# IV. ENVIRONMENTAL IMPACT ANALYSIS
# E. HYDROLOGY

The following section is a summary of two geotechnical reports and a hydrology study prepared for the project site. The three reports include the Report of Geotechnical Investigation Proposed High-Rise Condominium Building Development, prepared by MACTEC, dated August 26, 2003, the Technical Transmittal Support of Environmental Impact Report Proposed High-Rise Condominium Building Development, prepared by MACTEC, dated September 23, 2004, and the Wilshire Comstock Hydrology Study, prepared by PSOMAS, dated December 7, 2004. A copy of these reports can be found in Appendix C and G of this DEIR. The purpose of these studies were to determine if the project site could be designed based on the existing groundwater conditions and to determine the project's impacts on existing hydrologic conditions (increase in peak flow rates). In addition, MACTEC has provided specific analysis in response to public comments raised during the Notice of Preparation period. This analysis has been footnoted throughout the section.

## ENVIRONMENTAL SETTING

### Groundwater Conditions

As described in Section IV.D (Geology and Soils), the project site is located in the northwestern portion of the Coastal Plain of the Los Angeles Groundwater Basin within the physiographic feature known as the Sawtelle Plain. In the immediate project vicinity, the exposed geologic materials consist of Pleistocene-age alluvial deposits (older alluvial-fan deposits). Locally, the Pleistocene alluvial surface has been incised by stream activity from drainage of the fan surface, resulting in low-lying drainages located along the southern edge of the older alluvial deposits. Specifically, the project site is located at the western edge of a broad low-lying drainage, one of the several drainages that have been incised into the southern edge of the upper surface of the Pleistocene fan. The drainage is in-filled with a thin veneer of Holocene-age (younger) alluvial deposits.

The geologic materials underlying the project site consist of an interbedded sequence of well-graded sand, silty-sand, silt, silty-clay, and sandy-clay with some gravel to a depth of 100 feet beneath the existing ground surface (bgs). As shown in Figure IV.E-1, Groundwater Elevations and Direction of Groundwater Flow, these soils form a complex multiple-aquifer system at the project site, which is comprised of at least seven distinct soil layers. The coarse-grained soils form aquifers and the fine-grained deposits form aquitards. The upper 45 to 50 feet of materials encountered in the explorations are likely to be of Holocene age and the lower portion of the sequence is considered to be Pleistocene age.

Figure IV.E-1, Groundwater Elevations and Direction of Groundwater Flow

As shown in Figure IV.E-2, Location of MACTEC Projects and Wells in the Project Vicinity, the project site lies within Township 1 South, Range 15 West, Section 23, on the U. S. Geological Survey, Beverly Hills, 7½-minute Quadrangle. The project site aquifer system is part of the much larger complex multiple-aquifer system called the Santa Monica Groundwater Sub-basin that is contiguous throughout the Los Angeles County Groundwater Basin. Groundwater flow in the Holocene deposits is southeast.

Data obtained from 29 wells installed by MACTEC during June 7 through June 10, 2004 indicate that the depth to groundwater ranged between 24 and 30 feet below top-of-casing (TOC) on July 2, 2004. These depths correspond to groundwater elevations between 299 and 301 feet relative to the National Geodetic Vertical Datum of 1929 (NGVD).

***Historic Groundwater Levels***

Groundwater in the shallow Holocene deposits flows under unconfined, confined, and semi-confined conditions. Groundwater levels in the vicinity of the project site are influenced by local precipitation, irrigation, and local groundwater pumping. Each of these stresses can produce groundwater-level fluctuations.

Groundwater levels in the past have fluctuated significantly, and hence the soils at the project site and in the immediate vicinity have already experienced multiple cycles of loading and unloading based on variations of groundwater levels. A groundwater-level fluctuation is a rise or fall in the groundwater level as measured in a well or boring. When groundwater levels fall, loading occurs and when levels rise, unloading occurs. Data supporting the evidence that groundwater levels in the past have fluctuated significantly are presented below.

Groundwater data for wells were obtained from the State of California Department of Water Resources (DWR), the California Geological Survey (CGS, formerly known as the California Division of Mines and Geology), the U. S. Geological Survey (USGS), other agencies including the County of Los Angeles, and from other MACTEC Projects.

