Subject: Geotechnical Assessment  
Site 1: Proposed Office Building and Parking Structure  
500, 510, 526 and 532 South Vermont Avenue  
including 523 and 531 South Shatto Place  
Los Angeles, California

Dear Ms. Shorr:

1.0 INTRODUCTION

This document presents the results of the geotechnical assessment of the subject site. This report is intended to discuss the subsurface conditions anticipated at the site, discuss the potential for seismic hazards that could affect the site, and provide an opinion regarding the feasibility of the proposed project from the geotechnical perspective. This report is based on review of available project files, review of published geotechnical and geological information, and review of the Project Description provided by the client, dated April, 2017. A comprehensive geotechnical engineering investigation, including subsurface exploration and testing, will be prepared to provide design recommendations for the proposed development.

2.0 PROJECT DESCRIPTION

Two separate structures are being proposed as part of this project. An office structure proposed within the northwest region of the site will be comprised of 13 floors of office space to be constructed above eight levels of parking. Additionally, a 12-story parking structure is proposed in the southeast region of the site. The parking structure is anticipated to be 10 stories in height above ground level, constructed over two subterranean levels.
3.0 SITE CONDITIONS

The subject site is located at 500, 510, 526 and 532 South Vermont Avenue including 523 and 531 South Shatto Place, in the City of Los Angeles, California. The site is bisected into two distinct areas as illustrated on the enclosed Vicinity Map. The northwest region of the site is bounded by two and three-story commercial structures and a paved parking lot to the north, two to five-story commercial structures to the east, a 12-story commercial structure to the south, and South Vermont Avenue to the west. The southeast region of the site is bounded by three-story commercial structures to the north, Shatto Place to the east, single-story commercial structured and parking lot to the south and a 12-story office structure to the west. The site is shown relative to nearby topographic features in the enclosed Vicinity Map.

The existing site grade is relatively level, with no pronounced highs or lows. The northwest region of the site is currently developed with a two-story commercial structure and a paved parking lot. The southeast region of the site is currently developed with a six-story parking structure over a single, subterranean level. It is anticipated that the existing structures will be demolished prior construction of the proposed development. Vegetation at the site is essentially nonexistent due to the extent of the current development. Drainage across the site appears to be by sheetflow to the city streets.

A Metropolitan Transportation Authority (MTA) Subway Tunnel for the Red Line Route is located along Vermont Avenue, near the west perimeter of the site. Information regarding the exact location, alignment and depth of the tunnel are not available at this time. The approximate location of this tunnel is illustrated on the MTA Rail Line Map in the Appendix of this report. Based on the experience of this firm, MTA and the City of Los Angeles have specific requirements for allowing the construction of permanent structures adjacent to existing tunnels. Addressing the impact of these requirements is beyond the scope of this geotechnical assessment.

4.0 PROJECTS IN THE SITE VICINITY

This firm has provided geotechnical services on many projects throughout the City of Los Angeles. One of those projects is located immediately north of the subject site. A brief summary of the project closest to the subject site is provided below. The location of the project is indicated on the enclosed Vicinity Map.

- **Geotechnical Engineering Investigation, Geotechnologies, Inc. - Proposed Remodel and Addition to Existing Structure, 444 South Vermont Avenue, Los Angeles, California, dated September 3, 2009, File No. 19837.**

As shown in the enclosed Vicinity Map, this site is located immediately to the north of the northwest region of the subject site. This geotechnical investigation pertained to the demolition of a one-story commercial structure and replacement with a three-story structure which included the construction of a drive ramp, elevator shafts and escalators.
The investigation for this project included twelve exploratory borings, drilled to depths ranging between 27½ and 60 feet below grade. The borings encountered fill materials extending to depths of up to 33½ feet. Alluvial soils were observed to underlie the fill and consisted of a mixture of silty sands, sandy silts, and silty clays. Bedrock of the Puente Formation was observed at depth ranging between 28 and 46 feet below grade. Groundwater was encountered between depths of 28 and 30 feet below existing site grade.

Based on a site-specific liquefaction analysis, the report indicates the site soils would not be prone to liquefaction.

5.0 **ANTICIPATED SUBSURFACE CONDITIONS**

5.1 **Geologic Materials**

Based on review of previous investigation conducted in the vicinity of the site, review of the enclosed geologic map by Dibblee (1991), and this firm’s experience in this area of the City of Los Angeles, it is anticipated that the geologic materials underlying the subject site consist of fill materials, alluvial soils, and bedrock of the Puente Formation.

