4.3 EARTH RESOURCES

INTRODUCTION

This section describes the geologic and geotechnical conditions of the Specific Plan Area, and identifies mineral resources within the Specific Plan Area. This section evaluates the consistency of the RiverPark Project with applicable State, County, and City policies regarding minerals and identifies potentially significant geologic, geotechnical, and mineral resource impacts.

This analysis is based on technical information provided for the site by Fugro West, Inc. and by West Coast Environmental and Engineering. Much of this technical information relies upon existing available geologic and geotechnical data pertinent to the study area, including published and unpublished geologic and geotechnical maps, geotechnical reports for portions of the subject site and for adjacent properties, literature, and research data, along with pertinent well logs and historical stereo aerial photographs.

Based on this information this section analyzes the potential geologic and earth resources effects of the proposed Mine Reclamation Plan and the land uses that would be permitted by the RiverPark Specific Plan. As individual building projects are proposed within the Specific Plan Area in the future, additional and more detailed geologic and geotechnical information on individual building sites would be provided, including information derived from future subsurface investigations.

EXISTING CONDITIONS

As a result of prior and current uses of RiverPark Areas 'A' and 'B', many of the physical characteristics of RiverPark Areas 'A' and 'B' differ significantly. The reader is referred to **Section 2.0, Environmental Setting** and **Section 3.0, Project Description**, for a description of the Specific Plan Area, proposed uses and improvements, and land uses around the Specific Plan Area.

Geologic Setting

The RiverPark Specific Plan Area is situated in the southern portion of the Transverse Ranges Geomorphic Province of California. The province is characterized by east-west-trending mountain ranges composed of sedimentary and volcanic rocks ranging in age from Cretaceous to Recent. Major east-trending folds, reverse faults, and left-lateral strike-slip faults reflect regional north-south compression and are characteristic of the Transverse Ranges. The Transverse Ranges Geomorphic

Province is bound on the north by the Santa Ynez fault, on the east by the San Bernardino Mountains, on the south by the Transverse Ranges frontal fault zone, and on the west by the Pacific Ocean.

The Ventura Basin, including its offshore continuation in the Santa Barbara Channel, is the dominant structural element of the western Transverse Ranges. The Basin is filled with a thick sequence of Cenozoic[1] sedimentary rocks estimated to be more than 20,000 feet in total thickness.

Located along the Santa Clara River channel, the site is underlain by a 1,000- to 2,000-foot-thick sequence of recent (Quaternary age[2]) alluvium and terrace deposits, which are generally unconsolidated to partially consolidated. The alluvial materials generally consist of older stream channel (Qos) and floodplain deposits (Qfp) of sand, gravel, cobbles, silt, and clay that are generally stratified and locally cross-bedded. **Figure 4.3-1, Geologic Map**, shows the surface distribution of sediments in the project area.

Site Topography

Natural elevations across RiverPark Area 'A' vary from about 75 feet above mean sea level (msl) adjacent to the base of the southwestern end of the river levee to about 90 feet above msl at the eastern end of the property. Elevations on RiverPark Area 'B' vary from below sea level in the mining pits to roughly 138 feet above msl on a stockpile in the plant area. This wide variation in elevations reflects the existing El Rio Retention Basin No. 2 and the mine pit excavations, and the stockpiling of excavated and imported materials.

RiverPark Area 'B' specifically contains four mining pits: the Large Woolsey, Small Woolsey, Vickers, and Brigham pits, as shown in **Figure 2.0-6, RiverPark Area 'B' Features**. Each of these is briefly described below.

- The Large Woolsey pit is adjacent to the northeastern end of the plant area. The Santa Clara River levee runs parallel to the northwestern side of this pit, while industrial development and the Ventura County Juvenile Justice Center site borders its southeastern side.
- The Small Woolsey pit is located east of the plant area. Industrial property along Montgomery Avenue adjoins the northeastern side of this pit, and private industrial property along Carnegie Street adjoins its southeastern end. A peninsula consisting of excess fine granular material, obtained during the washing of sand and gravel, partially separates the Vickers pit from the southwestern side of the Small Woolsey pit.

1 The Cenozoic Era represents the last 65 million years.
2 The recent Quaternary Period represents the last 11,000 years.

Figure 4.3-1

Geologic Map

This is Plate 3 of the May 2000 Fugro Report.

- The Vickers pit is bound on the northwest by the plant area, on the southeast by the El Rio Drainage Basin No. 1, and on the southwest by the Brigham pit. A land bridge that was formerly the plant entrance road separates the Brigham and Vickers pits.
- The Brigham pit is bound on the northwest by the plant site, on the west by the "stockpile" area, on the southwest by the current entrance road, and on the southeast by the El Rio Drainage Basin No. 1.

The pits were actively mined between the mid-1970s and the late 1990s and no single photograph or topographic map exists that accurately reflects the deepest excavations or steepest slope gradients excavated into the native, undisturbed earth materials. Topographic maps indicate that the top of pit slope elevations range from about 100 feet above msl at the northeastern end of the Large Woolsey pit to about 85 feet above msl at the western end of the Brigham pit. The historical elevations at the pit bottoms range from about 2 feet below msl at the northeastern end of the Large Woolsey pit and at the northwestern end of the Small Woolsey pit, to about 8 feet below msl in the Brigham pit and 4 feet below msl in the Vickers pit.

In general, topographic maps indicate that the mining pits on RiverPark Area 'B' are up to about 100 feet in depth, with excavated slope gradients typically between about 2h (horizontal):1v (vertical) and 1h:1v. Oversteepened pit slope areas with gradients steeper than 1h:1v generally appear to be localized and do not appear to involve the entire slope height (refer to the July 2001 Fugro West, Inc report in **Appendix 4.3** for specific areas where those steeper gradients exist on RiverPark Area 'B').

The northwestern end of the RiverPark Area 'B' site is an approximately 80-acre stockpile area that was actively mined for aggregate materials from the mid-1960s through the early 1970s. Topographic maps from that period suggest that mining excavations extended at least as deep as about 29 feet above msl at the southeastern end of the stockpile area. Excavations from that period have since been backfilled, resulting in the existing topography which varies from about 60 feet above msl (along the southeastern boundary) to about 110 feet above msl along a fill ridge in the center of the stockpile area.

The approximately 50-acre plant area is located immediately northeast of the stockpile area. From a review of historical aerial photographs, excavations had already begun in the plant area by 1947 and continued up until about 1960. Excavations in the plant area generally appear to have been limited in extent and depth, typically on the order of about 20 feet deep. Those excavations were filled to the present topography, which generally ranges from about 82 feet above msl near the southwestern corner to about 95 feet above msl near the northeastern corner.

Drainage Characteristics

Drainage within the project area occurs as sheet flow and through numerous man-made diversion and catchment structures. Within RiverPark Area 'A', runoff generally flows toward the southwest and west, while within RiverPark Area 'B', the general direction of drainage has been disrupted by numerous mining pits and material stockpiles on the site, and by two County of Ventura water detention basins along Vineyard Avenue.

The RiverPark Specific Plan Area lies within the floodplain of the Santa Clara River and aerial photographs reveal a wide and braided channel morphology that historically has encroached on the northeastern end of the subject property. A levee exists along the length of the RiverPark river frontage to protect the Specific Plan Area from flooding. The reader is referred to **Section 4.5, Water Resources**, and **Section 4.11.1, Stormwater Drainage**, for more detailed discussion of the drainage characteristics of the site and project area.

Earth Materials

On the basis of subsurface investigations both on and near the RiverPark Specific Plan Area, the general native soil profile predominantly consists of alluvial (i.e., river bed and floodplain) deposits; however, due to activities on the site over the past decades, there is considerable artificial fill throughout the RiverPark Area 'B' site. The greatest proportion of artificial fill lies in the stockpile area, the southeastern third of which was excavated to depths of at least 60 feet (about 30 feet above msl) in the mid- to late 1960s. Artificial fill on the RiverPark Area 'A' site is generally within the upper 5 feet, resulting from agricultural discing. Alluvium and artificial fill on the site (illustrated on **Figure 4.3-1, Geologic Map**), as well as slope materials from mining operations on RiverPark Area 'B', are described below.

Alluvium (Qal)

The alluvium appears to consist primarily of silty to well-graded sand with varying amounts of gravel and cobbles, and scattered thin silt and clay layers. Along the river levee in the stockpile area, alternating native clay and silt layers are common below a depth of about 30 feet.

On the basis of descriptions and sampler blow counts ("N-values"[3]) from borings drilled on the subject site and on adjacent properties, the natural silty sand to well-graded sand (with varying amounts of gravel and cobbles) materials generally appear to range from medium dense to very dense. Those sandy materials are anticipated to be non-expansive. Natural fine-grained clay and clayey silt lenses are anticipated to be thin and discontinuous. Those materials generally have been found to range from medium stiff to medium dense.

Artificial Fill (Af)

The artificial fill on the site appears to consist predominantly of silty sand to well-graded sand with varying amounts of gravel. Within the stockpile area of RiverPark Area 'B', up to about 60 feet of artificial fill is located in the southeastern third, about 20 feet in the northwestern third, and about 35 feet elsewhere. Artificial fill in the stockpile area generally consists of silty sand to sand, with silt and clay layers predominant in the upper 20 to 40 feet of the southern half of that area. In the plant area, the fill consists of sand and silty sand, and the depth of the fill generally varies from a few feet to about 20 feet. In the slope areas of RiverPark Area 'B', approximately 65 feet of fill is present within about 200 feet of the present slope crest along the northwestern end of the Vickers pit (this pitward fill comprises the "fill peninsula" that extends into the Vickers and Small Woolsey Pits), about 15 feet of fill is present along the southeastern slope of the Large Woolsey pit, and about 35 feet of artificial fill is present along the western corner of the Brigham pit. Additionally, up to about 35 feet of artificial fill exists along the northwestern two-thirds of the southwestern slope of the Brigham pit, extending to the southwestern property line. See the discussion on slope materials below for further discussion on artificial fill at the RiverPark Area 'B' site.

El Rio Drainage Basin No. 2 was excavated by the Ventura County Flood Control District (VCFCD) in 1997. Materials excavated below the surficial topsoil at the basin site were hauled to the CalMat plant (now Vulcan Materials) to separate gravel for aggregate production, while the silty sand topsoil materials from the basin were stockpiled at the site and placed on the basin bottom once excavation was completed. The basin is approximately 15 feet deep with approximately 2h:1v side slopes. The basin bottom is level and has a bottom elevation of about 75 feet above msl. The southwestern corner of the basin was excavated to about 10 feet below its present elevation and loosely backfilled. There may be pockets of loose fill in other areas of the basin. Soil materials encountered during the excavation of the El Rio Detention Basin No. 2 consisted predominantly of medium-grained sand with 30 to 40 percent gravel and less than 10 percent fines.

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3 The N-value is the penetration resistance (i.e., number of blow counts) as the Standard Penetration Test (SPT) sampler is driven 12 inches (during the field exploration with the drill rig).

In the areas surrounding the RiverPark property, artificial fill associated with agriculture was estimated to be generally between about 2 and 5 feet in depth, and appears to be derived from surficial on-site silty sands, well-graded sands, sandy silts, and clayey silts. The topsoils are anticipated to be loose because of agricultural discing. Similar materials are expected on the cultivated portion of RiverPark Area 'A'.

Mining Pit Slope Materials

Mining pit slope materials on RiverPark Area 'B' consist of native, undisturbed granular soil and, in some areas, artificial fills. In general, native slope materials consist of dense to very dense, well-graded sand with varying amounts of gravel, and with intermittent gravel layers in a sandy matrix on the order of several feet thick. Artificial fills consist of sands and silty sands that were discarded from the aggregate mining process.

Thin clay lenses (typically on the order of 1- to 2-inches thick) were encountered in a few boring locations on RiverPark Area 'B'[4]; however, the elevation of the clay layers varied significantly between borings, when encountered, or were not noted in adjacent borings.

Several areas of fill placement along the pit slope areas are known, and several localized slope failures from uncontrolled runoff or drain pipe failures exist along the northeastern and eastern slopes of the Small Woolsey pit and the southeastern slope of the Large Woolsey pit. Additionally, one "washout" at the northern end of the southeastern slope of the Large Woolsey pit involved at least the upper 30 feet of slope materials.[5] Those failed areas were restored to their prior configuration by the placement of artificial fill consisting of "spill fills" below the water level or in inaccessible slope areas, and conventional fill placement with grading equipment and some level of compactive effort as the filling process continued above the water level. However, there were no known records of the observation of standard grading methods consisting of keying and benching fill materials into native slope materials, and testing of those fill materials by a geotechnical engineer during their placement. According to a study performed subsequent to fill placement, the artificial fill materials used to restore the slope at the eastern corner of the Small Woolsey pit consisted of fine silty sand with some fine gravel.