Figure IV.E-2, Location of MACTEC Projects and Wells in the Project Vicinity, shows the project site location, MACTEC projects, wells, and the maximum amount of observed groundwater-level fluctuation in wells. Additionally, these data are summarized in Appendix C, Table 1. Maximum groundwater-level fluctuation for wells in the immediate vicinity of the project site (wells 15, 16, 17, 20, and 21) ranged from 19 to 139 feet. Maximum fluctuations for wells south of the project site near Culver City ranged from 12 to 47 feet. It is not known how deep the wells near Culver City are and what parts of the regional complex multiple aquifer system the wells are completed in. Thus, it is not known if these wells are in the same aquifer system as the project site wells.

Figure IV.E-2, Location of MACTEC Projects and Wells in the Project Vicinity

The historic, since the turn of the century, high groundwater level in the area of the project site is approximately 23 feet bgs (California Division of Mines and Geology, 1998). This is based on information and published data obtained from the CGS, the USGS, the DWR, monitoring data from nearby groundwater wells, and available subsurface information from nearby MACTEC geotechnical investigations. The information from California Division of Mines and Geology (1998) indicates however, that less than one mile south of the project site, the historic depth to groundwater was less than 10 feet. Data from a well previously constructed at the project site indicate that the high groundwater level at the project site was 17.7 feet TOC on August 6, 2003. The well with the greatest historic water-level fluctuation of 139 feet is Well ID 20, State well 1S/15W-12L01 near Roxbury Park. The depth of this well is not known.

The nearest groundwater monitoring well is Well ID 14, County of Los Angeles Well No. 2583B, located approximately 2,000 feet east of the project site. This well is not currently being monitored. However, groundwater-level information for the monitoring period of 1963 to 1978 is on file in the County of Los Angeles offices. Based on the available information, the groundwater level in this artesian well fluctuated during the monitoring period from 12.8 feet TOC to flowing at the ground surface during 1976.

The next closest monitoring well is Well ID 17, California State Well No. 1S/R15W-24M01, located approximately 3,200 feet east of the project site. Monitoring information for this well was available for the period from 1934 to 1946. During this time period, the groundwater level fluctuated approximately 19 feet. The highest groundwater level recorded was at a depth of 45 feet in 1938 and the deepest water level was measured at a depth of 64 feet in 1936. Groundwater levels at the project site have similarly risen and fallen during this time period because the project site most likely experienced the same meteorological stresses that caused the fluctuations at Well 17. Prior to, and since recording of these data began, there have been similar periods of groundwater-level fluctuation.

As described above, another source of groundwater-level data was obtained from previously conducted MACTEC geotechnical investigations at adjacent sites (refer to Appendix C, Table 1, Site IDs 1 through 13). These sites are plotted as “blue” symbols on Figure IV.E-2. As a result of variation in existing grades, these data indicate that the depth and occurrence of groundwater is variable from site to site.

Table IV.E-1 contains a brief summary of groundwater levels encountered in borings that were advanced at nearby properties along Wilshire Boulevard between Comstock and Beverly Glen. These properties are shown on the aerial photograph in Figure IV.E-3, Aerial Photograph. Based on the review of the geotechnical reports of these properties, the excavations at these properties did not extend below the water table.

Figure IV.E-3, Aerial Photograph

**Table IV.E-1**
**Groundwater Levels in Project Vicinity**

| MACTEC Project Site ID /Address/Year of Investigation | Depth to Groundwater (Feet bgs[1] )/Approximate Groundwater Elevation (Feet NGVD[2]) |
|---|---|
| 2 /865 and 875 Comstock/ 1960 | 30-45 / 299-306.5[b] |
| 3 /865 and 875 Comstock/ 1960 | Groundwater not encountered to 35 feet max depth drilled / soils dry above 340-343[b] |
| 12 /10350 Wilshire Blvd/ 1980 | 45 – 66.5 /303.5 to 308[b] |
| 9a /10351 Wilshire Blvd/ 1987 | Groundwater not encountered to 42 feet max depth drilled / soils dry above 321.5-338.1[b] |
| Site /10250 Wilshire Blvd/ 1972 | 25 / 300[b] |
| Site /10250 Wilshire Blvd/ 2003 | 18 / 300[w3] |

*bgs[1] - below ground surface*
*NGVD[2] - National Geodetic Vertical Datum of 1929*
*[3] - Top of well casing not surveyed*
*[b] - Borehole Data*
*[w] - Well Data*

***Groundwater beneath the Project Site***

Groundwater at the project site moves through a complex multiple-aquifer system comprised of at least seven distinct soil layers. The aquifer system consists primarily of an interbedded sequence of well-graded sand, silty-sand, silt, silty-clay, and sandy-clay, with some gravel. The following soil properties, hydraulic conductivity ($K$), specific storage ($S_s$), and effective porosity ($n_e$), determine for the most part, how groundwater moves (magnitude of the rate of flow and direction of flow) and is stored in this aquifer system. Because the properties of the soils at the project site vary in direction and magnitude, this complex aquifer system is considered an anisotropic porous media.

