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January 30, 2017

Boulder Holdings, LLC
9663 Santa Monica Boulevard, #737
Beverly Hills, CA 90210-4303

Project No.: 641-A07
Report No.: 4

Attention: Mr. Yigal Hay

Subject: **Update of Geotechnical Study, Proposed 7-Eleven Convenience Store and Fuel Station / Future Commercial Development, Southeast Corner of Greenspot Road and Boulder Avenue, City of Highland, San Bernardino County, California..**

Reference:

1. Hilltop Geotechnical, Inc., May 6, 2005, *Report of Geotechnical Study, Proposed Commercial Development, Southwest Corner of Fifth Street and Boulder Avenue, City of Highland, San Bernardino County, California*, Project No. 483-D05, Report No. 1.

2. Hilltop Geotechnical, Inc., January 4, 2017, *Building and Canopy Set Back in Relation to the Proposed Underground Basin for Water Quality Treatment for the Proposed Highland, Greenspot Road and Boulder Avenue Parcel 1, City of Highland, San Bernardino County, California*, Project No. 641-A07, Report No. 3.

3. Thatcher Engineering & Associates, Inc., February 23, 2017, *Conditional Use Permit Site Plan, Proposed 7-Eleven Convenience Store and Fuel Station / Future Commercial Development APN 1201-361-17*, Reference No. 117207SP, Scale 1"= 30'.

Gentlemen:

In accordance with your request, **Hilltop Geotechnical, Inc.** has reviewed the referenced geotechnical report and plans pertaining to the subject site. Authorization to perform this study was in the form of a signed proposal from **Hilltop Geotechnical, Inc. (HGI)** (Geotechnical / Geologic Consultant) to **Mr. Yigal Hay** (Client), September 23, 2016, Proposal Number: P16146.

Per the referenced plan, proposed project will consist of a 7-Eleven Convenience Store and Fuel Station with associated hardscape (i.e., sidewalks, patios, curbs and gutters, etc.), paved parking and driveway areas. The proposed pad elevation for the structures were not presented on the plan. Cuts and fills of less than 3.0 feet are anticipated to develop the subject site.

As part of this geotechnical report update, a review of the Reference No. 1 'Report of Geotechnical Study' was performed and a supplemental site visit was performed on November 16, 2016 by a representative of **Hilltop Geotechnical, Inc.** As of November 16, 2016, the metal warehouse-type building, which was presented in the subject site at the time the Reference No. 1 'Report of Geotechnical Study' was performed, had been removed. There was no indication that the foundations for the structure had or had not been removed. It appears that there has been no other changes made to the subject site since the time the Reference No. 1 'Report of Geotechnical Study' was performed.

Based on our review of the referenced reports and plan, **Hilltop Geotechnical, Inc.** generally concurs with the recommendations presented in the Reference No. 1 report for the development of the subject site with the exception of the following:

2016 CBC SEISMIC DESIGN CRITERIA

Per the **California Building Standards Commission**, *2016 California Building Code* (CBC), California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Section 1613, 'Earthquake Loads,' the following coefficients and factors relevant to seismic mitigation and design for new construction include:

- Site Class

  Categorizing the upper 30 meters (±100 ft.) of earth materials into one (1) of the Site Classes 'A,' 'B,' 'C,' 'D,' 'E,' and 'F' that are based on average shear wave velocities, Standard Penetration Test blow counts, or undrained shear strength.

- **Occupancy Category**
  Relationship between the number of lives placed at risk by a failure of the structure as determined from Figure C1-1, 'Approximate Relationship between Number of Lives Placed at Risk by a Failure and Occupancy Category,' in Chapter C1 of ASCE 7-10.

- **Mapped, Maximum Considered Earthquake (MSC), 5.0 Percent Damped, Spectral Response Acceleration Parameters at Short Period and at 1-Second Period**
  Mapped, Maximum Considered Earthquake (MSC), 5.0 percent damped, spectral response acceleration parameters at short period (0.2 second) and at long period (1-second), S_s and S_1, respectively, for Site Class 'B' are determined from Java Ground Motion Parameter Calculator - Version 5.0.9a available at the USGS web site (http://earthquake.usgs.gov/research/hazmaps/design/).