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4 This information is based on borings done on the site by Earth Systems Consultants in 1997, Fugro West, Inc. in 1998 and 99, and The J. Byers Group, Inc. in 2000. The specific references for these borings are provided in the July 2001 Fugro West, Inc. report in **Appendix 4.3** of this EIR.

5 This information is based on borings done on the site by Earth Systems Consultants in 1997; the specific reference for these borings is provided in the July 2001 Fugro West, Inc. report in **Appendix 4.3** of this EIR.

The approximate locations of the slope failures (and subsequent fills placed to restore the pre-failure slope gradients) along the southeastern and northeastern slopes of the Small Woolsey pit and the southeastern slope of the Large Woolsey pit are shown on **Figure 4.3-2, Slope Reclamation Plan**.

Seismicity

The RiverPark Specific Plan Area is located in a seismically active region and it can be expected that the project would be subjected to strong ground shaking during its design life. Ventura County is the only county in southern California that has not directly experienced the effects of a devastating historical earthquake on a fault within its borders. That quiescence is in clear conflict with the active tectonic framework of the County because there are numerous regional and local active faults in the County that pose a seismic risk to the area.

Geodetic surveys indicate that the Ventura Basin is experiencing crustal shortening at an annual rate of about 1 centimeter per year in a north-south direction. Because no historical earthquakes have been recorded in the area over the course of at least 200 years (aside from the 1812 and 1857 earthquakes occurring on the San Andreas fault - occurrences that probably did little to relieve crustal strain in the Ventura Basin), the Ventura region is likely to experience a large earthquake, or a cluster of large earthquakes, in the near future.

On the basis of the crustal shortening rate noted above, the Ventura region should have experienced the equivalent of two moment magnitude 7.5 earthquakes during the last 200 years. However, no large-magnitude earthquakes have occurred historically along the Simi-Santa Rosa, Oak Ridge, San Cayetano, Ventura, or any other major fault in the County. Obviously, portions of Ventura County have been affected by earthquakes occurring in other geographic regions, such as the damage in Fillmore and Simi Valley that resulted from the January 17, 1994, Northridge earthquake (magnitude 6.7). However, no earthquakes with magnitudes larger than 6.0 have occurred historically on faults in Ventura County.

The relative earthquake quiescence in Ventura County is disconcerting because portions of Ventura County exhibit some of the greatest Quaternary deformation rates in California and the world. For instance, the Ventura anticline, located about 12 miles north of the Specific Plan Area, has exhibited uplift rates of about 6 millimeters per year (mm/yr) for the last 40,000 to 100,000 years. That rate compares with typical coastal terrace uplift rates in other areas of California of about 0.1 to 0.5 mm/yr. That high deformation rate implies a high tectonic activity rate for the region that has not been experienced historically.

Table 4.3-1, Summary of Nearby Faults, presents a summary of the distances to the Specific Plan Area and the maximum magnitude of some of the nearby faults that may cause future shaking at the Specific Plan Area.

Table 4.3-1
Summary of Nearby Faults

Fault Name	Distance Between Site and Surface Projection of Earthquake Rupture Area (miles)	Estimated Maximum Earthquake
Oak Ridge (onshore)	0.25	6.9
Simi-Santa Rosa	3	6.7
Ventura-Pitas Point	4	6.8
Channel Island Thrust (Eastern)	5	7.4
Montalvo-Oak Ridge Trend	6	6.6
Anacapa-Dume	6	7.3
Oak Ridge (Blind Thrust) Offshore	7	6.9
Red Mountain	11	6.9
San Cayetano	14	6.8
Santa Ana	14	6.7
Malibu Coast	18	6.7
San Andreas	41.5	7.8

Source: Fugro West, Inc.

Figure 4.3-1, Geologic Map, shows the proximity of the RiverPark Specific Plan Area to the Oak Ridge (onshore) fault. The closest portion of the Oak Ridge fault system to the project is along the inferred McGrath fault trace, located approximately 1,500 feet northwest of the site.

The potential earthquake-induced hazards that may affect the RiverPark Specific Plan Area consist of fault rupture and strong ground motions, and the secondary effects of ground motion, such as liquefaction, lateral spreading, settlement in dry sands, tsunamis, and seiches. Each of those is discussed below.

Ground Rupture Potential

Ground rupture caused by movement along a fault could likely result in catastrophic structural damage to buildings constructed along that fault trace. Consequently, the State of California, through the Alquist-Priolo Earthquake Fault Zoning Act, prohibits the construction of occupied structures[6] within a

6 The California Division of Mines and Geology (CDMG, 1997) defines an occupied structure as one that is occupied at least 2,000 person-hours per year.

Figure 4.3-2, Slope Reclamation Plan

This is Plate 3 – Slope Reclamation Plan from Fugro West Dated July 2001

designated fault zone without demonstrating that the structures would not encroach a 50-foot setback from the fault trace. Local government, such as the County of Ventura, identifies other faults, in addition to those faults mandated by the State, for which minimum construction setback requirements must be maintained. No Alquist-Priolo Earthquake Fault Zones, or any other mapped fault zone, encroaches onto the Specific Plan Area.

Potential for Strong Ground Motion

Strong ground motion from seismic wave propagation can cause significant damage to structures. At any location, the intensity of ground motion is a function of the distance to the fault rupture, the local soil/bedrock conditions, and the earthquake magnitude (among others).

A published regional probabilistic seismic hazard map prepared by the California Division of Mines and Geology (CDMG, 2001) estimates that a peak horizontal ground acceleration (phga) on the order of about 0.7g should have about a 10 percent probability of exceedance at the site in a 50-year exposure period. That level of ground shaking generally corresponds to the level of ground motion that would have a return period of about 475 years. The predominant (modal) magnitude that produced the 475-year ground motion is 6.9, and the predominant (modal) distance is about 1 mile. Recent studies (Bozorgnia et al., 1999) have observed that at such close distances and for such large earthquakes, the peak vertical acceleration can be about 1.6 times the peak horizontal acceleration.

Liquefaction Potential

Soil liquefaction results from the earthquake-induced temporary build-up of excess pore water pressure that can result in a condition of near-zero effective stress and the temporary loss of strength. Soil materials considered to be susceptible to liquefaction include loose to medium dense sands and non-plastic silts that typically are below the groundwater level. Clay soil or sand and silt with more than 15 percent clay-sized particles (particles less than 0.005 mm) are typically considered non-liquefiable.

Groundwater typically is present beneath the proposed development ground surface, as high as about 65 feet above msl at the western end of RiverPark Area 'A' to about 76 feet above msl at the northeastern end of RiverPark Area 'B', with significant seasonal and annual fluctuations related to rainfall, recharge, and withdrawal. However, blow count data from borings drilled on or adjacent to the Specific Plan Area suggest that the native granular soils are predominantly dense to very dense; such soils are typically not susceptible to liquefaction. The loose to medium dense sandy artificial fill materials encountered in the stockpile area on RiverPark Area 'B', however, appear to be susceptible to

liquefaction. Furthermore, pockets of artificial fill that extend to depths on the order of about 10 feet below the bottom of the El Rio Detention Basin No. 2 also are likely to be loose and because of their potentially submerged condition, susceptible to liquefaction.

Lateral Spreading

Lateral spreading movement may occur when a soil mass slides laterally on liquefied soil layers, moving downslope or towards a free face. The magnitude of lateral spreading movements depends on earthquake magnitude, distance between the site and the seismic event, thickness of the liquefied layer, ground slope or ratio of free-face height to distance between the free face and structure, fines content and average particle size of the material comprising the liquefied layer, and N-value. The mining pit slopes on RiverPark Area 'B' and the embankment slopes adjacent to the Santa Clara River are two examples of free-faces on or adjacent to the Specific Plan Area.

The potential for lateral spreading appears to be low in the native materials on the site; however, there may be a potential for lateral movement in the loose artificial fill materials in the stockpile area of RiverPark Area 'B', and in other unexplored fill areas, including along the Hanson Aggregates' plant entrance road located adjacent to the northeastern side of the El Rio Detention Basin No. 2 and within slope repair areas and the artificial fill peninsula that extends from the southeastern plant boundary into the Vickers pit.

Seismically Induced Settlement

Seismically induced settlement can occur during earthquake shaking in sandy soils that are loose to medium dense and above the water table. Seismically induced settlement differs from settlement resulting from liquefaction of saturated granular materials because it may occur in dry sands. In southern California, seismically induced settlement of dry and partly-saturated sand was observed during the 1971 San Fernando and 1994 Northridge earthquakes.

The upper 10 to 20 feet of soil at the RiverPark Specific Plan Area is anticipated, for the most part, to remain above the groundwater level. Artificial fills encountered in the stockpile and plant areas of the Hanson Aggregates property typically were loose to medium dense. Native sands and sandy silts encountered in the upper 20 feet on and adjacent to the Specific Plan Area typically were medium dense. Loose sandy fill materials are anticipated to be more susceptible to seismically induced settlement than the medium dense native sand and sandy silt materials. The potential for seismically induced settlement of the native sand and silty sand materials in the upper 10 to 20 feet appears to be minor.

Tsunamis and Seiches

Large earthquakes can induce tsunamis, which are sea waves characterized by significant runup reaches extending beyond coastal beach areas. The most significant historical tsunami in this area resulted from the 1812 Santa Barbara Channel earthquake in which the wave runup extended to Mission San Buenaventura (about 30 feet above msl).

According to the Ventura County Seismic Safety and Safety Element (1974), a tsunami runup elevation for most of Ventura County is about 35 feet above msl. The site lies in "Zone 3," which has an expected tsunami runup elevation in the range of 15 to 30 feet (with a 90 percent probability of not being exceeded in 50 years). The Specific Plan Area is generally above 75 feet above msl and is located several miles from the Pacific Ocean; therefore, impacts from tsunami hazards is low.

Seiches are seismically induced waves generated in a closed body of water from ground excitations such as earthquake shaking, tectonic tilting, fault rupture of the basin floor, landsliding of the basin slopes, volcanic pressure waves, or from atmospheric disturbances. The mining pit slopes are anticipated to have a minimum freeboard of about 2.5 feet under the fullest pit conditions. Therefore, ground excitations or atmospheric disturbances resulting in maximum wave heights less than the minimum anticipated freeboard height should not pose a hazard. Atmospheric pressure changes resulting in wind surges are not likely to produce wave heights greater than about 0.5 foot because of the relatively small size of the pits. Current volcanic activity is absent in the Oxnard plain area, so that potential source of seiche activity is unlikely. The potential for landslides of the pit slopes will be reduced to a less than significant level by increasing the stability of the pit slopes through implementation of the slope reclamation plan in the proposed Mine Reclamation Plan.

Oscillations from ground shaking, tectonic tilt, and fault rupture may produce seiche waves that could exceed the available pit slope freeboard. The nearest known active fault to the RiverPark site, the Oak Ridge fault, is located about 1,500 feet to the northwest. Therefore, the potential for seiche waves generated from fault rupture within the RiverPark basins is less than insignificant. Numerical models developed by Ichinose et al. (2000) for Lake Tahoe predict maximum seiche wave heights on the order of 0.5 meter as a result of tectonic tilting caused by fault rupture occurring outside the Lake Tahoe basin. It is conceivable that tectonic tilting resulting from activity along the nearby Oak Ridge fault may result in wave heights on the order of several feet.

Seiche waves resulting from oscillations generated from earthquake ground shaking have been observed hundreds of miles from the earthquake source (Richter, 1958). In most cases of those distant events, the

vertical amplitude of earthquake-shaking-induced seiche waves was no more than a few feet (Sherard, 1967).

When wave oscillations are in phase with ground motions from near-field events (i.e., nearby earthquake activity), significant wave heights may result. However, for water waves to be in phase with near-field ground motions, the body of water should be small. The size body of water most likely affected by near-field oscillations is in-ground swimming pools. Anecdotal observations of significant sloshing of in-ground swimming pools during the Northridge and other recent earthquakes are common. Conversely, larger bodies of water, such as the mining pits, are less likely to be in phase with near-field ground motions because their periods are typically much longer.

