3D Cultural Resources, Geology, Hydrology and Water Quality

3D.1 Introduction

This section provides an assessment of geologic features and soils in the vicinity of the proposed project site. Information in this section is based on the following reports: *Preliminary Geologic and Soils Engineering Evaluation,* prepared by J. Byer Group, Inc, July 12, 2006 and; *Geotechnical Memoranda Master Plan (Lots 9-10, 13-25 and 27, Tract 6014 and a portion of Lots 21 and 22, Tract 6515 Woodstock Road and Leicester Drive)*, prepared by J. Byer Group, Inc, January 10, 2007 and November 1, 2007. This section also briefly addresses Cultural Resources based on a records check with the South Central Coastal Information Center (see Appendix I).

3D.2 Environmental Setting

The project site lies on the eastern edge of the Santa Monica Mountain, located within the geomorphic province known as the Transverse Ranges. The Transverse Ranges are a series of east-west trending mountain ranges and broad alluvial valleys that extend approximately 320 miles from Point Arguello in the west to the Little San Bernardino Mountains at the edge of the Mojave and Colorado Desert provinces in the east. This geomorphic province includes Ventura County and portions of Los Angeles, San Bernardino, and Riverside Counties.

Prominent basins and ranges in the Transverse Ranges include the Ventura basin and the San Gabriel and San Bernardino Mountains. Several active faults, including the San Andreas Fault Zone, are located in the Transverse Ranges. Faults in the province include the Santa Clara River Valley fault, the San Gabriel Fault Zone, the Santa Cruz Island faults, the Santa Rosa Island Faults and the Soledad faults. This province is one of the most geologically diverse in California, containing a wide variety of bedrock types and structures. The Transverse Ranges include California's highest peaks south of the central Sierra Nevada and the only Paleozoic rocks in the coastal mountains in the United States. The province is subdivided into ranges and intervening valleys. Broad alleviated valleys, narrow stream canyons, and prominent faults separate these ranges.

Cultural Resources

Given the steepness of the site and the general location the potential for encountering resources is considered low.[1]

[1] Cultural Resources records check with the South Central Coastal Information Center, November 21, 2007; see Appendix I.

Topography

The project site consists of 22 hillside lots in the Santa Monica Mountains. The lots are on the western flank of a north trending secondary ridge. The generally topography is sloping hillsides that descend approximately 100 feet at average gradients of 36 degrees. Three westerly trending canyons convey drainage from the western flank of the north trending ridge to Leicester Drive toward Thames Street to the west. The area surrounding the project site generally consists of hillside development.

Soils

The formation of surficial soil depends on the topography, climate, biology, local vegetation, and the material on which the soil profile is developed. Soils within the project area generally consist of brown to dark brown silty sand that is slightly moist and loose to medium dense. Natural residual soil blankets the bedrock on portions of the site. The soil layer described in the geologic report is one to four and a half feet thick.

Alluvium is a soil or sediment that is usually deposited by a river or other running water. Natural alluvium underlies a portion of the secondary canyon on the site, along the axis of the canyon on Thames Street. This alluvium is approximately eight feet thick and consists of silty to clayey sand that is brown, moist and medium dense to dense.

Alluvial terrace is a terraced embankment of dense material typically adjacent to a river valley. Alluvial terrace deposits underlie the subject property at the eastern portion of Lots 21 and 25 (See Chapter 2, Table 2-1 lots and addresses of project lots) adjacent to Leicester Drive. The terrace deposits consist of silty and gravelly sand that is reddish brown, slightly moist and dense.

Bedrock is the native rock underlying the earth's surface; it is the unbroken, solid rock found underneath surface soils. Bedrock underlying the site consists of granite[2] (quartz diorite). The bedrock is exposed in cut slopes along Thames Street, Leicester Drive and Woodstock Road. The bedrock is tan to reddish brown, jointed, locally fractured and moderately hard to hard. The upper two to three feet of the bedrock is weathered.

Geologic Structure

The bedrock described is common to the Santa Monica Mountains. The granite bedrock is generally massive and lacks significant structural planes. Several joint and shear planes within the road cuts strike in various directions and are generally steeply dipping. The bedrock is grossly stable and massive in structure. The alluvial terrace is generally massive to horizontally layered and lacks significant structural planes.