Groundwater at the project site and throughout the Los Angeles region (within the upper 55 to 70 feet of subsurface soils) moves not as relatively fast-flowing surface water, as in a river, but as a relatively slow-moving body of subsurface water through a complex, non-homogenous and anisotropic porous media. Groundwater generally moves southeast, along a flowpath roughly parallel with the eastern boundary of the site. The groundwater velocity ranges from approximately 1.5 feet/day to 4 feet/day.

Two relatively permeable zones have been identified; a shallow zone that occurs up to a depth of approximately 30 feet below ground surface (bgs), and a deep zone that occurs between approximately 40 and 55 feet bgs.

To more clearly define how groundwater moves at the site, water levels measured in the 29 wells were used to construct groundwater elevation contour maps in plan and in section (see Figure IV.E-4, Water

Level Elevations in the Deep Zone and Generalized Direction of Groundwater Flow). These wells were constructed as a series of nine nested wells. At each location, three wells were constructed forming a "nest": a shallow well was screened across the water table, a deeper well was screened across a fine-grained zone, and the deepest well was screened across the lower sand. At nest 2 (N2) one deeper well was completed.

*Horizontal Component of Groundwater Flow*

Shallow Zone

The depth to the water table in wells completed in the shallow zone, ranged from 24.63 to 30.31 feet from top of casing (TOC), elevation 301.20 to 299.53 feet NGVD.

Figure IV.E-5, Elevation of Water-Table and Generalized Direction of Groundwater Flow, shows the horizontal component of groundwater flow in the phreatic zone, the shallowest portion of the aquifer system. This figure shows the elevation of the water table and the horizontal component of groundwater flow. The direction of groundwater movement is indicated by the red and blue arrows. Groundwater generally moves south-southeast, along a flowpath roughly parallel with the eastern boundary of the project site. The horizontal component of groundwater velocity ranges from approximately 1.5 feet per day between nests N7 and N8, to 4 feet per day between nests N1 and N7.

Figure IV.E-5 shows a southwest component of groundwater flow. This is partially due to the nature of the well completions that were used to construct this potentiometric surface. The nested "N" wells were completed using relatively short screens and gravel packs, typically less than 10 feet. Groundwater levels in these wells reflect relatively small discrete soil intervals. The pumping well, Q1, which was also included on this figure, has a longer twenty-foot screen in a gravel pack that is fully penetrating. Groundwater levels measured in Q1 represent an average of the heads in all aquifer/aquitard units tapped by this 20-foot long interval. The southwest component of groundwater flow is thus due in part to the difference in lengths of the screen/gravel packs intervals in the "N" and "Q" wells.

Deep Zone

The depth to the groundwater in wells completed in the deep zone ranged from 24.58 to 31.62 feet from TOC, elevation 300.97 to 298.84 feet NGVD.

**Figure IV.E-4, Water Level Elevations in the Deep Zone and Generalized Direction of Groundwater Flow**

**Figure IV.E-5, Elevation of Water-Table and Generalized Direction of Groundwater Flow**

Figure IV.E-4 shows the horizontal component of groundwater flow in the deep zone of the multiple aquifer system. Groundwater generally moves from north to south. A minor westerly component of groundwater flow is more prevalent in the deeper zone than in the shallow zone.

*Vertical Component of Groundwater Flow*

The nested wells (N1 through N9) were constructed to monitor groundwater levels within the vertical soil column at the project site and as such were used to determine the vertical components of groundwater flow throughout the complex multiple-aquifer system. Figure IV.E-1 is a fence diagram of the project site showing lithology and groundwater elevations. It was constructed roughly parallel with the principal direction of horizontal groundwater flow.