A National Science Foundation-funded study was performed by a University of Southern California graduate student, Christophe Ruscher, under the direction of Professor Costas Synolakis to estimate the seiche wave height that occurred in the Los Angeles reservoir as a result of the January 17, 1994, Northridge earthquake. That study (Ruscher, 1997), which consisted of the development of scaled physical models of the Los Angeles reservoir, was not able to substantiate the development of any more than just a few feet of reservoir sloshing due to earthquake induced oscillations.

The Los Angeles reservoir geometry is somewhat similar to the contiguous Brigham, Vickers, and Small Woolsey pit dimension and depth. Additionally, the ground movement from the Northridge fault is similar to that anticipated from the nearby Oak Ridge fault. If seiche waves in the mining pits were comparable in height to those estimated in the Los Angeles reservoir study, they would barely overtop the pit slope crests when the pits are at their fullest. Most of the year, freeboard in the mining pits is anticipated to range from 10 to 30 feet or more, during which time seiche runup would not overtop the pit slopes.

The minor overtopping of the slope crests by seiche waves induced from ground shaking or tectonic tilting would not be expected to travel very far beyond the crest. Additionally, landscape berms, trees, and shrubs would tend to impede the reach of the wave. Occupied structures for the RiverPark Area 'B' development are planned at least 75 feet from the proposed slope crests and existing occupied structures on adjacent properties will have a setback of at least 30 feet from proposed slope crests after implementation of the slope reclamation plan. Therefore, seiche potential is not considered significant in the mining pit areas.

Other Geohazards

Other geotechnical hazards or concerns relative to the RiverPark Specific Plan Area that are not directly related to earthquakes include hydroconsolidation, subsidence, expansive soils, and the stability of artificial fills on the RiverPark Specific Plan Area. A preliminary analysis of each of those relative to the Specific Plan Area is discussed below followed by a description of pit slope conditions at the Hanson Aggregate Plant on RiverPark Area 'B'. The absence or presence of the aforementioned potential geotechnical hazards on the RiverPark Specific Plan Area will be confirmed with specific geotechnical studies prepared for individual building projects within the Specific Plan Area.

Hydroconsolidation

Hydroconsolidation is a phenomenon in which natural soil deposits or fill materials collapse (settle) when wetted. Natural deposits susceptible to hydroconsolidation are typically aeolian, alluvial, or colluvial materials, with high apparent strength when dry. That dry strength may be attributed to the clay and silt constituency of the soil, and the presence of salts. Additionally, capillary tension may act to "bond" soil grains. Once those soils are wetted, the constituency including soluble salts or "bonding" agents is weakened or dissolved, capillary tensions are reduced, and collapse occurs.

Loose on-site artificial fills may be susceptible to collapse settlement. Because on-site native sands and sandy silts above the groundwater level generally are medium dense, the collapse potential in those materials is anticipated to be low. Native materials below the historical high groundwater level for the site should not have a significant collapse potential because they have been saturated at some time in the past.

Consolidation

Because the native soil profiles are likely to consist primarily of medium dense to very dense sand with varying amounts of gravel, the consolidation potential of undisturbed, native soils likely is low. However, uncontrolled artificial fill materials typically are variable in density and are likely to compress upon loading. As previously discussed, artificial fill is likely within the upper few feet of soil on RiverPark Area 'A', as well as in deep pockets on RiverPark Area 'B'.

Subsidence

Subsidence is the sinking of the ground surface caused by the compression of earth materials resulting from manmade activities, such as groundwater or oil and gas withdrawal, or from peat oxidation. The resulting compression typically occurs only once within the affected soils and cannot be repeated during fluctuations (i.e., rise and fall) of the groundwater level. The potential for subsidence from peat oxidation on the Specific Plan Area is not likely because of the absence of peat deposits in borings excavated on and near the site. Similarly, oil and gas withdrawal is not a likely cause of subsidence at the site because there are no known active oil or natural gas wells in that area.

Groundwater withdrawal may have caused some of the regional subsidence observed in the Oxnard Plain, and in the project area, over the last several decades. The Oxnard Plain has been monitored by the U.S. Coast and Geodetic Survey since the 1930s. Records to 1968 show numerous bench marks that have settled a foot over a 15 to 20 year period (i.e., between about 1950 and 1968). The Draft Safety Element Technical Appendix 7 (City of San Buenaventura, 1989) estimates subsidence in the project vicinity (near U.S. Highway 101 and the Santa Clara River) at about 0.05 feet/year. However, groundwater levels would have to continue to decline for subsidence to continue at that rate. Because groundwater levels are not likely to retreat below historic low levels, more recent subsidence rates (i.e., since 1968) from groundwater withdrawal should have retreated, if not ceased.

Expansive Soil

Expansive soil is characterized by a clay composition whereby clay particles expand dramatically upon wetting. Montmorillonitic clays[7] are most susceptible to expansion, resulting in heaving soils. Foundations for structures constructed on expansive soils require special design considerations that are identified in the Uniform Building Code.

Surficial materials on the Specific Plan Area generally consist of granular materials (silty sand, well-graded sand, sandy silt, and some clayey silt) that are not anticipated to be expansive. However, clayey silt soils on the site may demonstrate a slight to moderate expansion potential.

Artificial Fill

As previously discussed, artificial fill is located on both RiverPark Area 'A' and 'B'. Artificial fill materials between about 2 and 5 feet thick have been encountered in agricultural areas surrounding the

7 Montmorillonitic clays are a group of clay minerals characterized by swelling in water due to the introduction of interlayer water.

Specific Plan Area and fills of similar thickness are anticipated on RiverPark Area 'A', which is under agricultural production. Artificial fill materials also were encountered in the stockpile and the plant areas on RiverPark Area 'B' to depths ranging from a few feet to at least 60 feet, and were found to be quite variable in thickness, density, and composition. Artificial fill also exists in other areas of the site, such as the El Rio Detention Basin No. 2, mining pit slope areas, and along the plant entrance road alignment (see previous discussion on artificial materials under Earth Materials).

Groundwater Conditions

Groundwater was reported as shallow as 11 feet below ground surface (bgs), or about 65 feet above msl, in the southwestern corner of the Specific Plan Area. At the State Compensation Fund building site, adjacent to the levee along the Santa Clara River, groundwater was encountered at depths of about 25 to 26 feet (i.e., between about 50 and 52 feet above msl). Along the southeastern boundary of RiverPark Area 'A', groundwater was encountered at a depth of about 30 feet bgs (i.e., about 60 feet above msl).

In late October 2000, the groundwater level in the pits on RiverPark Area 'B' receded to below 42 feet above msl in the Brigham pit, below 45 feet above msl in the Vickers and Small Woolsey pits, and below 47 feet above msl in the Large Woolsey pit. The historical high groundwater levels range from roughly 76 feet above msl at the northernmost end of the site to roughly 60 feet above msl toward the State Fund Insurance building at the southwestern corner of the Specific Plan Area.

Because the RiverPark Specific Plan Area is located adjacent to an active river channel, the groundwater level at the site is anticipated to fluctuate significantly over the seasons and from one year to the next, depending on rainfall, runoff volumes, recharge, withdrawal, and irrigation. The highest historical groundwater elevation for RiverPark Area 'B' was estimated to be about 76 feet above msl.

Mineral Resources

Oil

The RiverPark Specific Plan Area is outside the Oxnard Oil Field. Three abandoned oil wells exist on the site; however, no oil or natural gas exploration and drilling currently occurs on the site. The wells were capped according to the standards of the California Division of Oil and Gas, which includes a cap 10 feet below the ground surface.

Aggregates

Aggregates represent a principal mineral resource within Ventura County, and include sand, gravel, and rock which are used for base fill, asphalt, concrete and riprap, among other things. Sand and gravel deposits (as well as extraction sites) within Ventura County occur primarily along the Santa Clara River channel as a result of alluvium transported by the river from the San Gabriel Mountains, and the Los Padres and Santa Inez Mountains of northeastern Ventura County. This alluvium forms a linear deposit ranging from 0.25 to 5.00 miles in width, and at least 1,000 feet deep. The Specific Plan Area is located within the Western Ventura County Production Consumption Region (PCR) for aggregates, as defined by the State. The aggregate resources in this PCR are almost exclusively located in and adjacent to the Santa Clara River. As of 1997/98, this PCR has been importing almost 100 percent of its aggregate materials from Simi Valley, Los Angeles County, and Kern County.[8]

With the exception of portions of RiverPark Area 'A' that have been "lost to urbanization" (according to DMG Open File Report (OFR) 93-10), much of the Specific Plan Area is located in an area designated as a regionally-significant construction aggregate resource area by the California State Mining and Geology Board (SMGB).[9] According to Section 2726 of the State Surface Mining and Reclamation Act (SMARA), this means that the area is

> *known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs for minerals in a particular region of the state within which the minerals are located and which, if prematurely developed for alternate incompatible land uses, could result in the permanent loss of minerals that are of more than local significance.*

RiverPark Area 'A' has never been mined. RiverPark Area 'B' consists of a existing surface mining site; however, no further excavation of the aggregates occurs on this site due to poor material quality (excess fines content in remaining native materials) and the high water levels in the mining pits, making mining operations no longer economically feasible.

PLAN AND POLICY CONSISTENCY ANALYSIS

This subsection examines the consistency of the project with the State Surface Mining and Reclamation Act, the City of Oxnard *2020 General Plan* for the western portion of the site (RiverPark Area 'A'), and

8 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 21 February 2001.
9 Jason Marshall, California Department of Conservation, correspondence to the City of Oxnard, 9 June 2000.

the Surface Mining Ordinance of the City of Oxnard. As RiverPark Area 'B' is presently located in unincorporated Ventura County, the County's plans and policies related to mineral resources are also discussed.

State Surface Mining and Reclamation Act (SMARA)

The State Surface Mining and Reclamation Act of 1975, as amended (SMARA) mandated the initiation of mineral land classification to help identify and protect mineral resources in areas within the State that are subject to urban expansion or other irreversible land uses which would preclude mineral extraction. After designation of mineral resource areas, SMARA provided for the classification of designated lands containing mineral deposits of regional or statewide significance. In addition, SMARA was designed to provide guidelines for the proper reclamation of mineral lands.

In compliance with SMARA, the State Division of Mines and Geology prepared Mineral Resource Zone maps that identify the following mineral resource zones:

MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2 Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists.

MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.

MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

The RiverPark Specific Plan Area is located within MRZ-2.

To meet its basic objectives, SMARA requires each jurisdiction with an MRZ-2 Zone to prepare a Mineral Resource Management Plan to protect access to mineral resources and to require reclamation when mining operations are closed. Furthermore, to ensure proper reclamation of mining sites, SMARA requires all jurisdictions with mining operations to adopt a reclamation ordinance and have it certified by the State Mining and Geology Board.

Ventura County Compliance with SMARA

In conformance with the requirements of SMARA, the County of Ventura prepared and adopted a Mineral Resource Management Plan (MRMP) in 1986 for the unincorporated portions of the County,

which includes RiverPark Area 'B'. The County's MRMP identifies resource areas, management policies, and standard permit conditions for mining operations. The Plan identifies protected resource areas where no other land use would be allowed unless a finding can be made that the proposed use would not hamper or preclude access to the resource and/or the economic value of the proposed use equals or exceeds the value of the resources thought to exist in the affected portion of the protected resource area. As the only portion of the Specific Plan Area within unincorporated Ventura County is RiverPark Area 'B', and as mineral extraction operations have ceased on this property due to poor aggregate quality, high water table, and other economic and environmental factors, development of RiverPark Area 'B' as proposed would be consistent with this policy of the MRMP.

To meet SMARA's objective to ensure proper reclamation of surface mining operations, Ventura County adopted a reclamation ordinance in compliance with SMARA (Sec. 8107-9 of the Zoning Code). A reclamation plan for the Hanson mining site was prepared in accordance with Section 8107-9 of the County's Zoning Code and was adopted in March 1979. This plan will remain in effect until the City of Oxnard and the State of California Department of Mine Reclamation approve the revised Reclamation Plan proposed as part of the RiverPark project. If RiverPark were not approved, the Hanson Aggregates Reclamation Plan, which has already been approved and amended by the County of Ventura, would remain in effect.

City of Oxnard *2020 General Plan*

Development in the City of Oxnard is subject to the City of Oxnard *2020 General Plan* (November 1990). The Specific Plan Area is located within Mineral Resource Zone 2 (MRZ-2). The RiverPark Area 'A' site is currently designated for regional commercial, office, and limited industrial uses, and much of the RiverPark Area 'B' site is currently designated as Open Space-Mineral Resource on the Oxnard *2020 General Plan* land use map. The Open Space and Conservation Element Map designates RiverPark Area 'A' as "developed," indicating that improvements already exist on this portion of the site.[10] The Open Space and Conservation Element contains a goals and policy that address mineral resources. The RiverPark Project includes a proposed general plan amendment that would modify the objective below. With this amendment, the text shown in italics below would be added. Consistency with the City's *General Plan* Development Policies relative to mineral resources is discussed in the Impacts sub-section.

