APPENDIX F

GEOTECHNICAL FEASIBILITY STUDY

CORNERSTONE EARTH GROUP

Date:	November 20, 2019
Project No.:	400-10-1
Prepared For:	Mr. Henry Cord **CORD ASSOCIATES** 401 Fieldcrest Drive San Jose, California 95123
Re:	Winchester Boulevard Residential Mixed-Use 1073 S. Winchester Boulevard San Jose, California

Dear Mr. Cord:

This letter provides the results of our geotechnical feasibility study and preliminary recommendations for the residential project referenced above. The findings and recommendations provided herein are intended for project planning purposes only and are not intended to be used for final project design or construction.

PROJECT UNDERSTANDING

Based on our understanding, the project will include redeveloping the approximately 0.8-acre, one-parcel, site located west of South Winchester Boulevard and south of Opal Drive. The site will be redeveloped for a 6-story residential apartment building over a one-level below-grade parking garage.

SITE CONDITIONS

REGIONAL SEISMICITY (GENERAL)

The San Francisco Bay area region is one of the most seismically active areas in the Country. While seismologists cannot predict earthquake events, the U.S. Geological Survey's Working Group on California Earthquake Probabilities 2015 revises earlier estimates from their 2008 (2008, UCERF2) publication. Compared to the previous assessment issued in 2008, the estimated rate of earthquakes around magnitude 6.7 (the size of the destructive 1994 Northridge earthquake) has gone down by about 30 percent. The expected frequency of such events statewide has dropped from an average of one per 4.8 years to about one per 6.3 years. However, in the new study, the estimate for the likelihood that California will experience a magnitude 8 or larger earthquake in the next 30 years has increased from about 4.7 percent for UCERF2 to about 7.0 percent for UCERF3.

UCERF3 estimates that each region of California will experience a magnitude 6.7 or larger earthquake in the next 30 years. Additionally, there is a 63 percent chance of at least one magnitude 6.7 or greater earthquake occurring in the Bay Area region between 2007 and 2036. Higher levels of shaking and damage would be expected for earthquakes occurring at closer distances.

EXISTING SITE CONDITIONS

The site is located west of South Winchester Boulevard in San Jose, California. It is bounded by residential development to the north and the west, South Winchester Boulevard to the east, and commercial development to the south. The site is currently occupied by an existing church and surrounding asphalt concrete parking lot and driveway. Based on our visual observation, the site appears to be relatively level, sloped for drainage.

ANTICIPATED SUBSURFACE CONDITIONS

The surficial geology at the site is mapped as Holocene alluvial fan deposits (CGS, 2002). Based on the mapped geological unit and our experience at other sites in the vicinity, we anticipate the site is underlain by generally medium stiff to very stiff fine-grained soils (silts and clays) interbedded with generally medium dense to dense sands. Plasticity Index tests performed at nearby sites indicate the surficial soils may exhibit moderate to high expansion potential.

Based on our experience with similar sites with past site use, we recommend you anticipate encountering localized areas of undocumented fill and loose surficial soils.

GROUNDWATER

Historic high groundwater is mapped as greater than 50 feet below the ground surface by CGS (San Jose West 7.5-Minute Quadrangle, 2002). Nearby groundwater monitoring well located north of the site indicates groundwater depths between 57 to 80 feet below the ground surface (GeoTracker, 2015). Fluctuations in the level of the groundwater may occur due to variations in rainfall, underground drainage patterns, as well as numerous other factors.

GEOLOGIC HAZARDS

FAULT RUPTURE

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone, therefore, fault rupture through the site is not anticipated (CGS, 2002).

GROUND SHAKING

Moderate to severe (design-level) earthquakes can cause strong ground shaking, which is the case for most sites within the Bay Area. While a seismic hazard analysis has not been prepared for this feasibility study, strong ground shaking can be expected at the site during the life of the improvement. With the recent updates to the California Building Code (2019 CBC), depending on the subsurface conditions encountered, a ground motion hazard analysis will likely be required to be performed to better characterize the seismic design parameters.

Potential mitigation of strong ground shaking likely includes designing new structures to meet current building codes and applicable requirements.

LANDSLIDING

The site is not located within a California Seismic Hazard Zone for landsliding (CGS, 2011). Due to the relatively flat topography, the potential for landsliding at the site may be considered low.

DIFFERENTIAL COMPACTION

Provided any near-surface undocumented fill and loose material is removed and replaced as engineered fill, in our opinion, the probability of differential compaction at the site is low.

LIQUEFACTION

The site is not mapped within a California Seismic Hazard Zone for liquefaction (CGS, 2002).

As previously discussed, groundwater in the area is anticipated to be greater than 50 feet below the ground surface. In addition, the site is underlain by alluvial deposits consisting of clayey, silty, and sandy soils. The granular materials, including sandy soils, are generally loose to dense in consistency. However due to the deep groundwater table, the potential for liquefaction impacting site development is considered low.

We recommend the potential for liquefaction is evaluated during the design-level geotechnical investigation to confirm anticipated groundwater depth and subsurface layers once the project plans are finalized.

LATERAL SPREADING

Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form.

There are no open faces within an appropriate distance of the site where lateral spreading could occur; therefore, in our opinion, the potential for lateral spreading to affect the site is low.