As stated in a previous section of this report, deep fill materials were encountered in a previous investigation conducted near the site. Additionally, based on review of the enclosed 1928 Topographic Map, it is the opinion of this firm that deep fill materials should be anticipated within the subject site.

The alluvial soils underlying the fill generally consist of mixtures of sands, silty sands, and silty clays. The alluvium is typically medium dense to very dense, or stiff, and well consolidated, with expansion characters that range from low to moderate. However, local variations in moisture content and soil type may occur.

It is anticipated that the alluvial soils will be underlain by Puente Formation bedrock. This bedrock was encountered at depths ranging between 28 and 46 feet below grade in a previous investigation conducted to the north of the subject site.

5.2 **Groundwater**

A previous investigation conducted near the subject site encountered groundwater at depths between 28 and 30 feet below grade. It is the opinion of this firm that the current groundwater level at the site should be anticipated to be similar to the water levels observed by the previous investigation.
According to groundwater data provided in the Seismic Hazard Zone Report of the Hollywood 7½-Minute Quadrangle, the historic-high groundwater level for the site was on the order of 20 feet below the ground surface (CDMG, 1998, Revised 2006). A copy of the historic high water map is enclosed herein.

Fluctuations in the level of groundwater would be expected to occur over time due to variations in rainfall, temperature, and other factors. Fluctuations also may occur in the vicinity of the site.

### 6.0 OIL/GAS FIELD AND OIL WELLS

The site is located within the Los Angeles City Oil/Gas Field as indicated on the attached Oil Well Location Map included herein. Several oil wells exist within the northwest region of the site as indicated by the enclosed Oil Well Location Map. The specific Well Numbers are: 057, 059, 060, 063, 064, 065, 066 and 068 which were previously operated by Ruhland Oil Co. The status of the wells is currently listed as buried.

Due to the potential presence of abandoned oil wells within the site, it is anticipated that the County of Los Angeles will require compliance to specific regulations in order to obtain building permits for the proposed development. A qualified consultant should be retained to consider the implications of abandoned oil wells of the Los Angeles City Oil/Gas Field, if any.

### 7.0 METHANE ZONES

Based on review of the NavigateLA Website, developed by the City of Los Angeles, Bureau of Engineering, Department of Public Works, the subject site is located within the limits of a methane zone or methane buffer zone as indicated by the enclosed Methane Zone Risk Map. Accordingly, the project would be subject to applicable regulations established by the County of Los Angeles for site specific methane evaluation and mitigation. A qualified methane consultant should be retained to consider the requirements and implications of the methane zone and methane buffer zone designation.

### 8.0 REGIONAL GEOLOGY

The subject site is located within the northern portions of the Los Angeles Basin and Peninsular Ranges Geomorphic Province. The Peninsular Ranges are characterized by northwest-trending blocks of mountain ridges and sediment-floored valleys. The dominant geologic structural features are northwest trending fault zones that either die out to the northwest or terminate at east-west trending reverse faults that form the southern margin of the Transverse Ranges.
The Los Angeles Basin is located at the northern end of the Peninsular Ranges Geomorphic Province. The basin is bounded by the east and southeast by the Santa Ana Mountains and San Joaquin Hills, and to the northwest by the Santa Monica Mountains. Over 22 million years ago, the Los Angeles Basin was a deep marine basin formed by tectonic forces between the North American and Pacific plates. Since that time, over 5 miles of marine and non-marine sedimentary rock, as well as intrusive and extrusive igneous rocks, have filled the basin. During the last 2 million years, defined by the Pleistocene and Holocene epochs, the Los Angeles Basin and surrounding mountain ranges have been uplifted to form the present day landscape. Erosion of the surrounding mountains has resulted in deposition of unconsolidated sediments in low-lying areas by rivers such as the Los Angeles River. Areas that have experienced subtle uplift have been eroded with gullies (Yerkes, 1965).

9.0 SEISMIC HAZARDS

9.1 Surface Rupture

Review of the Earthquake Zones of Required Investigation Map of the Hollywood Quadrangle (CGS, 2014) indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone.

Ground rupture is defined as surface displacement which occurs along the surface trace of the causative fault during an earthquake. Based on research of available literature and results of site reconnaissance, no known active or potentially active faults underlie the subject site. In addition, the subject site is not located within an Alquist-Priolo Earthquake Fault Zone or a Preliminary Fault Rupture Study Area. Based on these considerations, the potential for surface ground rupture at the subject site is considered low.