Using the July 2, 2004 water levels, this figure shows that groundwater moves predominantly horizontally within the sands and vertically in the clays. Groundwater flow in the silts is at an oblique angle. A small portion of the groundwater in the sands moves vertically downward into the underlying silts and clays. A portion of the groundwater in the silts moves vertically upward near nested well N9 and a small portion moves vertically downward. Groundwater in the middle sand unit near nested well N9 moves predominantly horizontally. The vertical component of groundwater flow ranges from approximately 0.03 to 0.30 feet per day.

**Benzene in Groundwater**

Groundwater samples were collected from all nine shallow wells and the pumping well (Q1). Benzene and other volatile organic compounds (VOCs), including Ethylbenzene, Toluene, and Total Xylenes (BTEX) were not detected above the method detection limits in any of the groundwater samples collected from all nine (9) shallow wells and the pumping well (Q1). The method detection limits for all VOCs were 0.5 $\mu$g/L, except for Total Xylenes, which was 1 $\mu$g/L.

Historically, results of a groundwater sample collected from monitoring well MW-1 on August 6, 2003, which was used to provide background water quality data for NPDES permitting, indicated a benzene concentration of 2.2 mg/L. No other VOCs were detected above the reporting limits from this collected sample. Groundwater samples were also collected from all nine shallow wells and the pumping well (Q1) during the aquifer testing activities. However, benzene and other volatile organic compounds (VOCs), including Ethylbenzene, Toluene, and Total Xylenes (BTEX) were not detected above the method detection limits in any of the groundwater samples collected from all nine (9) shallow wells and the pumping well (Q1).[1].[1] The method detection limits for all VOCs were 0.5 $\mu$g/L, except for Total Xylenes, which was 1 $\mu$g/L.

**Surface Water Hydrology**

Most on-site storm water currently sheet flows in the southeasterly direction. The on-site storm drain water drains into the curb and gutter of Club View Drive. A catch basin, which is approximately 150-feet south of the project site on Club View Drive, discharges into an existing 33-inch RCP storm drain line. This existing 33-inch storm drain line originates on Wilshire Boulevard and enters the City of Los Angeles Country Club via a public storm drain easement. The 33-inch storm drain line discharges onto the golf course and the runoff flows south along an existing grass drainage swale. The discharge is collected again into a public storm drain system at Santa Monica Boulevard. The two existing catch basins on Comstock Avenue and Wilshire Boulevard also connect into the 33-inch storm drain line.

***Assumptions***

The Los Angeles County Modified Rational Method was used for estimating the runoff flowrate for the 10-year and the 25-year storm events. The project site is broken down into watershed areas and the most hydraulically remote point is found within these areas. Length and relative slope of travel is used with rainfall intensity and runoff coefficient values to estimate the time required to travel across the watershed (time of concentration). The flow rate for watershed was obtained by performing a regression analysis on the time of concentration for a 24-hour storm event. The watershed for the project site is the 0.57-acre on-site area.

***Watershed Characteristics***

The 25-year 24-hour rainfall Isohyet nearest the project area is 6.0, while the 50-year 24-hour rainfall Isohyet is 6.8. The LACDPW TC program was used to calculate the time of concentration and peak runoff flow rate. The TC calculation is provided in Appendix G. The 10-year and 25-year storm events were used as the main design storms.

***Existing Watershed Conditions***

Existing condition hydrology results for the 10-year and the 25-year storm events are summarized in Table IV.E-2.

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[1] *MACTEC, December 8, 2004.*

**Table IV.E-2**
**Existing Condition Hydrology Summary**

| Drainage Area | Area (Ac) | Storm Data | | |
|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_{10}$ (cfs) | $Q_{25}$ (cfs) |
| 1 | 0.57 | 5 | 1.31 | 1.61 |
| *Source: PSOMAS, December 7, 2004.* | | | | |

# ENVIRONMENTAL IMPACTS

### Thresholds of Significance

The significance criteria employed in this analysis were based on a review of the factors identified in the Appendix G of the State CEQA Guidelines. For purposes of this analysis, a significant hydrology impact would occur if any of the following circumstances are met:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

### Project Impacts

The discussion presented below describes settlement at the project site as it relates to the groundwater conditions, local off-site and on-site investigations, and watershed flow.

### *Groundwater Settlement and Groundwater Dewatering*

The planned excavation would extend below the groundwater level and dewatering prior to excavation would be necessary to permit excavation for the basement level and for the mat-foundation or spread footings of the proposed development. Based on the analysis provided below, the groundwater levels at and in the vicinity of the project site have fluctuated, during the recent past, more than the planned depth of the project site excavation and the associated dewatering. This analysis demonstrates that the project site has experienced more natural groundwater-level fluctuation than would occur when the project site is dewatered for construction. This analysis further demonstrates that the settlement that could be caused by the planned dewatering at the project site has already occurred, and only minor settlement could occur at the project site and adjacent sites as a result of the dewatering operations at the project site.