- **Site Coefficients**
  Short period site coefficient (at 0.2 second period), F_a, and long-period site coefficient (at 1.0 second period), F_v, are based on 'Site Class' and the 'Mapped Spectral Response Acceleration at Short Period and at 1-Second Period,' S_a and S_1, respectively.

- **Seismic Design Category**
  A classification assigned to a structure based on its 'Risk Category' and the severity of the design earthquake ground motion at the site (i.e., Short Period Response Acceleration (S_{DS}) and Long Period Response Acceleration (S_{D1}) Parameters).

Based on our understanding of local geologic conditions, the 'Site Class' judged applicable to this site is 'D', with a soil profile name of 'Stiff Soil (D)' per Table 20.3-1, 'Site Classification,' in Chapter 20 of ASCE 7-10 with an average Shear Wave Velocity of 600 to 1,200 feet/second (ft./s) or an average Standard Penetration Test value of 15 to 50 blows per foot of penetration in the upper 100 feet (30.48 m) of the site.

The following table presents supplemental coefficients and factors relevant to seismic mitigation and design for new construction built according to the 2016 CBC based on a 2-percent probability of being exceeded in the next 50 years (2,475 years mean return time).

SEISMIC DESIGN CRITERIA	
Site Location	Latitude: 34.1076° North Longitude: 117.1856° West
Occupancy Category[1]	I, II, III
Site Class[2]	D
Mapped, Maximum Considered Earthquake (MCE), 5.0 Percent Damped, Spectral Response Acceleration Parameter at Short Period (S_s)[3] (0.2 Second) for Site Class 'B.'	2.233
Mapped, Maximum Considered Earthquake (MCE), 5.0 Percent Damped, Spectral Response Acceleration Parameter at 1-Second (S_1)[3] for Site Class 'B.'	1.095
Site Coefficients (F_a)[3] for Site Class 'D.'	1.0
Site Coefficients (F_v)[3] for Site Class 'D.'	1.5
The MSC, 5.0 Percent Damped, Spectral Response Acceleration Parameter at Short Periods Adjusted for Site Class 'D' Effects (S_{MS})[3].	2.233
The MSC, 5.0 Percent Damped, Spectral Response Acceleration Parameter at 1-Second Adjusted for Site Class 'D' Effects (S_{M1})[3]	1.642
Design, 5.0 Percent Damped, Spectral Response Acceleration Parameter at Short Periods (S_{DS})[3] for Site Class 'D.'	1.489
Design, 5.0 Percent Damped, Spectral Response Acceleration Parameter at 1-Second (S_{D1})[3] for Site Class 'D.'	1.095
Seismic Design Catagory[4]	E
Model Magnitude Earthquake (M)[5]	7.36
Average Shear Wave Velocity in the Top 30m of the Site for Site Class 'D.'[5]	274 m/s
Peak Ground Acceleration (PGA)[5]	1.7815g
Site Coefficient (F_{PGA})[6]	1.0
$PGA_M = F_{PGA} * PGA$[7]	1.7515

SEISMIC DESIGN CRITERIA	
1.	Determined from Figure C1-1, 'Approximate Relationship between Number of Lives Placed at Risk by a Failure and Occupancy Category,' in Chapter C1 of ASCE 7-10, 2010 Edition.
2.	Per Table 20.3-1, 'Site Classification,' in Chapter 20 of ASCE 7-10, 2010 Edition.
3.	Java Ground Motion Parameter Calculator - Version 5.1.0 (2-10-2011) available at USGS web site (http://earthquake.usgs.gov/designmaps/us/application.php). Data based on ASCE 7-10, 2010 Edition, 'Standard, Minimum Design Loads for Buildings and Other Structures.'
4.	Per Table 11.6-1, 'Seismic Design Category Based on Short Period Response Acceleration Parameters' and Table 11.6-2, 'Seismic Design Category Based on 1-S Period Response Acceleration Parameters' in Chapter 11 of ASCE 7-10, 2010 Edition.
5.	Probabilistic seismic hazard maps and data files prepared by the USGS assign a 2-percent likelihood that the PGA will occur at this site within the next 50 years (2,475 years mean return time). This data was available at the USGS, Geologic Hazards Science Center's 2008 NSHMP PSHA Interactive Deaggregation Web Site (https://geohazards.usgs.gov/deaggint/2008/).
6.	Per Table 11.8-1, 'Mapped Maximum Considered Geometric Mean (MCE_G) Peak Ground Acceleration, PGA,' in Chapter 11 of ASCE 7-10, 2010 Edition.
7.	Per Section 11.8.3 in Chapter 11 of ASCE 7-10, 2010 Edition.

