4.4 GEOLOGY AND SOILS

INTRODUCTION

This section analyzes potential geotechnical impacts resulting from project implementation. This section incorporates information from the Preliminary Geotechnical Investigation Report prepared for the proposed project by Leighton and Associates, Inc. The geotechnical study was prepared to determine the nature and engineering properties of the earth materials at the site and to provide geotechnical recommendations for design and construction of the proposed structures. The following were completed as part of the geotechnical investigation: a review of available site-specific information, subsurface exploration, collection of representative soil samples, relevant geotechnical engineering laboratory tests, and a geotechnical evaluation. The study is provided in ***Appendix 4.4*** *of this environmental impact report (EIR).*

ENVIRONMENTAL SETTING

Existing Conditions

The project site is a 2.18-acre triangular parcel bound by Los Feliz Road to the north, Central Avenue to the east, and San Fernando Road to the west. Currently, the project site is developed with a one-story car wash and detail building, a one-story automotive/tire center, a one-story Burger King restaurant building, and associated surface parking. The topography of the project site and surrounding area is generally flat.

In order to characterize the geologic conditions on the project site, a subsurface field exploration was performed which consisted of drilling five 8-inch-diameter exploratory hollow stem borings ranging in depth from 50.4 to 51.5 feet. Undocumented artificial fills were encountered underneath the existing pavement to a depth of approximately 2.5 feet below the finish pavement surface. Fill soils consisted of moist, dark brown, silty sands and silts mixed with fine sands and clays. Underlying the fill, Quaternary alluvium (Qal) was encountered up to the maximum explored depth of 51.5 feet below the ground surface. These alluvial deposits consisted of silty to clayey sands, silts, and intermediate clayey soils at different depths. Sandy soils were primarily light brown to brown, moist, medium dense to dense, and became gradually denser with depth below 30 feet. Silty and clayey soil layers were found to be primarily brown, moist, stiff to very stiff, generally stiffer with depth.

Historical high groundwater level, as reported within the vicinity of the project site, is approximately 45 feet below the ground surface. Groundwater was not encountered on the project site during field exploration up to a maximum explored depth of 51.5 feet below the ground surface.

Regional Geologic Setting

The project site lies near the western margin of the San Gabriel Valley (SGV) within the Transverse Ranges geomorphic province of California. The Transverse Ranges province extends 300 miles (500 kilometers) westward from the Mojave Desert to the Pacific Ocean. In addition to the SGV, the Santa Monica, San Gabriel, and San Bernardino Mountains are the most prominent topographical features which make up the Transverse Ranges.

The SGV is an almost closed basin drained by three rivers, the San Gabriel River, Rio Hondo, and Arroyo Seco, from east to west, respectively. During the last few thousand years, the SGV has been receiving sediments shed from the San Gabriel Mountains to the north. The San Gabriel Mountains are primarily comprised of Precambrian- to Mesozoic-aged (approximately 600 to 150 million years old) metamorphic and igneous basement rocks.[1]

The site is located in the SGV at approximately 550 feet above mean sea level, east of the Arroyo Seco. The Arroyo Seco emanates from a major canyon in the San Gabriel Mountains and flows southerly along the western margin of the SGV cutting an incised channel into the valley floor.

Faulting and Regional Seismicity

The project site is situated in an area of active and potentially active faults, as is all of Southern California. Active faults present a variety of potential risks to structures, the most common of which are strong ground shaking, soil densification and liquefaction, mass wasting, and surface rupture at the fault plane. Generally, the following four factors are the principal determinants of seismic risk at a given location:

- Distance to seismogenically capable faults;
- The maximum or characteristic magnitude earthquake for a capable fault;
- Seismic recurrence interval, in turn related to tectonic slip rates; and
- Nature of earth materials underlying the site.

Surface rupture represents a primary or direct potential hazard to structures built on an active fault zone. There are no known active or potentially active faults trending toward or through the project area. Additionally, the project site is not located in a currently established Alquist-Priolo Earthquake Zone. No known active faults are mapped on the site.

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1 Leighton and Associates, Inc., *Preliminary Geotechnical Investigation Report* (2007), 5.

The principal seismic hazard to the site is ground shaking caused by an earthquake occurring along any of several major active and potentially active faults in southern California. Known regional active faults that could produce strong ground shaking at the site include the Hollywood, Raymond Hill, Verdugo, and Sierra Madre faults among others. The closest regional active fault is the Hollywood fault, which is located approximately 0.75 mile from the site.