To compute the settlements that would result at the project site and the adjacent sites from the proposed dewatering operation, lines of equal drawdown were established, based on the results of the pumping tests. As groundwater levels are drawn down, the submerged soils lose their buoyancy (loss of weight carried by water) and the weight of the previously submerged soils increases. This increase in the weight increases the vertical soil pressure on the underlying soils and causes the soils to settle. The settlements at the project site and adjacent sites were computed which would result from dewatering at the project site were computed by lowering the groundwater level below the bottom of the planned excavation, approximately 46 feet bgs. The results demonstrate that the settlement at the project site would range between 0.2 and 0.3 inch, and the settlement of adjacent properties (up to a few hundred feet from the project site) would range between 0.1 and 0.2 inch at the existing grade. This settlement decreases with distance from the project site. Settlement ranging between 0.1 and 0.2 inch does not cause distress, such as surface or wall cracks in adjacent buildings, homes, or streets. Consequently, construction of the proposed project, including dewatering, would not produce settlement or subsidence that would adversely impact the adjacent properties or streets. Such settlements would not have any adverse impacts at the project site, or at the adjacent sites. However, as discussed in the previous paragraph, the vast majority of the settlement has occurred as the result of past groundwater-level fluctuations. Monitoring and measuring of the settlements at the project site and the adjacent sites would be conducted during the dewatering operation.

### *Local Off-Site Investigations*

Table 2 in Appendix C summarizes information from several prominent projects in the vicinity where the subterranean excavation extended below the groundwater table. At each of theses sites listed on Table 2 in Appendix C, dewatering was used to lower the groundwater level below the bottom of the planned excavations to allow for construction of each building under dry conditions. A sub-drain system was constructed beneath the lower basement floor slab of each of the buildings to prevent the groundwater from entering the building basements. Each project listed on Table 2 in Appendix C occurred without any reported settlement problems. No distress evidences caused by dewatering-related settlement were observed at any of the existing structures adjacent to these projects.

The projects listed in Table 2 in Appendix C are four to 20 years old. The first four projects listed on Table 2 in Appendix C are located on Figure 1 in Appendix C. The approximate planned excavation and groundwater depths for the project site are shown to enable a comparison to sites in the immediate vicinity where dewatering has occurred or is occurring, and to demonstrate that the project site conditions are typical for this area. Investigation of these other projects did not disclose any settlement distress caused by dewatering or the continuous groundwater withdrawal by the sub-drain systems has occurred at the project site or at the adjacent sites.

*One Westwood Building*

One of the sites located within the project site vicinity is One Westwood Building located at 10990 Wilshire Boulevard in Westwood, California (see Figure 1 in Appendix C). One Westwood Building is 17 stories high and underlain by a seven-level subterranean base structure that encompasses the entire site. A parking structure was constructed prior to the construction of One Westwood Building near the east property line of Westwood One. The parking structure is an on-grade, 13-level structure. The lower level of the One Westwood Building base structure was established at an elevation of 230 feet NGVD, with the depth of the excavation extended about 80 feet below grade adjacent to the parking structure. Groundwater levels were measured at depths ranging between 42 and 46 feet below existing grade. These depths correspond to elevations ranging between 256 and 259 feet NGVD. The dewatering system placed at One Westwood Building lowered the water level at the site by more than 30 feet, approximately 50 percent more than is planned at the project site.

To measure the settlement of the adjacent parking structure during the dewatering operation of One Westwood Building, settlement monuments were placed inside the parking structure. The monuments were placed on the 18 columns of the two rows of columns adjacent to One Westwood Building. The settlement measurements included the vertical and horizontal movements of the columns. The measurements were made between October 31, 1984 and September 30, 1986.

Based on the available settlement measurement data, the vertical settlements of the columns ranged between 0.1 and 0.2 inch. Such settlements did not have any adverse effects, such as cracking, on the existing parking structure. No subsidence complaints were received from adjacent landowners.