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[2] Dribblee, Thomas W. Jr., *Geologic Map of the Hollywood and Burbank (South ½) Quadrangles, Los Angeles County*; California. 1991

Seismicity

The Los Angeles area contains both active and potentially active faults and is considered a region of high seismic activity.[3] The project site is located within California Building Code Seismic Zone 4. Areas within Zone 4 are expected to experience maximum magnitudes and damage in the event of an earthquake. In the past 100 years, several earthquakes of magnitude 5.0 or larger have been reported on the active San Andreas, Garlock, and San Fernando fault systems. In Southern California, the last earthquake exceeding Richter magnitude 8.0 occurred in 1857. Much more frequent are smaller tremors such as the moderate 1992 Landers earthquake (Richter magnitude 7.0) and the 1971 San Fernando and 1994 Northridge earthquakes (Richter magnitude 6.7). These earthquakes caused extensive damage throughout Southern California.

Regional Faults

A fault is a fracture in the crust of the earth along which there has been displacement of the sides relative to one another parallel to the fracture. Most faults are the result of repeated displacements over a long period of time. Numerous active and potentially active faults have been mapped in the region, including the Santa Monica-Hollywood Fault which is made up of two left-reverse faults. The faults are characterized by one plane moving up and over another and are different from strike-slip faults such as the San Andreas Fault. The project site is within two kilometers of the Santa Monica Hollywood Fault. Other principal faults capable of producing significant ground shaking in the areas are listed in **Table 3D-1** and include the Raymond Fault and the Newport-Inglewood Fault. Major seismic events on any of these active faults could cause significant ground shaking and surface fault ruptures. The estimated magnitudes (moment) identified in Table 3D-1 represent characteristic earthquakes on a particular fault. [4]

Seismic Hazards

Surface Fault Rupture

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different segments of the same fault. Ground rupture is considered more than likely along active faults. Since no mapped active faults are known to pass through the project site, the potential risk from fault rupture is considered low.

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[3] An active fault is defined by the state of California as a fault that has had surface displacement within Holocene time (approximately the last 10,000 years). A potentially active fault is defined as a fault that has shown evidence of a surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course mean that faults lacking evidence of surface displacement are necessarily inactive. Sufficiently active is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997)

[4] Moment magnitude is related to the physical size of a fault rupture and movement across a fault while Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave. Moment magnitude provides a physically meaningful measure of the size of a faulting event (California division of Mines and Geology 1997b).

Table 3.D-1: Fault Zones in the Project Vicinity				
Class B Faults				
Fault	**Counties**	**Recency**	**Slip Rate (mm/yr)**	**Max. Moment**
TRANSVERSE RANGES AND LOS ANGELES BASIN				
Hollywood	Los Angeles		1.0	6.4
Newport-Inglewood	Los Angeles, Orange	Late Quaternary	1.0	7.1
Raymond	Los Angeles		1.5	6.5
Santa Monica	Los Angeles		1.0	6.6

Ground Shaking

Areas most susceptible to intense ground shaking are those located closest to the earthquake generating fault, and areas underlain by thick, loosely unconsolidated and saturated sediments. Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy and type of geologic material.

While earthquake magnitude is a measure of the energy released in an earthquake, intensity is a measure of the ground shaking effects at a particular location. Areas underlain by bedrock typically experience less severe ground shaking than those underlain by loose, unconsolidated materials. The Modified Mercalli Intensity (MMI) scale (**Table 3D-2**) is commonly used to measure earthquake effects due to ground shaking. The MMI values range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage.

The principal seismic hazard at the project site is strong ground shaking due to earthquakes produced by local faults. Peak ground acceleration of 0.47 is associated with the Design Basis Ground Motion (10 percent exceedance in 50 years), which is an earthquake with a moment magnitude of 6.4 (Mw). These ground motions could occur at the site during the life of the project. However, modern, well-constructed buildings are designed to resist ground shaking through the use of shear panels, movement frames and reinforcement.

Liquefaction

Liquefaction is a phenomenon whereby unconsolidated and/or near saturated soils lose cohesion and are converted to a fluid state as a result of sever vibratory motion. The relatively rapid loss of soil shear strength during strong earthquake shaking result in the temporary fluid like behavior of the soil. Soil liquefaction causes ground failure that can damage roads, pipelines, buildings with

The concept of "characteristic" earthquake means that we can anticipate, with reasonable certainty, the actual damaging earthquake that can occur on a fault.