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10 As shown in **Figure 2.0-5**, the southwestern corner of RiverPark Area 'A' has been previously developed with streets and two office buildings. The northernmost of these two office buildings, known as the State Compensation Fund Insurance Building, is a three-story building containing 115,000 square feet of space. The southernmost of these two buildings, known as the Nordman, Cormany, Hair and Compton Building, is a seven-story, 106,000 square foot building

A. Goals

1. Maintenance and enhancement of natural resources and open space.

B. Objectives[11]

4. Provide for the continued timely *extraction of minerals where continued extraction is feasible and economical*, while minimizing land use conflicts.

Surface Mining Ordinance of the City of Oxnard

The Surface Mining Ordinance of the City of Oxnard (Ordinance #2597) was approved by the City of Oxnard on September 18, 2001, and by the State Mining and Geology Board on October 1, 2001. The ordinance established regulations for surface mining operations in the City. Article IV, Reclamation Plans, of the ordinance requires that reclamation plans be prepared in accordance with SMARA regulations and other conditions set forth in the ordinance, and that financial assurances be posted with the City to ensure the reclamation of the mining site. Relative to the proposed project, Section 38-34 of the City's ordinance states that the City Planning Commission may approve a reclamation plan upon making the following findings:

- The plan complies with SMARA, SMARA regulations, and Chapter 38 of the City Code.
- The plan and the potential uses of reclaimed land pursuant to such plan are consistent with Chapter 38 of the City Code, the general plan, and any applicable resource plan or element.
- The plan has been reviewed if and as required by CEQA and the city's environmental review guidelines, and all significant adverse impacts from reclamation of the mined lands are mitigated to the maximum extent feasible.
- The land and resources to be reclaimed will be restored to a condition that is compatible with, and blends in with, the surrounding natural environment, topography, and other resources.
- The reclamation plan will ensure that the mined lands are restored to a useable condition that is readily adaptable for alternative land uses consistent with the general plan and any applicable resource plan or element.
- Sections 38-21 and 38-32 of the Ordinance have been satisfied. Those sections specify the notification requirements for a surface mining permit application and for an application for approval of a reclamation plan.

[11] Objectives 1 through 3, and 5 though 8 of the General Plan's Development Policies do not apply to mineral resources.

IMPACT ANALYSIS

Thresholds of Significance

Geology and Soils

Relative to geology and soils, the City of Oxnard considers a project to result in a significant effect on the environment if it would:

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, involving:

    a. rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Pub. 42 [*2020 General Plan, VIII- Safety Element; FEIR 88-3, 4.8 - Earth Resources*]),

    b. strong seismic ground shaking (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*),

    c. seismic-related ground failure, including liquefaction (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*), and/or

    d. landslides (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*);

2. Result in substantial soil erosion or the loss of topsoil (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*);

3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*); and/or

4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property (*2020 General Plan, VIII - Safety Element; FEIR 88-3, 4.8 - Earth Resources*).

Slope Stability

The proposed pit slope configurations, whether at existing or proposed gradients and composition, should meet or exceed minimum stability criteria to be considered as posing a less than significant impact. The criteria being used by the City of Oxnard consists of a calculated factor of safety of at least 1.5 for static stability and a factor of safety of at least 1.1 for pseudostatic stability (using a horizontal

seismic coefficient of 0.15g). Slope conditions that constitute a landslide hazard[12] or that do not meet those minimum factors of safety would be classified as "significant" impacts.

Mineral Resources

With respect to mineral resources, based on the City's *2020 General Plan*, the City considers a project to result in a significant effect on the environment if it would:

- result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state
- result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan
- be inconsistent with Section 2763(a) of SMARA which states:

> *Lead agency land use decisions involving areas designated as being of regional significance shall be in accordance with the lead agency's mineral resource management policies and shall also, in balancing mineral values against alternative land uses, consider the importance of these minerals to their market region as a whole and not just their importance to the lead agency's area of jurisdiction.*

Proposed Improvements

The RiverPark Specific Plan would allow the development of a mixed-use community containing commercial, residential, open space, and public facilities (see **Section 3.0, Project Description**, for a more complete description of uses proposed on the site). The existing mining pits on RiverPark Area 'B' would be reclaimed and remain as open space. The proposed reclamation concept involves reconfiguring the edges of the pits, stabilizing the slopes of the pits, and planting the crest and upper slope areas with vegetation. The proposed RiverPark Area 'B' residential lots typically will be constructed behind (i.e., landward of) the existing pit slope crests and will maintain a setback of at least 75 feet from the proposed tops of the reconfigured pit slopes.

As proposed, the southeastern edge of the RiverPark Area 'B' residential development generally coincides with the existing Brigham and Vickers pit slope crest, but encroaches upon the western end of

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12 According to the County of Ventura, a landslide hazard constitutes a "…natural or man-induced slope instability that may adversely influence life or property." The landslide hazard, as defined by the County, consists of "…all gravity-induced downslope movements, including the separate phenomena of rockfall, soil creep, soil failures, dry raveling, rotational and translational slides, flows, slumps and complex combination of the above phenomena. The hazard applies to both natural and constructed slopes."

the Small Woolsey pit by up to about 100 feet beyond that slope crest. The proposed RiverPark Area 'B' development incorporates a perimeter road adjacent to the edge of the residential lots along the Brigham, Vickers, and Small Woolsey pits and a dry swale that further separates the residential lot areas from the northwestern end of the Brigham and Vickers pits. A dry swale also is planned adjacent to the slope crest along the northeastern end of the southeastern side of the Large Woolsey pit.

The proposed perimeter road adjacent to the residential lots and near the Brigham, Vickers, and Small Woolsey pit slopes is on the order of about 25 feet wide, and the outlying dry swale area, where planned, is on the order of about 50 to 75 feet wide. The perimeter road and dry swale would provide a minimum setback of about 75 feet between the closest edge of the residential property and the proposed top of slope and generally extend about 75 to 150 feet beyond the existing slope crest. Encroachment into the pits will require the construction of a fill over the steepest historical excavated slopes along the northwestern side of the Brigham, Vickers, and Small Woolsey pits.

An elementary school is also proposed beyond the southern corner of the Brigham pit. Also, lined detention basins are proposed at the location of the existing El Rio Drainage Basin No. 1 (along Vineyard Avenue), between the northeastern end of the plant area and the western end of the Large Woolsey pit, and adjacent to the southwestern side of the Brigham pit.

Areas outside the RiverPark Area 'B' development, but adjacent to the top of pit slopes, consist of the following public or private properties:

- An existing industrial development along the northeastern side of the Small Woolsey pit and the southwestern half of the southeastern side of the Large Woolsey pit.
- A levee between the southeastern bank of the Santa Clara River and the northwestern slope of the Large Woolsey pit, and the drain adjacent to the northeastern end of the Large Woolsey pit, both of which are maintained by the Ventura County Flood Control District.
- A juvenile detention facility under construction by the County of Ventura on the property adjacent to the northeastern half of the southeastern side of the Large Woolsey pit.

Pitward Fills

Pit slope areas to receive fills to extend the RiverPark Area 'B' development envelope pitward are shown on **Figure 4.3-2, Slope Reclamation Plan** (please refer to the July 2001 Fugro West Inc. report for a discussion of the general methodology for the construction of pitward fills adjacent to the RiverPark development areas).

On the basis of the slope evaluations and the objectives of the Slope Reclamation Plan, potential slope envelopes have been developed for the pit slope areas to improve slope stability and to reduce lateral movements consistent with the standards of the County of Ventura, which are being used by the City of Oxnard, and the Southern California Earthquake Center (SCEC 2000). The slope envelopes represent proposed slope configurations that satisfy the minimum City of Oxnard factor of safety requirements for static and pseudostatic conditions and, where needed, reduce seismically induced lateral movements to levels recommended by SCEC 2000 by increasing the setback of occupied structures on adjacent properties to the slope crest. Refer to the July 2001 Fugro West, Inc. report in **Appendix 4.3** of this EIR for further discussion on this topic.

Project Impacts

Construction Impacts

Approximately 10 million yards of earth materials will be graded over the entire 701-acre site. A balanced grading program involving excavation and replacement of the 10 million cubic yards of material is planned. The majority of this grading would consist of the excavation and / or replacement of earth materials in RiverPark Area 'B' to improve the structural characteristics of the soils in the stockpile and plant areas and to stabilize the slopes of the existing mining pits.

In RiverPark Area 'A', the existing elevations range from approximately 75 to 90 feet above msl. The maximum cut or fill in RiverPark Area 'A' will be about 7 feet with an average of 5 feet of material that will need to be removed and recompacted. Overall, approximately 1.9 million cubic yards of earth materials will be excavated in RiverPark Area 'A'. The resulting grades will be 75 to 90 feet above msl.

Grading of RiverPark Area 'B' will be consistent with the proposed reclamation plan, wherein approximately 7.8 million cubic yards of earth will be excavated. The majority of this material, approximately 6 million yards, will be excavated in the stockpile area of the mine site. Approximately 1.5 million cubic yards will be excavated in the plant area of the mine site. The majority of this material will be replaced where excavated to improve the structural characteristics of the soils. The existing land bridge separating the Brigham and Small Woolsey pits and the peninsula of fill material that presently extends into the Vickers and Small Woolsey Pits from the northwest, consisting of approximately 0.35 million cubic yard of material, would also be excavated. Excavation of the existing slopes of the pits would involve 0.60 million cubic yards.

Outside the pit areas, the existing elevations vary from approximately 70 to 115 feet above msl in RiverPark Area 'B'. After grading, the elevations will vary from about 80 to 100 feet above msl. In order to create the planned grades some material will be relocated between Areas 'A' and 'B'.

Grading of RiverPark Area 'B' would be consistent with the reclamation plan proposed for this site. During grading and remediation operations, there is potential for wind and water erosion of on-site soils should grading take place during moderate- to high-wind conditions or the rainy season, respectively. Erosion of on-site soils would result in a significant impact unless mitigated.

During construction, sloped excavations are anticipated during the removal of the artificial fills described previously. Artificial fill and native materials encountered during subsurface explorations and excavations (i.e., silty sand, sand, and sand with gravel) have a potential for caving and sloughing. Unless mitigated, temporary slopes could be unstable and could fail, resulting in a significant geotechnical impact.

Groundwater likely will be encountered in the excavation for the deep fill removal in the southeastern third of the stockpile area. Dewatering will be necessary to lower the groundwater level in that area to at least 5 feet below the targeted excavation bottom, or to elevations between about 20 and 25 feet above msl. Other shallower fill removals in the stockpile area also may require dewatering, depending on groundwater levels at the time of construction. In general, a significant geotechnical impact from dewatering consists of subsidence of earth materials as a result of drawdown. However, because groundwater levels have fluctuated from historical highs up to about elevation 76 feet above msl to lows below sea level over the past several decades, temporarily lowering the groundwater level by about 20 to 25 feet during dewatering should not pose a significant subsidence hazard. Dewatering of the southeastern third of the stockpile area of RiverPark Area 'B' likely would involve the discharging of at least 100 acre feet of water per day into the Santa Clara River, or nearby mining pits on or adjacent to the RiverPark property, or at United Water Conservation District's (UWCD's) El Rio Spreading Grounds. Significant construction impacts from discharging large volumes of water in adjacent pits would result from rapid recirculation (i.e., recharge) of the discharged water, that would interfere with the dewatering operation. Other significant impacts from the dewatering operation may consist of drawdown in proximal wells, water quality of discharge, groundwater depletion (e.g., if pumped water is discharged into the river), and are addressed further in **Section 4.5, Water Resources**.

Due to the geologic characteristics of RiverPark Area 'A' and the nature of the proposed grading and construction activities, the overall geologic stability of this portion of the site would not normally be

compromised. Upon completion, the proposed reclamation and grading of the RiverPark Area 'B' site would improve the geologic stability of that portion of the site compared to existing conditions.

Operational Impacts

The following impact analysis was prepared in response to the thresholds of significance outlined previously.

Impacts Associated With Seismic Hazards

As previously discussed, no known earthquake faults traverse the site, and on that basis, the site is not subject to ground rupture. However, there is potential for strong ground motion, liquefaction, lateral spreading, and seismically induced settlement on the site. Each of those seismic hazards relative to the Specific Plan Area is discussed below.