*407 North Maple Drive*

This is an active site where dewatering is presently occurring via a sub-drain system. The sub-drain dewatering system is currently removing approximately 420 gallons per minute (gpm) or approximately

0.6 million gallons of groundwater per day (MGD). During the initial phase of this project, the network of production wells was removing approximately one MGD or approximately 700 gpm. Prior to discharging the collected groundwater from the sub-drain systems into the nearest storm drain, the groundwater is periodically tested for a list of contaminants pursuant to the requirements of the Los Angeles Regional Water Quality Control Board (LARWQCB). There are also two adjacent sites that are being dewatered. There are no reported adverse settlement effects due to dewatering at or adjacent to these sites.

***On-Site Investigation***

The majority of the planned excavation for the proposed project would be within the upper 45 to 50 feet of soils. Three sumps would be located within the excavation at a depth of 58 feet bgs. The elevation of the base planned excavation at the center of the building and the lowest sump would be approximately 281 and 269 feet NGVD, respectively. Thus, for the most part, the groundwater level would be lowered by 18 to 20 feet. At the sumps, the groundwater level would be lowered by 30 to 32 feet.

Further, the velocity rates of groundwater discharge would increase as the excavation is constructed. As the excavation is deepened, groundwater velocity discharge rates would be large near the pumping wells and the excavation seepage faces. As the construction proceeds and the water table is lowered, the discharge rates and corresponding groundwater velocities would decrease. When pumping ceases, the water table would rise to its pre-pumping static position and groundwater velocity discharge rates would approach their pre-pumping rates.

Therefore, based on the information provided in the section on historic groundwater levels, it can be determined that the groundwater levels in the vicinity of the project site have fluctuated during the recent past more than the planned depth of the project site excavation and the associated groundwater levels that would be encountered during dewatering. This demonstrates that:

- The project site has experienced at least as much groundwater-level fluctuation than would occur when the project site is dewatered;
- The majority of the settlement that could be caused by the planned dewatering at the project site has already occurred as there is constant groundwater-level fluctuation; and
- Only very minor settlement could occur at the project site and the adjacent sites as a result of natural water-level fluctuation and the dewatering operations at the project site. The data obtained for off-site and on-site investigations indicate that dewatering of the site may cause minor settlement that would not adversely impact the surrounding sites.

The data obtained for off-site and on-site investigations indicate that dewatering of the project site may cause minor settlement that would not adversely impact the surrounding sites. Dewatering for excavation purposes and minor settlement does not cause distress, such as surface or wall cracks in adjacent buildings, homes, or streets. Consequently, the construction of the proposed project, including dewatering, would not produce settlement or subsidence that would adversely impact the adjacent properties or streets. Furthermore, this condition will be mitigated during the design phase of the proposed project, as discussed in the mitigation measures. Impacts would therefore be less than significant.

***Benzene in Groundwater***

As described above, benzene and other volatile organic compounds (VOCs), including Ethylbenzene, Toluene, and Total Xylenes (BTEX) were not detected above the method detection limits in any of the groundwater samples collected from all nine (9) shallow wells and the pumping well (Q1). However, given the historical detection of benzene in on-site groundwater at a concentration above the State MCL, groundwater quality monitoring would continue to be performed during future dewatering operations.

***Future Water Runoff and Drainage Patterns Conditions***

Runoff for the project site would flow away from the proposed building, which changes the existing drainage path of the project site. This change diverts a portion of the total flow to the existing catch basin adjacent to the project site on Comstock Avenue. However, as discussed above this catch basin connects to the existing 33-inch RCP storm drain line, which currently collects the existing site runoff.

As with the existing conditions, the LACDPW TC program was used to calculate the time of concentration and peak runoff flow rate. The TC calculation is provided in Appendix G. The 10-year and the 25-year storm events were used as the design storms. The imperviousness percentage, based on the project site conditions for multi-family development, was determined to be 68 percent. Proposed condition hydrology results for the 10-year and the 25-year storm events are summarized in Table IV.E-3.

**Table IV.E-3**
**Proposed Condition Hydrology Summary**

| Drainage Area | Area (Ac) | Storm Data | | |
|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_{10}$ (cfs) | $Q_{25}$ (cfs) |
| 1 | 0.57 | 5 | 1.31 | 1.61 |
| *Source: PSOMAS, December 7, 2004.* | | | | |

*Baseline Hydrology Comparison*

A comparison of existing and proposed peak flow rates is provided in Table IV.E-4. The peak flow rates during the 10-year and the 25-year storms between the existing and proposed condition have no net change in flows. Therefore, there are no impacts to the surrounding public storm drain systems. As there would be no increase in runoff from the existing to the proposed conditions, there would be no significant impact on off-site drainage.