Table 3D-2: Modified Mercalli Intensity Scale[5]
I. Not felt except by a very few under especially favorable conditions.
II. Felt only by a few persons at rest, especially on upper floors of buildings.
III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.
Source: U.S. Geological Survey, National Earthquake Information Center

shallow foundations and levees. Liquefaction can occur in areas characterized by water saturated, cohesionless, granular materials at depths less than 40 feet. Saturated unconsolidated alluvium with earthquake intensities greater than MMI VII may be susceptible to liquefaction. This would include areas with shallow perched groundwater.

Landslide Hazards

A landslide is a mass of rock, soil, and debris displaced downslope by sliding, flowing or falling. The susceptibility of land (slope) failure is dependent on the slope and geology as well as the amount of rainfall, excavation, or seismic activities. Factors that decrease resistance to movement in a slope include pore water pressure, material changes and structure. Removing the lower portion (the toe) of a slope decreases or eliminates the support that opposes lateral motion in a slope. Shaking during an earthquake may lead material in a slope to lose cohesion and collapse. The project site is located within a state mapped zone requiring landslide investigation/mitigation as described in the Seismic Hazard Mapping Act.

Non-Seismic Geologic Hazards

Erosion

Erosion is the detachment and movement of soil materials through natural processes or human activities. The detachment of soil particles can be initiated through the suspension of materials by wind or water. Silt-sized particles are the most easily removed particles, due to low cohesiveness. Soils within the project area are silty sand and are considered loose to medium dense.

There are several erosion scars on and off-site in the project area. There is one particularly large erosion scar visible on Woodstock.

Expansive Soils

Expansive soils posses a shrink-swell characteristic that can result in structural damage over a long period of time. Expansive soils are largely comprised of silicate clays, which expand in volume when water is absorbed and shrink when dried.

Settlement

Settlement of loose, unconsolidated soils generally occurs slowly, but can cause significant structural damage such as cracked foundations or misaligned or cracked walls and windows.

Subsidence

Land subsidence can occur as a result of groundwater extraction. Underlying soils can compact when water is removed. The extraction of mineral or oil resources can also result in subsidence.

3D.3 Applicable Regulations

Alquist Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) provided for the delineation of rupture zones along active faults in California. The purpose of the Alquist Priolo Act is to regulate development on or near fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development projects within the zones, which include withholding permits until geologic investigations demonstrate the development sites are not threatened by future surface

[5] Excerpted from http://neic.usgs.gov/neis/general/mercalli.html Retrieved online August 19, 2007

displacement. Surface fault rupture is not necessarily restricted to the area within an area covered by the Alquist Priolo Act.

Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act, which became law in 1991, was developed to protect the public from the effects of strong groundshaking, liquefaction, landslides or other ground failure, and from other hazards caused by earthquakes. The Act requires the sate geologist to delineate various seismic hazard zones and requires cities, counties and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design.

California Building Code

The California Building Code is another name for the California Building Standards Code. CCR Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The California Building Code incorporates by reference the Uniform Building Code with necessary California amendments. The Uniform Building Code is a widely adopted model building code in the U.S. published by the International Conference of Building Officials. About one-third of the text within the California Building Code has been tailored for California earthquake conditions.

See also Section 3A for a discussion of planning regulations applicable to grading.

3D.4 Significance Criteria

The criteria used to determine the significance of an impact are based on Appendix G of the *CEQA Guidelines*. For this analysis, the proposed project may result in significant impacts if it would:

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

- 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;
- Strong seismic ground shaking;
- Seismic related ground failure including liquefaction;
- Landslides;
- Result in substantial soil erosion or the loss of topsoil;

- 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 landslides, lateral spreading, subsidence, liquefaction or collapse.

- Be located on expansive soil or soil that is unstable, or that would become unstable as a result of the project;

3D.5 Impacts and Mitigation

Impact 3D.1: Earth moving during construction of the one proposed new home could uncover previously unknown (buried) cultural resource. Construction of the proposed house could disturb previously unknown human remains. However, during the construction of Thames Street substantial earthmoving has already occurred in the vicinity of the lot for the one house to be constructed and no resources are anticipated to be found. Together with other area projects, the proposed project would not have cumulative impacts on cultural resources in the proposed project area. Less than significant.