SEISMIC SETTLEMENT/UNSATURATED SAND SHAKING

Loose to medium dense unsaturated sandy soils can settle during strong seismic shaking resulting in settlement of the ground surface and building foundations. Seismic compression of unsaturated sand occurs due to rearrangement of soil particles during shaking and compression of the void space. The magnitude of volumetric compression of unsaturated sand is largely a function of seismic loading (effective shear strain and number of cycles) and the state of the soil (relative density and degree of saturation). As previously discussed, groundwater in the area is anticipated to be greater than 50 feet below the ground surface and the site is underlain by alluvial deposits consisting of granular materials, generally of loose to dense consistency. As such we anticipate the potential for seismic settlement of unsaturated sandy soils to be moderate.

We recommend the potential for dry sand settlement to be evaluated during the design-level investigation to confirm anticipated groundwater depth and subsurface layers once the project plans are finalized.

FLOODING

Based on our internet search of the Federal Emergency Management Agency (FEMA) flood map public database, the site is located within Zone D (Areas in which flood hazards are undetermined, but possible, FEMA 2009). We recommend the project civil engineer be retained to confirm this information, if appropriate.

CONCLUSIONS AND RECOMMENDATIONS

GEOTECHNICAL DESIGN CONSIDERATIONS

Based on available data and our engineering judgment, the planned residential development project is feasible from a geotechnical standpoint. This feasibility report and recommendations are intended to assist you with the project planning. A final design-level geotechnical investigation should be performed once development plans are finalized.

Potential geotechnical concerns, design considerations, and preliminary recommendations are provided herein. A brief description of these concerns follows.

- Undocumented fill
- Expansive soils
- Potential for Cohesionless Soils
- Differential Movement at On-Grade to On-Structure Transitions
- Proximity of Basement Excavation to At-Grade Structures and Improvements

Undocumented Fill

The site is currently developed. Areas of undocumented fill and loose surficial materials should be anticipated and planned for. Potential issues that are often associated with redeveloping sites include demolition of existing improvements, abandonment of existing utilities, and undocumented fill. Undocumented fills and improvements will likely be removed for the 1-level below-grade basement. However, if fills and existing improvements extend below the bottom of basement or in areas of future at-grade improvements, the fills and improvements should be removed and replaced as engineered fill.

Expansive Soils

Based on our review of available data from nearby sites, we anticipate the surficial soils will be moderately to highly expansive. Expansive soils can undergo significant volume change with changes in moisture content. They shrink and harden when dried and expand and soften when wetted. Potential measures to reduce the potential for damage to the planned structures and slabs-on-grade, may include:

- employing grading and compaction methods to reduce potential volume change,
- providing sufficient reinforcement to resist expansive soil forces, and
- supporting slabs on a layer of non-expansive fill.

Foundations should be designed to extend below the zone of seasonal moisture fluctuation or to resist uplift forces. In addition, it is important to limit moisture changes in the surficial soils by using positive drainage away from the building as well as limiting landscaping watering.

Potential for Cohesionless Soils

As mentioned, the site is underlain by alluvial deposits consisting of clayey, silty and cohesionless, sandy soils with low fines content. If sandy soils are encountered they are likely to not stand vertical when excavated and excavation sidewalls for foundations, utility trenches, temporary slopes, basement excavation, etc. may cave in or accumulate significant amount of slough. Grading and excavation contractors should be made aware of this condition and plan on forming footings, preparing slab-on-grade subgrade just prior to concrete placement, and other similar construction issues as relates to temporary shoring, utility excavations, etc.

Differential Movement at On-Grade to On-Structure Transitions

Some improvements may transition from on-grade support to the basement. Where the improvements transition from on-grade to the basement, varying amounts of settlement can be anticipated between the hotel and the joining improvements supported on-grade due to difficulty in compacting the retaining wall backfill as well as other issues. Subslabs beneath flatwork or pavers that can cantilever at least 3 feet beyond the wall may need to be considered.

Proximity of Basement Excavation to At-Grade Structures and Improvements

We anticipate the proposed garage basement walls will be close to existing buildings, roadways, and other improvements adjacent to the site. Design of permanent walls and shoring incorporating surcharge loads from adjacent existing structures and improvements or underpinning of the adjacent structures and improvements may be required.

FOUNDATIONS

The new residential apartment building with below grade parking garage will most likely consist of steel frame construction over and concrete frame construction. In our opinion, it is likely that the apartment building can be supported on conventional continuous and/or isolated spread foundations bearing entirely on natural, undisturbed soil, or compacted fill. As an alternative, the apartment building can also be supported on reinforced concrete mat foundations bearing on undisturbed natural soil or engineered fill. We estimate allowable soil bearing pressures on the order of 2,000 to 3,000 psf for combined dead plus live loading. The feasibility of spread footings and mat foundations should be evaluated further during the design-level geotechnical investigation.

DESIGN-LEVEL GEOTECHNICAL INVESTIGATION

The design considerations and feasibility recommendations contained in this report were based on limited site development information, geotechnical data in our files, and available published information. We recommend that Cornerstone Earth Group be retained to perform a design-level geotechnical investigation, once detailed site development plans are available. The recommendations provided in this letter should not be used for project design.

CLOSURE

This report has been prepared for the sole use of Cord Associates for the property at 1073 S. Winchester Boulevard in San Jose, California. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices at this time and location. No warranties are expressed or implied.

If you have any questions or need any additional information from us, please call and we will be glad to discuss them with you.

Sincerely,

Cornerstone Earth Group, Inc.

Stephen C. Ohlsen, P.E.
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SCO:DTT

Copies: Addressee (by email)