**Table IV.E-4**
**Existing Verses Proposed Hydrology Comparison Summary**

| Drainage Area | Storm Events | | | | | |
|---|---|---|---|---|---|---|
| | $Q_{10}$ (cfs) | | | $Q_{25}$ (cfs) | | |
| | Existing | Proposed | Difference | Existing | Proposed | Difference |
| 1 | 1.31 | 1.31 | 0 | 1.61 | 1.61 | 0 |
| *Source: PSOMAS, December 7, 2004.* | | | | | | |

## CUMULATIVE IMPACTS

Development of the proposed project in conjunction with the related projects listed in Section II.B would result in further development of the Westwood area in the City of Los Angeles. Groundwater impacts are site-specific and there is little, if any, cumulative relationship between development of the proposed project and the related projects. As indicated above, the existing stormwater infrastructure serving the project area would be capable of serving the surface runoff from the project site. Impacts attributable to surface runoff would be addressed on a case-by-case basis, as applicable to the specific land uses proposed. Individual projects would be required to develop and implement storm drain mitigation as applicable. Therefore, cumulative hydrology impacts would be less than significant.

## MITIGATION MEASURES

The following mitigation measures are required to reduce groundwater impacts to less than significant levels:

**Floor Slab or Mat Support**

1. The required filter material (as discussed in Section IV.D. Geology and Soils, Mitigation Measures) for the subdrain system would offer adequate support for the floor slab or the mat foundation of the lower subterranean parking level. The at-grade concrete slabs and walks adjacent to the proposed building may be also supported on grade. The lower floor slab or the mat of the building would be used for parking and should not be sensitive to capillary moisture,

however, where vinyl or other moisture-sensitive floor covering is planned for portions of the lower floor slab or the mat, the floor slab or the mat foundation shall be underlain by a capillary break consisting of a vapor-retarding membrane at least 10 mils thick. A 2 inch-thick layer of sand shall be placed beneath the membrane to decrease the possibility of damage to the membrane.

If a membrane is used, a low-slump concrete shall be used to minimize possible curling of the slab or the mat. A 2-inch-thick layer of coarse sand shall be placed over the membrane to reduce slab curling. Care should be taken during the placement of the concrete to prevent displacement of the sand. The concrete slab shall be allowed to cure properly before placing vinyl or other moisture-sensitive floor covering.

Where vinyl or other moisture-sensitive floor covering is not planned, the floor slab or the mat foundation may be supported directly on the subdrain materials.

**Excavation Slopes and Dewatering**

2. Excavation up to about 35 to 40 feet deep would be required for the lower subterranean parking level of the proposed development. Where the necessary space is available, temporary unsurcharged embankments may be sloped back at 1:1 without shoring. Where space is not available, shoring shall be required. Data for design of shoring are presented in Section IV.D. Geology and Soils, Mitigation Measures.

3. Inspection of the foundation excavations shall also be required by the appropriate reviewing governmental agencies. The contractor shall be familiar with the inspection requirements of the reviewing agencies.

4. Where sloped embankments are used, the tops of the slopes shall be barricaded to prevent vehicles and storage loads within 10 feet of the tops of the slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes; the engineer shall be advised of such heavy vehicles so that specific setback requirements can be established. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested shall be installed along the tops of the slopes, where necessary, to prevent runoff water form entering the excavation and eroding the slope faces.

5. The soils at the excavated level will be wet and spongy. To provide support for foundations and a working base for men and equipment, a layer of 1½-inch crushed rock at least 1-foot-thick shall be provided over the excavated surface.

6. The excavation shall be observed a qualified geotechnical expert so that any necessary modifications based on variations in the soil conditions encountered can be made. All applicable safety requirements, including OSHA requirements, shall be met.

7. The excavation for the spread footings or the mat foundation would extend below the ground water level, and dewatering of the excavation shall be required. The dewatering could be done by means of dewatering wells located around the perimeter of the site with supplementary wells located within the limits of the excavation. The dewatering system shall be placed several weeks prior to the start of excavation. In addition, a few monitoring wells shall be placed at the site to monitor the water level. The excavation at the site shall not start until the water level is withdrawn a few feet below the bottom of the excavation. In addition, drainage trenches excavated at the bottom of the excavation and backfilled with crushed rock shall be used to supplement the wells. The trenches shall be placed in areas between the foundation locations and should drain, together with the wells, into sumps equipped with pumps. The trenching should be coordinated with the construction sequencing.