Subsidence

Loose sandy soils subjected to moderate to strong ground shaking can experience settlement. Ground surface subsidence generally results from the extraction of fluids or gas from the subsurface that can result in a gradual lowering of the overlying ground surface. Another more localized cause of ground surface subsidence is the deterioration of subsurface peat deposits.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low-density, fine, clean sandy soils; and (3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.[2] The project site is not located within a mapped liquefaction hazard zone. Due to deep groundwater level, relatively high fine contents and intermediate soil layers, liquefaction is not considered to be a hazard in the project area.[3]

Seiching and Tsunamis

Tsunamis and seiches are large seismic generated waves in the ocean or large enclosed bodies of water, respectively.

Landslides

Landslides and other types of slope failures, such as lateral spreading, can result in areas with varying topography in the event of an earthquake. No significant ground slopes exists in the vicinity of the project site.

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2 Ibid, 9.

3 Ibid.

Earthquake-Induced Flooding

Earthquake-induced flooding is caused by failure of up gradient dams or other water-retaining structures during an earthquake. Review of the project area indicates that there are no significant up gradient lakes or reservoirs near the project site.

REGULATORY FRAMEWORK

Building and construction within the City of Glendale are subject to Chapter 15.12 of the Municipal Code, which governs grading, fill, and excavation activities. In addition, seismic design criteria are contained within the California Building Code (CBC). Finally, the City of Glendale Safety Element (August 2003) includes standards and plans to reduce the loss of life, injuries, damage to property, and economic and social dislocations resulting from natural and urban-related hazards.

ENVIRONMENTAL IMPACTS

Thresholds of Significance

The following thresholds for determining the significance of impacts related to geology and soils are contained in the environmental checklist form contained in Appendix G of the most recent update of the *2008 California Environmental Quality Act (CEQA) Statutes and Guidelines*. Impacts related to geology and soils are considered significant if the proposed project 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. Refer to Division of Mines and Geology Special Publication 42.
  - 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 landslide, lateral spreading, subsidence, liquefaction or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.

- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

Impact Analysis

Each applicable threshold of significance is listed below followed by analysis of the significance of potential impacts and the identification of mitigation measures that would lessen or avoid potential impacts. Finally, the significance of potential impacts after implementation of all identified mitigation measures is presented.

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

Threshold: **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 Publication 42.**

Impact Analysis: As discussed above, the project site is not located within an established Alquist-Priolo Earthquake Fault Zone or designated Fault-Rupture Hazard Zone for surface fault rupture hazards. While the Hollywood Fault is the closest active fault, the nearest Fault-Rupture Hazard Zone for active faults with evidence of surface rupture is for the Raymond fault, which is located approximately 1 mile southeast of the project site. Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located directly beneath or projecting toward the project site. Therefore, the potential for surface rupture as a result of fault plane displacement during the design life of the project is less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

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

- Strong seismic ground shaking.

Impact Analysis: The project site could be subject to strong ground shaking in the event of an earthquake originating along one of the faults listed as active or potentially active in the Southern

California area. This hazard exists throughout Southern California and could pose a risk to public safety and property by exposing people, property, or infrastructure to potentially adverse effects including strong seismic ground shaking. Design of the proposed structures would be required to comply with all applicable building codes to ensure safety in the event of an earthquake. Therefore, impacts would be less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are required.

Level of Significance After Mitigation: Less than significant.

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

- Seismic-related ground failure, including liquefaction.

Impact Analysis: Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low-density, fine, clean sandy soils; and (3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

The site is not located within a mapped liquefaction hazard zone.[4] Due to deep groundwater level exceeding 45 feet, relatively high fine contents and intermediate clayey soil layers, potential for liquefaction is low and impacts from liquefaction are less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

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

- Landslides.

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4 Leighton and Associates, Inc., *Preliminary Geotechnical Investigation Report* (2007), 9.

Impact Analysis: The topography of the project site and the immediate built environment is relatively flat and, thus, devoid of any distinctive landforms. As indicated above, there are no significant ground slopes in the vicinity of the project site, there are no known landslides near the project site nor is the project site in the path of any known or potential landslides.[5] Therefore, the potential for impacts from landslides is not significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Threshold: Result in substantial soil erosion or the loss of topsoil.

Impact Analysis: Construction activity associated with project development may result in wind and water driven erosion of soils due to grading activities if soil is stockpiled or exposed during construction. However, this impact is considered short-term in nature since the potential for significance will end after construction is finished due to covering the site with pavement and landscaping. Further, as part of the project, the applicant would be required to adhere to conditions under the National Pollutant Discharge Elimination System (NPDES) Permit set forth by the Regional Water Quality Control Board (RWQCB), and prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) to be administered throughout project construction. The SWPPP would incorporate Best Management Practices (BMPs) to ensure that potential water quality impacts during construction from water erosion would be reduced to less than significant. In addition, the applicant would be required to adhere to SCAQMD Rule 403—Fugitive Dust, which together would further reduce potential impacts on geology and soils to less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

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[5] Leighton and Associates, Inc., *Preliminary Geotechnical Investigation Report* (2007) 10. Earth Consultants International, *City of Glendale Technical Background Report to the 2003 Safety Element of the General Plan* (2003) Plates 2-1 though 2-4.