Actual shaking intensities at the site from any seismic source may be substantially higher or lower than estimated for a given earthquake magnitude, due to complex and unpredictable effects from variables such as:

- Near-source directivity effects.
- Direction, length, and mechanism of fault rupture (strike-slip, normal, reverse).
- Depth and consistency of unconsolidated sediments.
- Topography.
- Geologic structure underlying the site.
- Seismic wave reflection, refraction, and interference.

UNDERGROUND TANK INSTALLATIONS

Excavations for the installation of the proposed underground fuel storage tanks are anticipated to extend to depths of 10 to 15 feet below finished site grades. The excavation sidewalls should be cut back according to the 'Temporary Construction Excavation Recommendation' section of this report or be shored during construction. Surcharge loads (i.e., spoil piles, earthmoving equipment, trucks, etc,) should not be allowed within a horizontal distance measured from the top of the trench excavation equivalent to the depth of the excavation. The tanks should be installed and the excavations backfilled in accordance with the tank manufactures recommendations. If recommendations are not provided by the tank manufacture for the backfill of the excavations, the following procedures should be utilized. The backfill around the tanks should consist of 1/8 to 3/8 inch rounded to subrounded natural material. Crushed materials are not recommended unless the backfill is placed in thin lifts and compaction can be performed. If fiberglass tanks are used, it is not recommended to vibrate the gravel for compaction due to the potential for localized over-stressing of the tank walls. The gravel should be placed in 12 to 18 inch thick lifts, spread evenly, and lightly tamped with a manually operated compactor to minimize potential settlement.

TEMPORARY CONSTRUCTION EXCAVATION RECOMMENDATIONS

Before excavation work is begun on the site, the site should be observed carefully for conditions which require precautionary measures. This is especially important when working in developed areas and in the vicinity of roadways and utility structures. The adjacent properties should be surveyed before beginning excavations. Existing defects such as cracking and settlement of buildings, perimeter block walls, paved areas, etc. should be documented.

The locations of underground utilities, such as electric, telephone, fuel, water, sewer, gas, etc. should be determined both on the subject site and adjacent to the site before performing the excavation. Even if subsurface utility lines do not cross the excavation, they can still be disrupted. Utility lines that run parallel to the line of the excavation also can be effected. Sometimes pipes fracture at the time the excavation is performed; often pipes fracture several months after the completion of the excavation backfilled procedures. It is difficult to predict the bending moments, joint rotation, and movement in the pipe either during excavation or backfill operations. If utility lines are located within a zone extending upward from a point below the toe of the excavation slope of B/2, where B is the width of the bottom of the excavation, to a horizontal distance of H+B/2 measured from the top of the excavation slope, where H is the vertical height of the excavation, the utility company should be contacted for recommendations and a

plan for protecting the utility. If utility lines are located within a zone extending upward from a point below the toe of the excavation slope of B/2, where B is the width of the bottom of the excavation, to a horizontal distance between H+B/2 to 2(H+B/2) measured from the top of the excavation slope, where H is the vertical height of the excavation, there is an intermediate risk of damage to the utility. If the utility lines are located outside the zone extending upward from a point below the toe of the excavation slope of B/2, where B is the width of the bottom of the excavation, to a horizontal distance of 2(H+B/2) measured from the top of the excavation slope, where H is the vertical height of the excavation, there should not be a risk of damage.

