treatment methods is discussed below.

Chlorine Oxidation/Filtration

Chlorine oxidation / filtration uses chlorine to oxidize dissolved metals constituents into a particulate form that can be filtered out. Since it uses chlorine, the potential to produce THMs is a significant drawback of this process. Specifically, chlorination would result in the potential production of trihalomethanes (THM), a group of known carcinogenic compounds that include chloroform, bromodichloromethane, dibromochloromethane, and bromoform. This concern also eliminated bromine

71 Komex. Letter Report to Tim Thompson, R.G., Integrated Water Resources. Conceptual Level Stormwater Treatment Plant Designs And Costs For RiverPark. September 28, 2001.

and ozone disinfection. A further concern would be the potential introduction of chlorine into the Santa Clara River aquatic environment that could detrimental to aquatic life. To avoid this potential impact, an additional treatment process, dechlorination, would be needed. Additional cost and treatment area would be required for dechlorination. In addition, these treatment systems would be used very infrequently. As discussed above, based on historic rainfall data, no runoff would have reached the mine pits between 1979 and 1999 if the proposed water quality treatment system had been in place. Reliability is also an issue, as the treatment system would be used infrequently. For these reasons, chlorine oxidation/filtration is not considered a feasible mitigation measure.

Manganese Green Sand Filtration

Manganese green sand filtration with continuous regeneration with potassium permanganate is a similar process, but utilizes potassium permanganate as the oxidant. Use of potassium permanganate avoids THM production issues while allowing for the removal of the desired constituents.

Similar to the approach used for UV disinfection of smaller return frequency storms, a single facility to treat all excess flows would be most suitable. The treatment system would be modular and initially sized at 1,000 gallons per minute. This facility is to be located between the east and south detention basins. The components of the treatment system included a 10.9 million gallon flow equalization tank (approximate dimensions of 300 feet long x 300 feet wide x 16 feet deep) and a 1,000 gallon per minute manganese green sand filter. Piping from the detention basins to the flow equalization tank is also necessary. The system is estimated to cost $11,755,000 and take up approximately 2 acres.[72]

The levels of iron, manganese, and nickel out of the treatment system are expected to be 0.067 to 0.402 mg/L, 0.007 to 0.044 mg/L, and 0.001 to 0.003 mg/L, respectively. Although the iron and manganese levels may exceed the threshold limits, additional removal is anticipated in the Water Storage/Recharge basins as iron and manganese would be oxidized entirely to particulate form. Removal via settling in the Water Storage/Recharge basins would reduce the level for those constituents to less than 0.13 mg/L and less than 0.03 mg/L, respectively, as measured at groundwater beneath the Water Storage/Recharge basins.

Similar to the surface water treatment system, the groundwater treatment system should also be increased in treatment capacity to reduce the treatment time to less than seven days. This would entail increasing treatment from 1,000 gallons per minute to 2,000 gallons per minute. Equalization volume

72 Komex. Letter Report to Tim Thompson, R.G., Integrated Water Resources. Conceptual Level Stormwater Treatment Plant Designs And Costs For RiverPark. September 28, 2001.

would be reduced from 10.9 million gallons to 9.4 million gallons. The cost of the system would drop from $11,755,000 to $10,800,000 and the required acreage would decrease from 2.0 acres to 1.8 acres. Reliability is also an issue, as the treatment system would be used infrequently.

The magnitude of the cost and the amount of land required for the treatment facilities (2 acres) associated with this mitigation measure are substantial. Although the system should be capable of reducing iron, manganese, and nickel concentrations below the identified numerical threshold limits, this measure is considered infeasible from a cost, land planning and reliability issues.

UNAVOIDABLE SIGNIFICANT IMPACTS

Based on the thresholds of significance used in this analysis, unavoidable significant impacts have been identified for fecal coliform, iron, manganese, and nickel. The concentrations of these constituents in runoff will be higher than the thresholds of significance used in this analysis. Fecal coliform concentrations discharged to the Santa Clara River will exceed the Basin Plan objective for recreational use, but represent an improvement over existing conditions. The concentration also falls within the observed maximum ambient concentration for conditions that would likely result in discharges to the River.

Iron concentration in discharges to the Water Storage/Recharge basins exceeds ambient groundwater concentration, but is lower than the SMCL and the existing discharge concentration. Manganese concentration in discharges to the Water Storage/Recharge basins also exceeds ambient groundwater concentration, but is lower than the existing discharge concentration and matches the SMCL. Nickel concentration in discharges to the Water Storage/Recharge basin exceeds the ambient groundwater concentration, but is lower than the MCL. Although concentrations for these constituents could potentially degrade groundwater quality, the frequency of these occurrences is expected to be very rare. Based on the historical rainfall data form 1979 to 1999 and the proposed stormwater treatment system, no runoff would have reached the Water Storage/Recharge basins and thus no threshold exceedances would have been observed. In this respect, the implemented stormwater treatment system would, under all but the most extreme rainfall events, reduce mass loading of these contaminants to groundwater.

Reduction of the concentrations of these constituents to a level that is lower than the numeric thresholds of significance used in this analysis is not feasible due to the significant costs associated with treatment systems that would be required and the reliability of treatment systems that would operate infrequently.