Threshold: **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.**

Impact Analysis: The relatively flat-lying topography at the project sites precludes both stability problems and the potential for lurching, which is earth movement at right angles to a cliff or steep slope during ground shaking. As indicated above, there are no significant ground slopes in the vicinity of the project site, there are no known landslides near the site nor is the site in the path of any known or potential landslides.[6] Therefore, the potential for impacts from landslides is not significant.

Excavation up to depths of 40 feet below ground surface would occur for the subterranean parking. Loose sandy soils were encountered on site at shallow depth (within upper 5 feet), which will be removed during grading for subterranean parking. Subsurface sandy soils at depths of 25 feet and below are medium dense to very dense. Therefore, the potential for subsidence is low and impacts would be less than significant.[7]

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low density, fine, clean sandy soils; and (3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

As discussed above, the site is not located within a mapped liquefaction hazard zone. Due to deep groundwater level, relatively high fine contents and intermediate clayey soil layers, potential for liquefaction is considered low and impacts would be less than significant.

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. However, if lateral containment is present for those zones, then no significant risk of lateral spreading will exist. Since the liquefaction potential at the site is low, earthquake-induced lateral spreading is not considered to be a seismic hazard at the site and impacts would be less than significant.

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6 Leighton and Associates, Inc., *Preliminary Geotechnical Investigation Report* (2007) 10. Earth Consultants International, *City of Glendale Technical Background Report to the 2003 Safety Element of the General Plan* (2003) Plates 2-1 though 2-4.

7 Zafar Ahmed, Leighton and Associates, Inc., PE, Senior Project Engineer, personal communication with Lee Jaffe, July 22, 2008.

While project development would not result in the hazards addressed above, the Geotechnical Investigation Report prepared for the project included design and construction recommendations. Without implementation of the geotechnical recommendation, a potentially significant impact could occur. Therefore, design and construction recommendations provided in the Preliminary Geotechnical Investigation Report shall be implemented as mitigation and impacts would be reduced to less than significant.

***Level of Significance Before Mitigation*:** Significant.

***Mitigation Measures*:**

The following measure is recommended by the Geotechnical Investigation Report prepared for the proposed project to mitigate impacts related to unstable geologic conditions to a less than significant level:

4.4-2 Geotechnical recommendations 4.1 through 4.14 contained in Section 4.0, Recommendations, of the Geotechnical Investigation Report prepared for the proposed project by Leighton and Associates, Inc., dated September 24, 2007, shall be implemented during project construction.

Level of Significance After Mitigation: Less than significant.

Threshold: **Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.**

Impact Analysis: Limited laboratory test of one composite bulk sample taken from depths of 25 to 30 feet below ground surface indicate very low expansion potential per CBC, 2001. Based on exploration performed by Leighton and Associates, Inc and laboratory test results, subsurface soils within upper 30 feet are anticipated to be very low to low expansive. Therefore, impacts associated with expansive soil would be less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Threshold: **Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.**

Impact Analysis: Septic tanks would not be used in the proposed project. The project would connect to and use the City's existing sewage conveyance system. No impact would result.

***Level of Significance Before Mitigation*:** No impact.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: No impact.

CUMULATIVE IMPACTS

The potential for cumulative impacts associated with geology and soils was assessed, based upon consideration of the proposed project and related projects in the City of Glendale. These related projects are identified in **Section 4.0, Environmental Impact Analysis**. The applicable threshold is listed below in bold followed by an analysis of the cumulative impact of the project and related projects, and their potential significance.

Threshold: **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. Refer to Division of Mines and Geology Special Publication 42.
- Strong seismic ground shaking.
- Seismic-related ground failure, including liquefaction.
- Landslides.

Threshold: **Result in substantial soil erosion or the loss of topsoil.**

Threshold: **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.**

Threshold: **Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.**

Threshold: **Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.**

Impact Analysis: Geotechnical impacts tend to be site-specific rather than cumulative in nature and any development occurring within the City of Glendale would be subject to, at a minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region. As project development and each related project would have to be consistent with recommendations contained in each project's Geotechnical Investigation Report, or similar study, and be designed in accordance with the CBC, cumulative impacts associated with known geologic conditions would be less than significant. In addition, the closest related project is located approximately 500 feet to the west of the project site. Therefore, none of the related projects are directly adjacent to the proposed project site to potentially result in cumulative impacts.

Impacts regarding surficial deposits, namely erosion and sediment deposition, can be cumulative in nature within a watershed. Development of the proposed project and related projects have the potential to impact water quality. However, with implementation of a SWPPP, as required by the NPDES permit, cumulative erosion within the watershed would not exceed natural levels, and significant cumulative impacts related to erosion would not occur.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.