Potential for Strong Ground Motion

There is about a 10 percent probability of exceedance in a 50-year exposure period that the site will experience a pgha on the order of about 0.7g. The predominant (modal) magnitude that produced the 475-year ground motion is 6.9 and the predominant (modal) distance is 1 mile. Because the Specific Plan Area is close to major earthquake sources, the peak vertical acceleration may be about 1.6 times the peak horizontal acceleration. As with most Southern California sites, earthquake-related ground shaking could cause structural damage to on-site improvements; however, all structures within the site would be required to be constructed in conformance with the Uniform Building Code (UBC), with amendments, as adopted by the City of Oxnard. Similar to other Southern California sites that are located near earthquake sources, project compliance with the UBC would reduce effects associated with strong ground motion; although, the risk of damage would not be completely eliminated. However, the implementation of Uniform Building Code (UBC) standards for new construction is the procedure that is commonly applied in Southern California to mitigate earthquake shaking hazards to an acceptable level.

Liquefaction Potential

Liquefaction-induced settlements in granular, submerged artificial fill materials on the Specific Plan Area could be significant and somewhat proportionate to the fill thickness. However, native sand materials generally appear to be dense to very dense and therefore not likely susceptible to

liquefaction. As individual building projects are developed within the RiverPark Specific Plan Area at later dates, further evaluation of the proposed development area for liquefaction potential would be necessary. If areas on any individual building sites are found to have liquefaction potential, development in those areas could result in a significant seismic hazard impact if estimated liquefaction induced differential settlements exceed design tolerances.

Lateral Spreading

Although existing data for the Specific Plan Area and adjacent properties do not indicate a potential for significant lateral movements in the native materials, there may be potential for lateral movements in the fills on the site, including the loose artificial fill materials in the stockpile area, the pit slope areas, and along the Hanson Aggregates' plant entrance road located adjacent to the northeastern side of the El Rio Detention Basin No. 2. Because the data obtained from borings excavated on nearby properties are limited in depth, frequency, and location to fully characterize site conditions, site-specific studies are recommended to further evaluate the potential for lateral movements. If susceptible areas are identified in subsequent studies, development in those areas could result in a significant geologic impact.

Seismically Induced Settlement

The loose to medium dense artificial fill materials found in the stockpile and plant areas of the RiverPark Area 'B' site, as well as the artificial fill pockets below the bottom of the El Rio Detention Basin No. 2, are susceptible to seismically induced settlement, while the potential for seismically induced settlement of the native sand and silty sand materials in the upper 10 to 20 feet appears to be minor. Development in those areas is susceptible to seismically induced settlement and could result in a significant impact.

Impacts Associated With Erosion

Once the proposed development areas of the site are built-out, the ground surface would be covered with non-erosive materials (i.e., pavement and structures) and vegetation that would minimize wind- and water-related erosion of the site. As a result, no significant post-development impacts associated with erosion from those areas would occur.

With respect to the open pits that would remain on the site after reclamation of RiverPark Area 'B', the approved reclamation plan for the site requires slope erosion protection for the excavation pits.[13] Slope erosion protection would consist of establishing grades adjacent to slope crest areas to divert runoff away from the pit slopes. In addition, as part of the project, the slopes of the pits are proposed to be planted with vegetation. As a result of these features of the Reclamation Plan, erosion impacts will not be significant.

Impacts Associated With Soil Instability

Other geotechnical hazards or concerns identified on the RiverPark Specific Plan Area include soil instability characterized by hydroconsolidation, consolidation, artificial fills, and expansive soils. If the proposed development would occur on unstable earth materials, a significant impact would result. Each of those geotechnical concerns is discussed below and the reader is referred to **Appendix 4.3** of this EIR for more detailed discussion of on-site soils. As previously stated, the presence and extent of those geologic hazards on the site will be confirmed with specific geotechnical studies on the site as the project builds out.

Hydroconsolidation

Loose on-site artificial fills, such as those encountered in the stockpile and plant areas and along the plant entrance road, and located above the highest recent (i.e., since fill placement) groundwater level, may be susceptible to collapse (i.e., hydroconsolidation) settlement, which could result in a significant geologic impact unless mitigated.

Consolidation

Uncontrolled artificial fill materials typically are variable in density and are likely to compress upon loading, resulting in settlement. Artificial fill is likely within the upper few feet of soil in RiverPark Area 'A' and exists to a larger extent in the stockpile, plant, and plant entrance road areas of RiverPark Area 'B'. Unless mitigated, development on soils with consolidation potential would result in a significant impact.

Artificial Fill

Artificial fill materials were encountered in the stockpile and the plant areas of RiverPark Area 'B' to depths ranging from a few feet to at least 60 feet, and were found to be quite variable in thickness,

13 John Hecht, P.E., West Coast Environmental, correspondence to Hanson Aggregates, 28 November 2000.

density, and composition. Artificial fill materials between about 2 and 5 feet thick have been encountered in agricultural areas surrounding the Specific Plan Area and are anticipated on RiverPark Area 'A', which is under agricultural production. Artificial fill may also exist in other areas of the site. Uncontrolled artificial fills generally are considered to be unsuitable for support of structures and other improvements because of their variability. Therefore, unless mitigated, development on artificial fills would be unstable and would result in a significant geologic impact.

Expansive Soils

Clayey silt soils on the site may demonstrate a slight to moderate expansion potential. Development on expansive soils could result in a significant impact unless mitigated.

Impacts Associated With Slope Instability

Areas adjacent to the existing and proposed pit slopes may be impacted by: (1) gross instability of the pit slopes under static or seismic conditions, and/or (2) seismically induced lateral movements. Potentially impacted slope areas would consist of those areas where artificial fills are present along the slope face (**Figure 4.3-2**) or where the excavated pit slope gradient is steeper than about 2h:1v. For earthquake-induced lateral movements, potentially impacted areas may include RiverPark development areas and neighboring public and private properties adjacent to the pit slope crests.

Potential Instability of Artificial Fills

Artificial fill materials in slope areas are likely to be less stable than the indigenous native sand and gravel, particularly during seismic shaking. In general, the artificial fill materials discarded from the aggregate mining process and placed in the pit areas were typically finer-grained than native granular materials. Those materials may have been end-dumped or may have been placed hydraulically (i.e., under water) into pit areas to be reclaimed. Neither method of placement reliably results in a dense state; therefore, those materials are considered to be potentially much weaker than the underlying native, undisturbed alluvial materials.

Additionally, artificial fills placed without keying and benching into native materials and without compactive effort are vulnerable to settlement and lateral movements under static conditions (such as creep), as well as under seismic conditions. Settlement potential has been demonstrated for the fill slope located along the existing entrance road to the Hanson Aggregates plant (i.e., the fill extends from the southwestern slope of the Brigham pit to the southwestern property line). Settlement of the

fill in that area has adversely impacted the entrance road pavement, which has suffered repeated episodes of cracking with vertical offset visible across the cracks.

Moreover, submerged fill materials likely would be susceptible to liquefaction and lateral movements during an earthquake. Such fill materials could fail, or flow, into the pit during an earthquake, thereby exposing an original cut slope surface of the denser native materials. In addition to the proposed development areas, there are slope stability concerns for existing pit slopes adjacent to public and private properties. For example, the 1977, 1988, 1989, and 1992 topographic maps suggest that the lower 30 feet or so of the northwestern half of the southeastern slope of the Small Woolsey Pit was excavated at about 1/2h:1v. A slope toe that steep is not likely to be stable under static and seismic conditions. Other oversteepened areas have been identified from the review of the aerial photographs and the 1977, 1988, 1989, 1992, and 1999 topographic maps, and are summarized in Appendix A of the July 2001 Fugro West, Inc. report in **Appendix 4.3** of this EIR.

Slope Stability Evaluation

The evaluation of the pit slopes consisted of performing slope stability computations using the program XSTABL (Sharma, 2000) and estimating lateral movements using procedures developed by the Southern California Earthquake Center (SCEC) (2000). The slopes were modeled to approximate a configuration compatible with the reclamation and development plans and the topographic data compiled by Fugro West, Inc. (please see the July 2001 Fugro West, Inc report in **Appendix 4.3** for a detailed description of the methods and assumptions used in the evaluation). The results of the evaluation of gross slope stability and lateral movements indicates that some remediation of the pit slopes is necessary to satisfy minimum factor of safety requirements being used by the City of Oxnard and to reduce lateral movements to an acceptable range for occupied structures in proposed development areas and on adjacent properties.

Based on the threshold of significance for slope stability identified above, significant impacts associated with the existing and proposed slopes consist of the following:

- Slopes or slope areas where artificial fills are suspect because artificial fills placed under water, by dumping, or without appropriate benching and compaction are likely to be vulnerable to instability, settlement, and to liquefaction and lateral movements during seismic shaking.
- Areas where native slopes are steeper than 2h:1v will not satisfy factor of safety criteria for static and seismic conditions and are steeper than the limits being used by the City of Oxnard.
- Seismically induced lateral movements within about 80 feet of the pit slope crests are estimated to be on the order of 2 inches or more. According to the SCEC (2000), occupied

structures are not recommended in areas with estimated lateral movements greater than 2 inches.

Specific significant slope stability impacts for the pit slopes on RiverPark Area 'B' include the following:

- Brigham Pit Southwestern Slope/Western Corner: Existing artificial fills are subject to settlement and lateral movements.
- Brigham Pit Southeastern End of Southwestern Slope: Existing artificial fills are subject to settlement and lateral movements. Does not meet minimum factor of safety requirements.
- Brigham Pit Southeastern Slope: Does not meet minimum factor of safety requirements.
- Brigham Pit Northwestern End: Steep portions of slope do not meet minimum factor of safety requirements.
- Vickers Pit Northwestern End: Existing artificial fills subject to settlement and lateral movements.
- Vickers Pit North End of Northwestern Slope: Existing artificial fills subject to settlement and lateral movements.
- Vickers Pit Southeastern Slope: Does not meet minimum factor of safety requirements.
- Small Woolsey Pit Northern End: Existing artificial fills subject to settlement and lateral movements; steep portions of slope do not meet minimum factor of safety requirements.
- Small Woolsey Pit Northwestern Corner: Hydraulic fill subject to liquefaction and lateral movement.
- Small Woolsey Pit Southeastern Slope: Does not meet minimum factor of safety requirements.
- Small Woolsey Pit Eastern Corner: Existing artificial fills subject to settlement and lateral movements.
- Large Woolsey Pit Southwestern End: Existing artificial fills subject to settlement and lateral movements.
- Large Woolsey Pit Southwestern Half of Southeastern Slope: Existing artificial fills subject to settlement and lateral movements.
- Large Woolsey Pit Northeastern Half of Southeastern Slope: Existing artificial fills subject to settlement and lateral movements, slope does not meet minimum factor of safety requirements.
- Large Woolsey Pit Northeastern Slope: Does not meet minimum factor of safety requirements.
- Large Woolsey Pit Northwestern Slope: Steep portions of slope do not meet minimum factor of safety requirements and artificial fills subject to settlement and lateral movement.

Impacts to Mineral Resources

Loss of a Known Mineral Resource of Regional and State Value

In 1982, the State Mining and Geology Board designated sand and gravel resource areas in Ventura County as resource areas of regional significance, including those resources on the RiverPark Specific

Plan Area. Mining operations on RiverPark Area 'B' are complete and further resource recovery on the site is considered infeasible. Development of RiverPark Area 'A' would result in the loss of approximately 2.2 million tons of aggregate resources,[14] and the loss of a mineral resource of regional and state significance.

In evaluating the site's mineral value against the feasibility of mining its resources, the following conclusions have been made:

- The mineral resources on the Specific Plan Area have been estimated to be less than 1.5 million cubic yards, or approximately 2.2 million tons when taking required setbacks into account.[15]
- The site is within a portion of Ventura County that already imports 100 percent of its aggregate materials, so the local construction industry would not be affected in the near- or long-term.
- The cost of permitting an aggregate resource of such a relatively small quantity is not cost effective.
- The resources have no net value due to the costs associated with the environmental review of permitting of the mining operations.
- Although the site has mineral resources, development of a mining operation would generate significant scenic impacts. The site lies adjacent to and below the Ventura Freeway and any mining operations would be visible to thousands of daily commuters.
- Because the site is located at the junction of two major highways, it has high value for urban development.

While the City's *General Plan* has designated RiverPark Area 'A' for urban use since 1986 and mining of the site would be economically infeasible due to its location, expected poor quality of materials recovered, and other environmental factors, the loss of this mineral resource is a significant impact.