9.2 Nearby Faults

According to the Website NavigateLA, developed by the City of Los Angeles, Bureau of Engineering, Department of Public Works, a northwest-southeast trending fault is located approximately 0.3 miles to the east of the proposed structures. A copy of this map is attached as the Fault Location Map – NavigateLA. The fault source is listed as the California Geological Survey (CGS) digital database of Fault Activity Map of California. However, after reviewing the CGS website, the Fault Activity Map does not show this unnamed fault.

Geologic maps by Lamar (1970), Dibblee (1989), Yerkes, et al, (1977), and the Department of Water Resources (1961) do not show this fault. The fault does not have a designated Fault rupture Hazard Zone (Bryant, W.A. and Hart, E.W. 2007). The origin of this fault is unknown to this firm.
This firm contacted a City of Los Angeles, Department of Building and Safety Geologist, to inquire about the origin of this fault. While the geologist was aware that the NavigateLA website indicated the trace of a fault, he was not aware of any surface manifestation of a fault within this area of Los Angeles. Furthermore, he indicated that no Special Studies Zones have been delineated by the City of Los Angeles, Department of Building and Safety along this fault trace.

Based on the research by this firm, the presence of the fault as shown on the NavigateLA Website could not be corroborated or verified with other references. Additionally, surface manifestation of fault activity in that region could not be ascertained by the geologist representing the Los Angeles, Department of Building and Safety. Therefore, in the opinion of this firm, the designated fault need not be considered in the design of the proposed structures.

9.3 Liquefaction

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength due to the buildup of excess pore pressure during cyclic loading conditions such as those induced by an earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures.

The Seismic Hazards Map of the Hollywood Quadrangle by the State of California (CDMG, 1999) does not classify the site as part of a potentially liquefiable area. This determination is based on groundwater depth records, soil type and distance to a fault capable of producing a substantial earthquake. A copy of this Seismic Hazard Zones Map is enclosed herein.

A previous investigation conducted near the site encountered groundwater at a depth of between 28 and 30 feet below grade. According to groundwater data provided in the Seismic Hazard Zone Report of the Hollywood 7½-Minute Quadrangle, the historic-high groundwater level for the site was on the order of 20 feet below the ground surface (CDMG, 1998, Revised 2006).

A site-specific liquefaction analysis was conducted by this firm as part of the previous investigation conducted immediately north of the subject site. The analysis, which was performed to a depth of 60 feet below grade, was based on a conservatively estimated highest groundwater level of 15 feet. The site-specific liquefaction analysis determined that the site soils were not susceptible to liquefaction potential.

Based on the depth to the historically highest and current groundwater levels, results from the site-specific liquefaction analysis conducted immediately to the north of the site, it is the opinion of this firm that the potential for liquefaction at the subject site is considered to be remote. Nonetheless, a site specific liquefaction analysis should be performed as part of a design level geotechnical investigation.
9.4 Dynamic Dry Settlement

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be an effect related to earthquake ground motion. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures.

Some seismically-induced dry settlement of the proposed structure could be expected at the subject site as a result of strong ground-shaking. However, based on the typically dense, stiff, and consolidated nature of the alluvial soils and bedrock expected to underlie the site, the potential dynamic settlements would be expected to be negligible.

9.5 Tsunamis and Flooding

Tsunamis are large ocean waves generated by sudden water displacement caused by a submarine earthquake, landslide, or volcanic eruption. Review of the County of Los Angeles Flood and Inundation Hazards Map (Leighton, 1990) indicates the site does not lie within mapped tsunami inundation boundaries.

Review of the County of Los Angeles Flood and Inundation Hazards Map, (Leighton, 1990), indicates the site lies within the mapped inundation boundaries of a breached upgradient reservoir. A determination of whether a higher site elevation would remove the site from the potential inundation zones is beyond the scope of this investigation.

9.6 Landsliding

The probability of seismically-induced landslides affecting the subject development is considered to be remote, due to the lack of significant slopes on the site and surrounding areas.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the research of other projects in the site vicinity, and this firm’s experience in this area of the City of Los Angeles, it is the opinion of this firm the proposed development is feasible from a geotechnical engineering standpoint. Once the proposed project proceeds to design and development, it is recommended a comprehensive geotechnical investigation should be prepared in order to provide design parameters and recommendations for the proposed project.

The Seismic Hazards Map of the Hollywood Quadrangle by the State of California (CDMG, 1999) does not classify the site as part of a potentially liquefiable area. However, as discussed in Section 9.3 of this report, it is the opinion of this firm that a site-specific liquefaction analysis would be necessary to determine if the site soils are susceptible to liquefaction.
Based on a previous geotechnical investigation performed near the site, it is the opinion of this firm that the current groundwater level at the site could be on the order of 28 feet below grade. However, the historically highest groundwater level for the site is on the order of 20 feet below grade. This historically highest groundwater level shall be considered when designing the underground portion of the proposed structures.