There exists potential for buried resources to exist throughout the Los Angeles basin. The Native American Heritage Commission was contacted (in response to the letter received on the NOP) and staff indicated that the below mitigation measures would suffice for to ensure a less than significant impact on the project site.[6]

Mitigation:

> **Mitigation Measure 3D.1:** Excavation of any previously undisturbed soil shall be monitored by a qualified cultural resource monitor. The monitor shall be equipped to salvage artifacts and/or fossils and samples of sediments as they are unearthed to avoid construction delays. Monitors shall be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.
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> Any recovered artifacts and/or specimens, if found, shall be prepared to a point of identification and permanent preservation, including washing of sediments to recover small invertebrates and vertebrates. Artifacts and/or specimens shall be curated into a professional, accredited museum repository with permanent retrievable storage. A report of findings, with an appended itemized inventory of specimens, shall be prepared. The report and inventory, when submitted to the South Coast information Center, would signify completion of the program to mitigate impacts to paleontologic resources.
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> **Mitigation Measure 3D.2**: If human remains were exposed during construction, the Los Angeles County Coroner shall be contacted in accordance with §7050.5 of the State Health and Safety Code. State Health and Safety Code §7050.5 states that no further disturbance shall occur at the site until the County Coroner has made the necessary findings as to origin and disposition of the remains pursuant to Public Resources Code §5097.98.

Impact 3D.2: Construction of the one home and completion of the five homes would not result in a change in potential risk to people or structures and potential loss, injury or death due to geologic or seismic hazards. (Less than significant.)

[6] Dave Singleton, telephone conversation, October 15, 2007

Ground shaking

The principal seismic hazard to the subject property and proposed project is strong ground shaking from earthquakes produced by local faults. The site is not located on a known active fault. It is located within two kilometers of the Santa Monica-Hollywood Fault, a Type B fault. According to the geotechnical exploration, it is likely that the subject property, as with all properties in the region, will be shaken by future earthquakes produced in Southern California. However, secondary effects such as surface rupture, lurching, consolidation, and ridge shattering should not occur at the project site because there are no known active faults which cross through the site. Ground shaking from regional faults could be a potentially significant impact without proper project structural engineering, foundations, or site preparation. Mitigation Measure 3D-4 will ensure that impacts to the proposed structures due to ground shaking would be reduced to a minimum, and no significant seismic impacts would occur.

Surficial Failures

The proposed project site has experienced significant surficial failures onto the public right of way (Thames Street) and on homes below the site. The geologic report prepared for the original project indicates that surfical deposits overlying the slopes are not stable; however this is an existing condition that would not be worsened by the project. The project includes improving drainage along Woodstock and plantings on-site, but without construction of retaining walls, surficial failures will continue. The applicant proposes to donate the central portion of the site for purposes of protecting the existing character of the slope. No grading is proposed on that portion of the site (except possibly trenching to allow connection of the sewer line). The future owner of those lots would take responsibility for maintenance of those lots (unless other arrangements are made). The City will review site grading plans – for the project as proposed and as it proceeds and will determine the extent of site intervention required for the project.

Mitigation:

Mitigation Measure 3D-3: Final Geotechnical Report(s) shall be prepared for each lot to be developed, including the lots to be tied to the lots containing the five existing structures; this/these final report(s) shall incorporate all previous documents including comments on previous documents from the City of Los Angeles Building and Safety Department. The Final Geotechnical Report(s) shall be reviewed and approved by the Department of Building and Safety. All development on the site shall comply with all recommendations of the Final Geotechnical Report(s). The central portion of the site (13 lots) to be donated as an open space easement shall be maintained, by the new owner of those properties or by others as negotiated as part of the donation, as needed to ensure that other properties are not affected by mud or debris slides or other potential soil and or geologic and/or hydrologic issues on the open space lots.

Mitigation Measure 3D-4: Earthquake-resistant design shall be incorporated into final structural and foundation plans in accordance with the most current structural design requirements utilized by the State of California State Architect and the recommended seismic design parameters of the project geologist.

Mitigation Measure 3D-5: Prior to and during construction, site preparation (remedial grading, foundation design, retaining wall design, floor slabs, decking, paving, drainage, waterproofing), site observations, and construction site maintenance shall be conducted consistent with the recommendations of a State Architect's office-approved geotechnical investigation. The project geotechnical engineer shall observe all excavations, subgrade preparation, and fill activities and shall conduct soils testing, as necessary, consistent with local, State, and federal regulations.

Mitigation Measure 3D-6: All slopes will be evaluated by the Project Geotechnical Engineer at the Tentative and/or Grading Plan Stage. The Final Grading Plan will require approval from the City of Los Angeles prior to implementation. Cut slopes that do not comply with the City's required minimum factors for safety conditions and/or are anticipated to expose landslide material, will require corrective measures such as buttresses or stability fills, or will need to be redesigned to a more stable configuration.