Loss of Availability of a Locally-Important Mineral Resource Recovery Site

Neither the City's *General Plan* nor other land use plans reviewed for this impact analysis have identified the RiverPark Specific Plan Area as a "locally-important mineral resource recovery site."

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14 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 22 February 2001. This quantity is based on the assumptions that the top 3 to 5 feet of material on RiverPark Area 'A' are comprised of agricultural soil and have no value as aggregate, and that only 50 percent of the materials excavated would have commercial value. This amount does not take into account material lost as a result of required setbacks from roadways and adjacent public and private uses.

15 Section 81078-9.6.2 of the Ventura County Zoning Ordinance states that no processing equipment or facilities shall be permanently located and no mining shall occur within the following horizontal setbacks:
   a. 100 feet of any dedicated public street or highway unless the Public Works Agency determines that a lesser distance would be acceptable.
   b. 100 feet of any dwelling not accessory to the project, unless a waiver is signed pursuant to Section 8107-9.6.13 allowing the setback to be reduced. In no case shall permanent processing facilities, equipment, or mining be located less than 50 feet from said structure.
   c. 200 feet from any institution, school, or other building used as a place of public assemblage, unless a waiver signed pursuant to Section 8107.9.6.12 allowing the setback to be reduced. In no case shall permanent processing facilities, equipment, or mining be located less than 100 feet from said structures.

Therefore, the RiverPark Project will not result in a significant impact in relation to loss of a locally important mineral resource recovery site.

Project Consistency with City's Mineral Resource Management Policies

Consistency with the City's *General Plan* Development Policies relative to mineral resources is addressed below. The RiverPark Project includes a proposed general plan amendment that would modify Policies 31 and 32. With this amendment, the text shown in italics below would be added.

C. Policies[16]

10. The City shall adequately control any mining activities and comment on the appropriateness of mining activities conducted under the authority of adjacent jurisdictions.

No mining activities are proposed on the RiverPark Specific Plan Area; however, the project would be consistent with this policy because extraction of the mineral resources in RiverPark Area 'A' is not feasible or economical. The City of Oxnard, based on the findings of this EIR and related studies, will ultimately determine whether mining activities should occur on RiverPark Area 'A'.

30. The City should promote the efficient reclamation of mineral resources areas.

RiverPark Area 'B' mining area is covered by a County-approved reclamation plan; however, the City will be asked to consider a new reclamation plan as part of the proposed RiverPark Specific Plan. The existing reclamation plan will remain in effect until the City of Oxnard and the State Department of Mine Reclamation approve the proposed reclamation plan. Although RiverPark Area 'B' is within unincorporated Ventura County, the City of Oxnard will ultimately determine whether the proposed reclamation plan and associated re-use of RiverPark Area 'B' represent an "efficient reclamation" of the site. As such, the project is consistent with this policy.

31. The management of mineral resource extraction activities which are currently outside the City limits but within the City's Sphere of *Influence may come under the jurisdiction of the City where the City determines that annexation best serves the community's interests.* Consideration of urban land uses in these areas *may be made if such uses will* occur only after or *in conjunction with completion* of reclamation requirements.

The project is consistent with this policy. RiverPark Area 'B' is currently outside City limits, but is within the City's Sphere of Influence. This area will be annexed to the City of Oxnard as part of this

16 Policies 1 through 9, and 11 though 29 of the General Plan's Development Policies do not apply to mineral resources.

project. A new reclamation plan is currently under consideration and subject to approval by the City of Oxnard. Once approved, the City will ensure implementation of the reclamation plan.

32. In MRZ-2 Areas designated for land uses other than low density residential, industrial, open space and agriculture, the extraction of mineral resources prior to permitting development should be encouraged *where such extraction is feasible and economical*.

Although RiverPark Area 'A' is in an MRZ-2 area, the City's *General Plan* designates RiverPark Area 'A' as committed to urban development. Furthermore, the location and configuration of the RiverPark Area 'A' site, as well as other environmentally-related issues (e.g., poor aggregate quality, high water table, required setbacks from adjacent properties, etc.), make aggregate mining on the site uneconomical.[17] Therefore, while it is the City's policy to encourage mineral extraction where possible, prior land use decisions and the physical restrictions of the site make mining impractical.

33. The approval of new development adjacent to an operational aggregate mine or MRZ-2 area should be designed and conditioned to avoid impinging on mining operations.

Mining operations on RiverPark Area 'B' have ceased and no other mining operations occur adjacent to in or in close proximity to the RiverPark Specific Plan Area. Furthermore, neither RiverPark Area 'A' or adjacent properties are considered developable for aggregate mining (see discussion below regarding the mining potential of RiverPark Area 'A'). Therefore, the project proposes no new development adjacent to actively mined areas or adjacent to a developable MRZ-2 area. As a result, this policy does not apply to the proposed project.

34. New mining operations should be designed to produce the least amount of incompatibility with surrounding, existing land uses (i.e., limited hours of operation, pest control, etc.).

35. Specialized production techniques, such as slant drilling, shall be required to limit the land area committed to oil recovery and to extract such resources adjacent to existing development.

No new mining operations are proposed as part of this project; therefore, no further analysis relative to Policies 34 and 35 is required.

Project Consistency with SMARA Section 2763(a)

Section 2763(a) of SMARA states:

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17 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 22 February 2001.

> *Lead agency land use decisions involving areas designated as being of regional significance shall be in accordance with the lead agency's mineral resource management policies and shall also, in balancing mineral values against alternative land uses, consider the importance of these minerals to their market region as a whole and not just their importance to the lead agency's area of jurisdiction.*

As discussed previously, the project is consistent with the City's mineral resource management policies. No further mining operations are proposed on RiverPark Area 'B' because it is no longer economically feasible to mine the site (see discussion above) and the remaining resources would not make significant contributions to the aggregate market. The volume of recoverable aggregate material on RiverPark Area 'A' that is designated as a regionally significant resource area is estimated to be 1.5 million cubic yards, or approximately 2.2 million tons.[18] This calculation assumes that the site has 5 feet of overburden or topsoil, and that mining of the site would be practical only to within 10 feet of historic high groundwater.[19] It was also conservatively assumed that 50 percent of the material that would be recovered on the site would be usable for building materials (actual recovery at the Hanson Aggregates plant site on RiverPark Area 'B' has been between 25 and 50 percent). This amount does not take into account material lost as a result of setback requirements for the site that would reduce the mineable area. Material quality at RiverPark Area 'A' also is a concern because mining operations on western RiverPark Area 'B' (closest to RiverPark Area 'A') encountered a higher clay content than the plant and pit perimeter areas, particularly at shallow depths near the river levee, which suggests that mineral resource quality on RiverPark Area 'A' could be poor.

As of 1997/98, Western Ventura County has been importing 100 percent of its aggregate materials from Simi Valley, Los Angeles County, and Kern County, resulting in additional transportation costs and associated environmental effects. While the benefits of producing this material on the RiverPark Specific Plan Area would be high, especially in a region that has no current production, the environmental and economic costs of producing the material (in addition to mining restrictions on depth and width of operations along the river and competition from highly productive cash crops[20]) can be great. As of 1997/98, no mining permits have been issued in the Western Ventura County PCR for environmental reasons.[21] For those same reasons, no permits are expected to be issued in the foreseeable future, and there is no guarantee that a mining permit for RiverPark Area 'A' (if filed) would be approved. Furthermore, the quality of the aggregate materials underlying the site is questionable given the higher clay content at shallow depths found near the river levee on the western portion of

18 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 22 February 2001.

19 As previously mentioned, groundwater levels encountered in previous subsurface explorations in the RiverPark Area 'A' area have ranged from 11 to 30 feet below ground surface.

20 Ventura County General Plan, Resources Appendix, p. 40.

21 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 21 February 2001.

RiverPark Area 'B', adjacent to the RiverPark Area 'A' site. Therefore, it is not cost-effective to seek a permit to mine an aggregate resource in an environmentally-sensitive area, especially one that is believed to be of a relatively small quantity and of an unknown quality.

Cumulative Impacts

Cumulative Geotechnical Impacts

Geotechnical impacts are site specific in nature and each development site is subject to, at minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region. Because the development of each site in the project area would have to be consistent with City of Oxnard requirements and the adopted Uniform Building Code as it pertains to protection against known geologic hazards, impacts of cumulative development would be less than significant given known geologic considerations.

Slope stability impacts associated with RiverPark Area 'B' are isolated to that Specific Plan Area Therefore, as with the proposed project, cumulative development projects are expected to be consistent with jurisdictional requirements relative to geologic hazards and there would be no significant cumulative development impacts relative to slope stability.

Cumulative Impacts to Mineral Resources

The State has determined that the annual per capita consumption rate for aggregates in the Western Ventura County Production Consumption Region (PCR) is 11.0 tons. Based upon population projections developed by the County, the Southern California Association of Governments, and the State Department of Finance, the Western PCR population is expected to exceed 700,000 by the year 2030; therefore, the cumulative demand for aggregates is 310 million tons by 2030.[22]

The State has estimated that the Western Ventura County PCR has a total remaining aggregate supply of 4,077 million tons[23]; however, given the mining restrictions[24] currently in place in the County, only

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22 Ventura County General Plan, Resources Appendix, as amended July 12, 1994, p. 31. The County's General Plan Resources Appendix (page 31) acknowledges that this projection is a very gross measure of demand and has an inherent degree of uncertainty due to recessions, natural disasters, etc.

23 Ingrid Elsel, West Coast Environmental, correspondence to Impact Sciences, Inc., 21 February 2001.

24 The County has set depth / profile standards for aggregate excavations in order to stabilize the riverbed and to promote downstream transport of sediment from the upper reaches of the river to the degraded lower reaches of the river. (Ventura County General Plan Goals, Policies and Programs, amended July 18, 1995, p. 16.)

an estimated 200 million tons of this amount is potentially available for this PCR.[25] As a result, there is a significant shortfall of aggregate available in this PCR to meet the projected demand and, as mentioned, as of 1997/98, 100 percent of the aggregate for this PCR are imported from other areas. RiverPark Area 'A' has a mineral resource potential of 2.2 million tons; however, because mineral resource extraction on the site is unlikely due to environmental and economic constraints, the loss of this resource is not realistically expected to exacerbate the shortfall of aggregate resources in this PCR.

It should be noted, however, that the adjacent Simi PCR has surplus resources beyond the projected demand within its own region. Given its proximity to the Western Ventura County PCR, it is a likely alternative source of aggregates. Additional sources of supply may also include surplus aggregates in the Saugus Newhall PCR[26] and Kern County. Given those potential sources of supply, the cumulative impact of population growth in the Western Ventura County PCR on aggregate resources would be less than significant.

MITIGATION MEASURES

General Site Preparation Measures

4.3-1 During the initial stage of the mitigation of unstable soil units during site preparation, organic material and vegetation, hazardous materials, old foundations from demolished structures, underground utilities, debris, unsuitable fill materials, and/or deleterious materials shall be stripped, removed, and wasted from construction areas by the contractor. Abandoned below-grade or underground structures, such as wells, cesspools, pipelines, mining equipment, old foundations, etc., that are not relocated prior to grading shall be removed or treated in a manner prescribed by the controlling governmental agencies.

4.3-2 Grading shall be performed by the contractor in accordance with the City of Oxnard grading ordinance and Chapter 33 of the Uniform Building Code (1997).

4.3-3 Artificial fill materials should be removed down to competent native earth materials. The excavation bottom should be observed by the Geotechnical Engineer or Geologist prior to processing the excavation bottom and placing backfill. Once the bottom has been accepted by the Geotechnical Engineer, the exposed surface shall be scarified by the contractor to a depth

25 Ventura County General Plan, Resources Appendix, as amended July 12, 1994, p. 38. This amount is based on the fact that, in 1990, only 4.1 percent of the total deposits in heavily mined sectors at that time were actually available for extraction. This factor is acknowledged as being conservative (p. 39).

26 Ventura County General Plan, Resources Appendix, p. 40.

of 8 inches, aerated or moistened as required to bring the soil to within 2 percent of optimum moisture content, and compacted to a minimum of 93 percent relative compaction, according to ASTM D1557. If the excavation bottom requires stabilization or if scarification is likely to induce pumping conditions, scarification of the excavation bottoms near the groundwater level may be waived by the Geotechnical Engineer.