8. The dewatering system shall be designed by a competent dewatering contractor. The contractor shall determine the size, spacing, and depths of the dewatering wells. In addition, the contractor shall determine the locations and sizes of any necessary trenches within the excavation, and the volume of water inflow from the dewatering system.

9. Given the historical detection of benzene in on-site groundwater at a concentration above the State MCL, groundwater quality monitoring shall continue to be performed during future dewatering operations.

10. Any groundwater discharge from construction dewatering and the proposed permanent sub-drain system at the site would be treated as required and discharged to the local discharge point (outfall) in accordance with the discharge requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit, which consists of Order No. R4-2003-0111 and Monitoring and Reporting Program No. CI-8745, issued on May 4, 2004. Also, in accordance with the reuse agreements between Fifield and the Los Angeles Country Club (LACC), some of the discharge groundwater from the proposed permanent sub-drain system, if found to be of suitable quality, will be conveyed to the nearby LACC for reuse.

**Subdrain System**

11. Ground water was encountered above the planned lower subterranean parking level and provisions must be taken to protect the building from hydrostatic pressure. The following

measures pertain to subdrain system beneath the floor slab (if spread footings are used) and beneath the mat foundation (if the mat is used) to support the building.

One of the two following alternative procedures shall be followed. A permanent subdrain system could be installed beneath the lower floor or mat of the building to maintain the water level below the lower subterranean level, or the lower subterranean floor slab or mat and the lower portions of the subterranean walls could be waterproofed and designed for the possible hydrostatic pressure. To compute the hydrostatic pressure, it may be assumed that the water level would be at a depth of 15 feet below the existing grade. The design of the lower floor slab or mat to resist the possible hydrostatic pressure would require a thorough waterproofing installation and relatively thick floor slab or mat.

If a subdrain system is installed, discharge would have to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit. A water treatment system shall be required if the chemicals or pollutants within the water exceeds the allowable limits.

For a subdrain system, the lower floor or mat of the building shall be underlain by a layer of filter material approximately 1 foot thick. The filter material shall be drained by subdrain pipes leading to sump areas equipped with automatic pumping units. The filter material shall meet the requirements of Class 2 Permeable Material as defined in Section 68 of the latest edition of the State of California, Department of Transportation, Standard Specifications. If Class 2 material is not available, ¾-inch crushed rock separated from the adjacent soils by a filter fabric may be used. The crushed rock shall have less than 5% passing a No. 200 sieve. The drain lines shall consist of perforated pipe placed, with the perforations down, in trenches extending at least 1 foot below the filter material. The trenches shall be backfilled with material meeting the requirements of the Class 2 Permeable Material or lined with filter fabric and filled with ¾-inch crushed rock. The drain lines shall extend around the perimeter of the building and should be spaced approximately 40 feet apart within the interior of the building. A slope of at least 2 inches per 100 feet shall be used for the drain lines. Based on the results of a field pumping test, we suggest that the pumps and sumps be sized for a total inflow into the system of 450 gallons per minute. The actual inflow into the subdrain system is expected to be less.

12. In addition to the above drainage system, some means of draining the soils outside the exterior walls will be required. The means of accomplishing drainage outside the walls would depend primarily on the selected method of shoring and the method of constructing the exterior building walls. A drainage system behind the basement walls may be provided by strips of Miradrain 6000 (or equivalent). Miradrain 6000 (or equivalent), attached to the lagging and protected from the concrete placement of the walls, would provide satisfactory drainage.

Continuous Miradrain may be placed at a depth starting at about 3 feet below the existing grade.

The Miradrain shall be connected to weep holes at the bottom of the excavation. The weep holes should consist of solid pipes spaced at 8 feet on centers. At the connection of the weep holes and the Miradrain, the weep holes shall be embedded in 1 cubic foot of free-drainage aggregate surrounded by a filter fabric. The weep holes shall drain into the subdrain system placed beneath the slab of the lower subterranean level or into a solid pipe placed beneath the edge of the lower floor slab. The solid pipe shall discharge into the sump.

The installed drainage system should be observed by a qualified dewatering contractor.

## LEVEL OF SIGNIFICANCE AFTER MITIGATION

After incorporation of the mitigation measures listed above, impacts related to dewatering and surface runoff would be less than significant.