Fill depths in the southeast region of the site are not precisely known at this time. Based on review of the attached 1928 Historical Topographic Map, it is the opinion of this firm that the existing fill within this region would be shallower than within the northwest region.

As illustrated on the enclosed MTA (Metropolitan Transportation Authority) Rail Line Map, an MTA Subway Tunnel for the Red Line Route is located along Vermont Avenue, near the western perimeter of the site. Based on the experience of this firm, MTA and the County of Los Angeles have specific requirements for allowing the construction of permanent structures adjacent to existing tunnels. Addressing the impact of these requirements is beyond the scope of this geotechnical assessment.

Due to the depth of the proposed subterranean levels, and their proximity of the property lines, it should be anticipated that shoring will be required for construction of the basement levels. At this time, soldier piles would be recommended for shoring.

Excavations deeper than 28 feet below existing ground surface will likely encounter groundwater. Temporary dewatering in order to achieve a dry and stable excavation will be necessary. The expected number and depths of well-points, expected flow rates, and expected pre-pumping time frames should be determined during a dewatering test program conducted by a qualified dewatering consultant. Once the temporary construction dewatering is discontinued, the water table will likely return to its current elevation. Refer to the Water Resources Technical Report by KPFF, dated August 15, 2017, for groundwater and hydrology specifics analyzed within the site.

As with all of Southern California, the site is subject to potential strong ground motion should a moderate to strong earthquake occur on a local or regional fault. The proposed project should be completed in accordance with the provisions of the most current City of Los Angeles Building Code. In either case, design of the project in accordance with the current building code provisions will be intended to mitigate the potential effects of strong ground shaking.

11.0 CLOSURE

As indicated above, this geotechnical assessment is based on available geotechnical information and published geologic data. A comprehensive geotechnical engineering investigation including subsurface exploration and testing will be necessary in order to provide design recommendations for the proposed development.
Geotechnologies, Inc. appreciates the opportunity to provide our services on this project. Should you have any questions please contact this office.

Respectfully Submitted,
GEOTECHNOLOGIES, INC.

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R.C.E. 83961

STP: km/ae

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Email to: [kshorr@trammellcrow.com]

Enclosures: References
Vicinity Map
Local Geologic Map
Historical Topography Map
Historically Highest Groundwater Levels Map
Seismic Hazard Zone Map
Fault Location Map - NavigateLA
MTA Rail Line Map
Oil Well Location Map
Methane Zone Risk Map
REFERENCES

California Department of Conservation, Division of Mines and Geology, 1998 (Revised 2006), Seismic Hazard Zone Report of the Hollywood 7½-Minute Quadrangle, Los Angeles County, California., C.D.M.G. Seismic Hazard Zone Report 026, map scale 1:24,000.


Dibblee, T.W. Jr., 1991, Geologic Map of the Hollywood and Burbank (South ½), Quadrangles, Division of Mines and Geology, DF Map #DF-30, Map Scale 1:24,000.


LEGEND

Qa: Surficial Sediments - Alluvium - gravel, sand and clay
Qae: Older Surficial Sediments - similar to Qa, but slightly elevated and dissected
Tush: Unnamed Shale - gray to light brown, thin-bedded silty clay shale, soft and crumbly
Tmss: Monterey Formation - tan to light gray semi-friable sandstone
Tvb: Middle Topanga Formation and Volcanic Rocks - basaltic volcanic rocks - dark gray to black, fine grained, massive to locally vesicular and/or pillowed

fault - dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful

GUARDIAN SITE

Los Angeles City Oil

SUBJECT SITE

REFERENCE: CDMG, SEISMIC HAZARD ZONE REPORT, 026
HOLLYWOOD 7.5 - MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (1998, REVISED 2006)

HISTORICALLY HIGHEST GROUNDWATER LEVELS

Geotechnologies, Inc.
Consulting Geotechnical Engineers

TRAMMELL CROW

FILE No. 21338
SUBJECT SITE

LIQUEFACTION AREA

REFERENCE: SEISMIC HAZARD ZONES, HOLLYWOOD QUADRANGLE OFFICIAL MAP (CMRG, 1999)
REFERENCE: http://navigatela.lacity.org/NavigateLA/
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REFERENCE: DIVISION OF OIL, GAS & GEOTHERMAL RESOURCES WELL FINDER, STATE OF CALIFORNIA, 2014