Structures located within a horizontal distance from the edge of an excavation equivalent to the vertical depth of the excavation can be effected by the excavation. Shoring, bracing, or underpinning may be needed to maintain the stability of the structure and to protect the workers in the excavation.

Temporary construction excavations for grading, foundations, retaining walls, utility trenches, etc., 5.0 feet in depth and to a depth of 20 feet should be shored or cut back to the following inclinations:

EARTH MATERIAL	OSHA SOIL TYPE*	TEMPORARY SLOPE INCLINATION (H:V)**
Undocumented Fill	C	1.5:1
Compacted Fill	C	1.5:1
Alluvium	C	1.5:1

* Type 'C': Cohesive soils with an unconfined compressive strength of 0.5 tsf or less: or Granular soils including sands, gravels, loamy sands, etc.

** Steepest allowable slopes for excavations less than 20 feet in vertical height. Slopes for excavations greater than 20 feet in vertical height should be designed by a Registered Professional Engineer with experience in Geotechnical Consulting and Soil Mechanics.

Excavations of less than 5.0 feet in depth may also be subject to collapse due to water, vibrations, previously disturbed earth materials, or other factors and may require protection for workers such as temporary slopes, shoring, or a shielding protective system. The excavations should be observed by a qualified, competent

person (as defined in the OSHA regulations) looking for signs of potential cave-ins on a daily basis before start of work, as needed throughout the work shifts, and after every rainstorm or other hazard-increasing occurrence.

Surcharge loads (i.e., spoil piles, earthmoving equipment, trucks, etc,) should not be allowed within a horizontal distance measured from the top of the excavation slope equivalent to 1.5 times the vertical depth of the excavation (for medium stiff or dense earth materials). Excavations should be initially observed by the project Geotechnical / Geologic Consultant and/or their representative to verify the recommendations presented or to make additional recommendations to maintain stability and safety. Moisture variations, differences in the cohesive or cementation characteristics, or changes in the coarseness of the deposits may require slope flattening or, conversely, permit steepening upon review by the project Geotechnical / Geologic Consultant or their representative. The excavations should be observed by a qualified, competent person (as defined in the OSHA regulations) looking for signs of potential problems on a daily basis before start of work, as needed throughout the work shifts, and after every rainstorm or other hazard-increasing occurrence. Deep utility trenches may experience caving which will require special considerations to stabilize the walls and expedite trenching operations. Surface drainage should be controlled along the top of the construction slopes to preclude erosion of the slope face. If excavations are to be left open for long periods, the slopes should be sprayed with a protective compound and/or covered to minimize drying out, raveling, and/or erosion of the slopes.

Where insufficient space exists for sloped excavations, shoring should be used. The contractor should submit to the owner and/or the owner's designated representative detailed drawings showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection. If the drawings do not vary from the requirements of the OSHA Construction Standards for Excavations (CAL OSHA or FED OSHA, whichever is applicable for the project at the time of construction), a statement signed by a registered Civil or Structural Engineer in the State of California, engaged by the contractor at his expense, should be submitted certifying that the contractor's excavation safety drawings comply with OSHA Construction Standards for Excavations. If the drawings vary from the applicable OSHA Construction Standards for Excavations, the drawings should be prepared, signed, and sealed by a Registered Civil or Structural Engineer in the State of California. The contractor should not proceed with excavations until the project owner or his designated representative has received and acknowledged the prepared excavation safety drawings. Geotechnical recommendations for shoring design can be submitted upon request.

It is recommended that **Hilltop Geotechnical, Inc.** review the grading plans and foundation plans for the subject development as they become available. The purpose of this review is to determine if these plans have been prepared in accordance with the recommendations contained in the Reference No. 1 'Report of Geotechnical Study' and presented in this report. This review will also provide us an opportunity to submit additional recommendations as conditions warrant.

If you have any questions regarding this submittal, please do not hesitate to contact this office at your convenience.

Respectfully submitted,
HILLTOP GEOTECHNICAL, INC.

Mark Hulett, CEG No. 1623
President

Sundaramoorthy Srirajan, GE No. 2871
Senior Engineer
Date Signed 3-30-17

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