Mitigation Measure 3D-7: Existing provisions outlined in the Grading Ordinance for planting and irrigation of cut slopes and fill slopes will be implemented to reduce the potential for erosion. All grading will be in accordance with the City of Los Angeles Grading Codes and recommendations of the engineering geologist.

Mitigation Measure 3D-8: Prior to approval of the grading plan, a study will be conducted to evaluate potential debris flow hazards on the subject site. Avoidance of the hazard by selective structural locations (setbacks), construction of impact or debris walls and/or debris basins, control of run-off or removal of loose surficial materials can be used to mitigate debris flow hazards.

Mitigation Measure 3D-9: Surficial debris flow potential will be mitigated as feasible by surficial material removal, diverter slough walls, construction walls, runoff control and/or vegetative cover.

Mitigation Measure 3D-10: The Geotechnical Engineer shall evaluate natural slopes with day-lighted bedding conditions, including subsurface investigation in order to determine the specific geologic conditions for evaluation. Building setbacks or remedial measures such as buttressing or redesigned engineered slopes will be required as appropriate where ascending or descending slopes are not stable as determined by geologic or geotechnical stability.

Significance after Mitigation: Less than significant.

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Impact 3D-3: Construction activities associated with the proposed project could temporarily result in erosion and/or siltation on- and off-site and/or impact surface water quality. (Less than significant.)

As indicated in the Geotechnical Report prepared for the project, the surficial soils at the site are not considered stable.

Neighbors have noted a large “fissure” on and in the vicinity of the site. This “fissure” is an erosion scar caused by concentrated drainage that flows uncontrolled over the slope from a developed property west of the terminus of Mount Olympus Drive, extending from the top of the slope to the road-cut along unimproved Leicester Drive, downslope of Lots 24 and 25 (2505 and 2590 Woodstock Road). As noted in the site geotechnical reports (see Appendix F, surficial failures are present on site. The concentrated drainage flows across Leicester Drive to the axis of a canyon just above the residence at 2530 Thames Street. The erosion gully exposes fill and soil. A narrow channel near the top of slope and a narrow channel at the road-cut on the upslope side of Leicester Drive exposes one foot of weathered bedrock. The erosion occurs in the surficial fill and soil. Little bedrock is affected. Mitigation measures outlined below, including removal of surficial fill and soils and recommendations contained in the geotechnical reports would address erosion on the site.

Site preparation includes excavation, placement and compaction of fill, foundation preparation, floor slab preparation, and pavement of other areas. Specific procedures consistent with soil preparation and foundation design will be adhered to during this phase. Vegetation and debris will need to be removed. Remedial grading is recommended. The subgrade will require observation by the soils engineer to facilitate fill placement. Fill material type, placement, and compaction will be inspected by the on-site geotechnical engineer.

Mitigation Measures 3D-3 through 10 will reduce to a less than significant level potential impacts related to site preparation.

Mitigation:

Implement measures 3D-3 through 10 above.

> **Mitigation Measure 3D.11:** A SWPPP will be developed for the construction-phase of the proposed project and BMPs shall be implemented to capture and treat polluted runoff from the proposed project site and incorporated into the construction contracts. Recommended BMPs for the construction phase include: 1) Proper stockpiling and disposal of demolition debris, concrete, and soil; 2) Protecting existing storm drain inlets; stabilizing disturbed areas; 3) Erosion controls; 4) Proper management of construction materials; and 5) Waste management; aggressive litter control; and sediment controls. These requirements shall be incorporated into design specifications and the construction contracts.

> **Mitigation Measure 3D.12:** An analysis of project drainage will be required to determine which design feature(s) would make the most sense for the project site; the analysis shall be approved by the City. Based on the results of this analysis, design features shall be developed and submitted to the City for review and approval. Incorporation of City-approved project design features into the project design and

construction contracts shall ensure that operational surface water quality is below applicable water quality thresholds and in compliance with the City's Municipal Code and the County SUSMP.

Significance after Mitigation: Less than significant.

Impact 3D.3: The proposed project would not have cumulative impacts on hydrology and water quality in the proposed project area. (Less than significant.)

Project drainage would be designed to collect flows and direct them in to storm drains with available capacity. Current storm drains have the capacity to accept the additional flows, there are no other projects anticipated that could add to project impacts in this area.

Mitigation: See Mitigation measure 3D-12 above.

Significance after Mitigation: Less than significant.