4.3-4 To reduce the potential for unstable subgrade conditions in excavations near the groundwater level during grading, the contractor shall consider using equipment that imparts light loads to the subgrade in order to help avert "pumping" subgrade conditions. Should groundwater be encountered during excavation, the dewatering contractor shall be responsible for the design of the dewatering system. The design shall prevent piping and soil migration, or erosion, and shall draw down the water level a minimum of 5 feet below any point along the excavation bottom. The Geotechnical Engineer shall provide on-site inspection to ensure that this measure is implemented.

4.3-5 To mitigate unstable subgrade which may develop during grading, special stabilization measures shall be implemented by the contractor and as specified by the Geotechnical Engineer. If soft or pumping subgrade is encountered during grading (e.g., excavation bottom near groundwater level), one of the following measures shall be employed to provide a firm and unyielding subgrade surface:

- use of a geosynthetic fabric, such as Mirafi 600X, or equivalent, placed beneath a minimum one foot lift of gravel or rock fill,
- working of rock fill into clayey subgrade soils, or
- working cement into sandy subgrade or lime into clayey subgrade.

Any special subgrade stabilization measures shall be approved and observed by the Geotechnical Engineer.

4.3-6 During the mitigation of unstable soil units during site preparation at the Specific Plan Area on-site materials used as backfill shall be free of organic material, hazardous material, debris, or any other deleterious materials. Backfill in deep removal areas (i.e., exceeding 25 feet in depth) shall consist of granular materials in the lower 50 feet. Clay (i.e., potentially expansive materials) shall not be placed by the contractor in the upper 5 feet (with respect to proposed grade) of backfill.

4.3-7 During the backfilling of excavations resulting from artificial fill removal or placement of fill in slope areas, rock or gravel less than 4 inches in maximum dimension may be utilized by the contractor in the fill, provided those materials are not placed in concentrated pockets and provided they have sufficient sand-sized material surrounding the individual rock fragments. Fill material shall not contain more than 20 percent by weight of particle sizes larger than 2 inches.

4.3-8 During the backfilling of excavations resulting from artificial fill removal or placement of fill in slope areas, imported fill that may be used on the site by the contractor shall be equal to or better than on-site materials in gradation, strength, and expansive characteristics. Imported fill material shall be evaluated by the Geotechnical Engineer to verify suitability for its intended use.

4.3-9 During the backfilling of excavations resulting from artificial fill removal or placement of fill in slope areas, fill materials shall be placed by the contractor in layers that do not exceed 8 inches in loose thickness. Each layer shall be spread evenly, moisture-conditioned to within 2 percent above or below optimum moisture content, and processed and compacted to obtain a uniformly dense layer. The fill shall be placed and compacted on near-horizontal planes to a minimum of 93 percent (relative compaction) of the maximum dry density as determined from ASTM D1557.

Mitigation for Construction Impacts

4.3-10 To mitigate potential unstable slope conditions during grading, temporary excavation slopes shall be continuously monitored by the contractor and loose or unstable soil masses shall be removed immediately. The contractor shall ensure that temporary slopes and excavations shall conform to federal Occupational Safety and Health (OSHA) regulations and California Division of Occupational Safety and Health (DOSH) regulations, and other applicable local ordinances and building codes, as required. The contractor should be responsible for the design and construction of shoring systems such that the construction will not result in settlement or instability of nearby structures. Stockpiled materials or equipment shall not be placed within a distance from the slope crest on RiverPark Area 'B' equal to the height of the slope.

4.3-11 To mitigate potential unstable slope conditions during grading, the contractor shall ensure that runoff is directed away from temporary slopes and shall not be allowed to flow across

slope faces and excavations. Provisions shall be made by the contractor for collecting and pumping seepage or water out of excavations.

4.3-12 To mitigate potential unstable slope conditions during grading, impacts from rapid recharge during dewatering operations shall be reduced by the contractor by discharging pumped water to more distant basins, such as the Large Woolsey pit, or the UWCD El Rio Spreading Grounds.

4.3-13 To mitigate the potential for surface erosion during grading, sandbags, desilting basins, and other temporary surface drainage devices shall be used by the contractor to control water runoff. Wind erosion shall be controlled with the use of water trucks and silt fences, as necessary.

Mitigation for Impacts Associated with Seismic Hazards

4.3-14 Prior to final design, a site-specific study for the different development types (i.e., residential, commercial, and educational) and with a specificity commensurate with individual structure use, size, and footprint, shall be completed to estimate the potential for liquefaction-induced differential settlement in submerged native earth materials. Although a significant impact from liquefaction is not anticipated in native materials on the RiverPark Specific Plan Area, site-specific evaluations of that potential shall be performed within footprint areas of future commercial and educational facilities to verify that there is no significant impact within specific building areas. Measures to reduce the liquefaction hazard, if any, to less than significant, shall be included in the study. These studies shall require review and approval by the City of Oxnard.

4.3-15 To mitigate the potential for liquefaction–induced settlement in existing artificial fills those materials shall be removed and replaced by the contractor as compacted fill placed in accordance with the "General Site Preparation Measures," presented previously.

4.3-16 To mitigate the potential for lateral spreading in existing artificial fill materials, one of the following two methods shall be implemented: 1) removal and compaction of the fill materials in accordance with the "General Site Preparation Measures," presented previously, or 2) ground-improvement (such as deep dynamic compaction or vibroflotation) in granular fill materials. Site-specific studies shall be conducted by the Geotechnical Engineer to further evaluate the potential for lateral movements in native alluvial materials at the

site and to select the appropriate treatment (i.e., ground improvement) method and develop specifications for that treatment, where necessary.

4.3-17 To mitigate the potential for seismically induced settlement in the loose artificial fill materials on the site, the contractor shall remove existing artificial fill materials down to competent native materials and replace those materials as a controlled, compacted fill, in accordance with the "General Site Preparation Measures," presented previously. The slight potential for seismically induced settlement in the native sand and sandy silt materials either shall be mitigated through foundation design of the proposed structures or shall be (at least) partially mitigated with the overexcavation and recompaction of surficial soils in building areas, so that the resulting potential can be tolerated in the structure design.

Mitigation for Impacts Associated with Soil Instability

Most of the following potential significant impacts associated with soil instability (with the exception of expansive soils) result from the presence of loose, uncontrolled artificial fills on the RiverPark Specific Plan Area. Those significant impacts shall be mitigated by the removal and replacement of those materials as a controlled, compacted fill.

Hydroconsolidation

4.3-18 To mitigate potentially significant impacts associated with hydroconsolidation, artificial fill materials shall be removed and replaced by the contractor as a controlled, compacted fill in accordance with the "General Site Preparation Measures," presented previously, or as specified by the Geotechnical Engineer.

Consolidation

4.3-19 To mitigate potentially significant impacts associated with consolidation and compressibility, existing artificial fill materials shall be removed and replaced by the contractor as a controlled, compacted fill in accordance with the "General Site Preparation Measures," presented previously.

Artificial Fill

4.3-20 To mitigate potentially significant impacts associated with the variability of existing artificial fill materials, artificial fill materials on the Specific Plan Area shall be removed

and replaced as controlled, compacted fill in accordance with the "General Site Preparation Measures," presented previously.

4.3-21 During the mitigation of existing artificial fill in the stockpile area, removals are anticipated to extend below the current groundwater level and may require dewatering by the contractor. Removal bottoms shall be observed by the Geotechnical Engineer or Geologist. If fill remains in the excavation bottom, the excavation shall be deepened by the contractor until the fill is completely removed. The bottom shall be firm or dense and unyielding. If unstable conditions are encountered, the excavation bottom shall be stabilized. Fills in these areas shall be placed by the contractor in accordance with the "General Site Preparation Measures," presented previously.

4.3-22 To mitigate potentially significant impacts associated with artificial fill in the plant area on RiverPark Area 'B', the entire plant area shall be overexcavated by the contractor to a minimum depth of 20 feet below existing grade, or 5 feet below proposed grade, whichever is deeper. The bottom of excavation shall be observed by the Geotechnical Engineer or Geologist prior to processing. Areas where artificial fill is exposed in the bottom will require deeper removals, so that the existing artificial fill is completely removed. The depth of removal and fills in those areas shall be determined by the Geotechnical Engineer or Geologist.

4.3-23 To mitigate potentially significant impacts associated with artificial fill and to reduce differential settlements in the fill, areas adjacent to deepened removals shall be excavated by the contractor to a depth such that the variation in fill thickness does not exceed 20 percent. Alternatively, areas where the fill thickness variation exceeds 20 percent shall be designated by the Geotechnical Engineer for nonstructural uses. Additionally, deep removals (e.g., in stockpile area) shall overlap a sufficient distance into the adjacent constructed fill to ensure that existing artificial fill is removed and the compactness of the fill being placed is consistent throughout.

Expansive Soils

4.3-24 To mitigate potentially significant impacts associated with expansive soils, foundations bearing on soils with a low to moderate shall be designed with deeper perimeter footing embedment to act as a barrier for moisture migration under interior floor slabs; low to moderately expansive foundation subgrade shall be pre-moistened to reduce the potential

and the effects of shrink/swell cycles beneath the slabs; and slabs shall be thickened and contain additional reinforcement, as specified by the Geotechnical Engineer.

Mitigation for Impacts Associated with Slope Instability

General Background Discussion

The existing pit slopes can be mitigated to effect the minimum factor of safety requirements being used by the City of Oxnard for gross stability (these measures are described below). Additionally, reducing lateral movements of occupied structures near pit slope crests is feasible by establishing structure setback criteria and, where setbacks currently are not sufficient, reducing lateral movements by providing lateral reinforcement to the upper portion of the pit slopes.

Laying back existing slopes to 2- to 2-1/2h:1v increases the factor of safety under static and pseudostatic conditions to exceed 1.5 and 1.1, respectively, and reduces the potential for relict unstable fills in the slopes. However, there are some areas where laying back the entire slope to effect a more stable configuration is not viable because of the proximity of the slope crest to either the proposed development or adjacent private or public properties. For those areas, reinforcing the upper half of the slope by providing additional lateral resistance from, for example, drilled piers, tiebacks, or minipiles would decrease the lateral movements behind the slope crest.

Additionally, artificial fills should be removed and replaced with compacted fills that are keyed and benched into native, undisturbed slope materials. On the basis of the slope evaluations and the objectives of the Slope Reclamation Plan, potential slope envelopes have been developed for the pit slope areas to improve slope stability and to reduce lateral movements to suggested tolerable values in accordance with the City of Oxnard and the SCEC (2000).

The following recommended mitigation measures for stabilizing the existing pit slopes as shown on the proposed Slope Reclamation Plan are based on the following assumptions:

- The water level in the pits will recede to below 45 feet above msl to allow conventional (dry) grading methods.
- The exposed benches at about that elevation (i.e., 45 feet above msl) comprise native, undisturbed materials.
- Native materials adjacent to all slope areas consist of granular soils.
- Artificial fills will be removed in the course of implementing the Slope Reclamation Plan.

4.3-25 Prior to grading on RiverPark Area 'B', Mitigation Measures 26 through 38 shall include a performance standard specified by the Geotechnical Engineer, as well as an alternative measure in the event unanticipated slope conditions prevail (see Table 1 in the July 2001 Fugro West, Inc. report in **Appendix 4.3** of this EIR).

4.3-26 To mitigate potentially significant impacts associated with instability of the **Brigham Pit - Southwestern Slope:** The extensive artificial fills along the northwestern two-thirds of the southwestern slope of the Brigham pit shall be removed by the contractor down to a native bench that appears between elevations of about 40 and 50 feet above msl on the 1977, 1988, 1989, and 1992 topographic maps. Placement of fill above the exposed native bench shall be in accordance with conventional grading methods, including the keying and benching of fill materials into dense, undisturbed native materials. Undisturbed native slopes below that bench that are found to be steeper than a 2- to 2-1/2h:1v gradient shall be laid back to inclinations of 2- to 2-1/2h:1v. (The top of the reconstructed fill slope is approximately shown as the brown envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-27 To mitigate potentially significant impacts associated with instability of the **Brigham Pit - Western Corner:** The deep fill at the southeastern quarter of the stockpile area will require removals by the contractor to below El. 10 feet, thereby necessitating local dewatering. The fill removal on the Brigham pit side of that deep removal shall extend down to native materials, which, according to the 1977, 1988, 1989, and 1992 topographic maps, are likely between elevations of about 40 and 50 feet above msl. The fill on the native bench shall be placed according to conventional grading methods, including keying and benching of the fill into dense undisturbed native materials. (The toe of the pitward fill slope is approximately shown as the green envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-28 To mitigate potentially significant impacts associated with instability of the **Brigham Pit - Southeastern Slope and Southern Corner:** The southeastern slope of the Brigham pit should be laid back by the contractor at about 2- to 2-1/2h:1v, as shown by the blue envelope on **Figure 4.3-2, Slope Reclamation Plan**. The proposed East Detention Basin will be set back a horizontal distance of about 40 feet from the top of the southeastern slope of the Brigham pit. To accommodate that setback, the existing basin (i.e., El Rio Drainage Basin No. 1) slope should be shifted to the southeast by constructing a fill over the existing basin slope face.

The southern corner (i.e., the southeastern end of the southwestern slope) also shall be laid back to inclinations of 2- to 2-1/2h:1v and existing artificial fill in the upper portion of the

slope shall be removed and replaced with compacted fill. (The top of the combination slope is shown as the brown/blue envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-29 To mitigate potentially significant impacts associated with instability of the **Brigham Pit - Northwestern End:** The slope along the northwestern end of the Brigham pit may be reconstructed pitward by the contractor by placing fill over a native bench suggested in the 1977, 1988, 1989, and 1992 topographic maps, at an elevation of about 40 to 50 feet above msl. Placement of fill above the native bench shall be in accordance with conventional grading methods, including the keying and benching of fill materials into dense, undisturbed native materials. Undisturbed native slopes below the conventionally-constructed fill slope that are found to be steeper than a 2- to 2-1/2h:1v gradient shall be laid back to inclinations of 2- to 2-1/2h:1v. (The toe of the pitward fill is approximately shown as the green envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-30 To mitigate potentially significant impacts associated with instability of the **Vickers Pit - Northwestern End:** The existing fill peninsula in the Vickers pit will be largely removed to generate fill materials for the overall project. For pitward slope construction, existing fill materials at the northwestern end of the Vickers pit shall be removed by the contractor down to a native bench suggested by the 1977, 1988, 1989, and 1992 topographic maps at about El. 45 to 50 feet within a distance of roughly 100 feet from the current slope crest in the plant area. The steep slope below the native bench shall be laid back to about 2-1/2h:1v.

To extend the development area further pitward (i.e., greater than about 100 feet beyond the current slope crest), the removals shall extend down to about El. 40 to 50 feet, and 10 feet above the groundwater level. That area shall be densified by the contractor using DDC to a horizontal distance pitward of about 2 to 3 times the thickness of the fill being densified, followed by laying back the pitward edge of the improved zone at about 2- to 2-1/2h:1v. The fill placed above the densified layer shall be constructed at 2- to 2-1/2h:1v with conventional grading methods. (The toe of the pitward fill slope is approximately shown as the magenta envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

The fill placed above the densified layer of hydraulically placed fill along the northern third of the existing fill peninsula (i.e., the north end of northwestern slope of the Vickers pit) shall be mechanically reinforced with geogrid, metal strips, or cement to limit the pitward extension of the overall slope toe (comprising DDC-densified materials), because beyond the slope envelope shown on the Slope Reclamation Plan, the submerged fill

thickness likely exceeds the "reach" of the DDC treatment. (This slope area is approximated by the lavender envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-31 To mitigate potentially significant impacts associated with instability of the **Vickers Pit - Southeastern Slope:** The southeastern slope of the Vickers pit shall be laid back to 2- to 2-1/2h:1v. (The resulting slope crest area is approximated by the blue envelope on the **Figure 4.3-2, Slope Reclamation Plan**.) The proposed East Detention Basin will be set back a horizontal distance of about 40 feet from the top of the southeastern slope of the Vickers pit. To accommodate that setback, the existing basin (i.e., El Rio Drainage Basin No. 1) slope shall be shifted to the southeast by constructing a fill over the existing basin slope face.

4.3-32 To mitigate potentially significant impacts associated with instability of the **Small Woolsey Pit - Northern End:** The northern end of the Small Woolsey pit shall be laid back at about 2- to 2-1/2h:1v by the contractor. Artificial fill materials above an elevation of about 50 feet above msl, where according to the 1977, 1988, 1989, and 1992 topographic maps, native materials are likely to be encountered, shall be removed and replaced as a compacted fill. This removal shall continue northwestward and northward so that existing artificial fill is removed in the proposed detention basin area and along the northern end of the RiverPark development. (The slope crest area is approximated by the blue/brown envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-33 To mitigate potentially significant impacts associated with instability of the **Small Woolsey Pit - Northwestern Corner:** The pitward extension of the development at the northwestern corner of the Small Woolsey pit consists of the underwater construction of a rock dike up to an elevation of a few feet above the groundwater level (El. 45 feet), followed by the placement of hydraulic (granular) fill against the rock dike. The submerged hydraulically placed fill shall then be densified by the contractor using vibroflotation, followed by the construction of a mechanically reinforced fill (e.g., with geogrid, metal strips, or cement) above the densified surface, using conventional grading methods. If the groundwater recedes below an elevation of about 45 feet, DDC may be used as an alternative method to densify the hydraulically placed fill. (This slope area is the dark blue envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-34 To mitigate potentially significant impacts associated with instability of the **Small Woolsey Pit - Southeastern Slope:** Portions of the southeastern slope of the Small Woolsey pit are steeper than 2h:1v. For example, the lower 30 feet of the slope below the currently

exposed bench at about El. 45 feet at the northwestern end of the pit (formerly an access road to the pit bottom), appears to be about 1/2h:1v according to the 1992 topographic map. Alternatives for increasing the stability and increasing the distance between the slope crest and the property line (and to reduce lateral movements at the property line) along the southeastern slope of the Small Woolsey Pit consist of the following:

- Laying the steep slope areas back to 2- to 2-1/2h:1v, and/or
- Reinforcing the upper portion of the slope with drilled piers to reduce lateral movements at the property line or adjacent occupied structures to less than 2 inches.

The artificial fills placed during the slope repair at the eastern corner (i.e., the southern end of the southeastern slope) of the Small Woolsey pit shall be removed down to native materials. That slope area shall be reconstructed at a gradient of 2- to 2-1/2h:1v using conventional grading methods. Reinforcing the upper portion of the reconstructed slope using, for example, drilled piers may be necessary to reduce lateral movements at the property line or adjacent occupied structures to less than 2 inches.

4.3-35 To mitigate potentially significant impacts associated with instability of the **Large Woolsey Pit - Northern Detention Basin Over Southwestern End:** Artificial fill at the southwestern end of the Large Woolsey pit shall be removed down to about El. 40 by the contractor, where according to the 1977, 1988, 1989, and 1992 topographic maps, native materials are likely to be exposed. The pit fill slope shall be constructed at about 2-1/2h:1v. For granular soil conditions, the proposed detention basin shall be set back at least 20 feet from the top of the northwestern slope of the Small Woolsey pit and the top of the proposed southwestern fill slope of the Large Woolsey pit. Fill materials shall comprise on-site sand and gravelly sand so that seepage forces are not introduced near the pit slopes in the event of a leak in the basin liner. (The slope crest area is approximated by the brown envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-36 To mitigate potentially significant impacts associated with instability of the **Large Woolsey Pit - Southeastern Slope:** The northeastern half of the southeastern slope of the Large Woolsey pit (i.e., where the toe extends to about El. 10 feet) shall be laid back by the contractor at about 2- to 2-1/2h:1v to expose undisturbed native materials. Additionally, the artificial fill placed during the slope repair at the northeastern end of the southeastern slope shall be removed down to native, undisturbed slope materials. Some areas may require

lateral reinforcement of the upper portion of the slope to keep lateral movements below significant threshold levels for adjacent occupied structures.

To increase the setback behind the slope crest to the property line (thereby decreasing lateral movements at the property line), the southwestern half of the southeastern slope (i.e., where the pit bottom is between about El. 35 and 40 feet), can be reconstructed about 20 to 30 feet pitward on the broad native bench exposed at about El. 45 feet. The slope may be constructed using conventional grading methods at a gradient of about 2- to 2-1/2h:1v. (The approximate slope crest envelope to effect the increased setback along the southwestern portion of the southeastern slope is shown in brown on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-37 To mitigate potentially significant impacts associated with instability of the **Large Woolsey Pit - Northeastern Slope:** The northeastern slope shall be laid back by the contractor at 2- to 2-1/2h:1v. (The slope crest area for the 2- to 2-1/2h:1v configuration is approximated by the blue envelope on **Figure 4.3-2, Slope Reclamation Plan**.) In some areas of the northeastern slope, the 2- to 2-1/2h:1v inclination may encroach the County of Ventura drainage easement. If that encroachment is not acceptable, the upper portion of the slope may be reinforced with drilled piers to increase the factor of safety of a 2h:1v gradient to an acceptable level.

4.3-38 To mitigate potentially significant impacts associated with instability of the **Large Woolsey Pit - Northwestern Slope:** The northwestern pit slope that parallels the Santa Clara River levee shall be laid back at 2- to 2-1/2h:1v by the contractor. The southwestern third of thee slope shall be trimmed back by lowering the existing gradient so that native materials are exposed and the resulting gradient is 2- 2-1/2h:1v or flatter. (The slope crest area is approximated by the blue envelope on **Figure 4.3-2, Slope Reclamation Plan**.)

4.3-39 To mitigate potentially significant impacts associated with unstable slopes, prior to preparation of site grading plans for the slope areas, site-specific geotechnical studies shall be performed by the Geotechnical Engineer. Those studies shall evaluate the uniformity of slope materials and verify that benches (where keyways are planned for reconstructed slopes) consist of native, undisturbed materials. Areas between proposed dry swales and the slope faces shall be explored to verify the absence of continuous clay layers. These studies shall require review and approval by the City of Oxnard.

4.3-40 To mitigate potentially significant impacts associated with unstable slopes, the following elements shall be included in the design-level study of the pit slopes by the Geotechnical Engineer:

- An evaluation of the composition and strength of slope materials, consisting of incremental penetration resistance tests, the continuous characterization of overall slope materials, and laboratory tests appropriate for the material composition, grain-size, and sample quality. Continuous characterization of slope materials may be achieved by excavating a trench above the full, unsubmerged upper portion of the pit slope face.
- The extent of artificial fills shall be explored further by reconnaissance mapping and trenching.

These studies shall require review and approval by the City of Oxnard.

Once additional field data and material samples are collected and evaluated, higher strengths for slope materials may be justifiable. If higher strength values result, reevaluation of slope stability and lateral movements should reduce the lateral movements estimated herein and increase the factors of safety for gross stability under static and pseudostatic conditions.

Mitigation for Lateral Movement

4.3-41 Seismically induced lateral movements should decrease with increasing distance from the top of the slope. Occupied structures shall be located on the final site map at least 80 feet beyond the top of unreinforced slopes to limit seismically induced lateral movements to less than 2 inches (as recommended by the SCEC [2000]). Setback distances from slope crests to occupied structures (or property lines, where applicable) may be reduced to about 30 feet in areas where the upper slope is laterally reinforced with drilled piers or other means such as tiebacks or minipiles. The Geotechnical Engineer shall confirm setback distances prior to final map approval.

4.3-42 Dry swales, detention basins, greenbelt areas, and streets may be located on the final site map within 80 feet of the slope crest provided those improvements can potentially accommodate several inches of seismically induced lateral movement. Alternatively, damage to dry swales and streets from seismically induced lateral movements can be subsequently repaired. The Geotechnical Engineer shall confirm final locations of these facilities prior to final map approval.

4.3-43 To mitigate potentially significant impacts associated with lateral movement, utility lines shall be placed by the contractor on opposite side (from slope crest) of streets planned within 50 to 100 feet of the pit slope crests to maximize the setback and shall have flexible connections able to withstand movements of at least 2 inches.

4.3-44 To mitigate potentially significant impacts associated with lateral movement, private properties located adjacent to slope crests shall be inventoried by the Geotechnical Engineer for occupied structures,[27] so that setback criteria can be satisfied and/or owners apprised of the risk of earthquake-induced lateral movements to their structures and improvements (whether occupied or not). The Geotechnical Engineer shall provide documentation of this inventory to the City of Oxnard. Any notifications to adjacent owners of the risk of earthquake-induced lateral movements shall be as specified by the City Attorney.

UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

No unavoidable significant geotechnical or geologic hazard impacts will result from the RiverPark Project.

The loss of access to approximately 2.2 million tons of mineral resources underlying the agricultural soils in RiverPark Area 'A' is considered an unavoidable significant impact of the RiverPark Project.

27 The California Division of Mines and Geology (CDMG, 1977) defines an occupied structure as one that is occupied at least 2,000 person-hours per year.