APPENDIX C

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# GEOTECHNICAL INVESTIGATION REPORT

**PROPOSED**
**(3) TWO-STORY NEW RESIDENCE**
**AT**
**18081 LOS GATOS SARATOGA RD.**
**MONTE SERENO, CA**

By

*CAPEX ENGINEERING INC.*

Project No. 10926
February 21, 2017

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## 1.0 INTRODUCTION

The purpose of the geotechnical investigation for the proposed (3) Two-story new residence, development located at 18081 Los Gatos Saratoga, Monte Sereno, CA; was to determine the surface and subsurface soil conditions at the subject site. Based on the data and information obtained, we have provided recommendations for foundation design and grading criteria for the site.

The scope of our work included the following:

1. Site reconnaissance by Project Engineer.
2. Subsurface exploration consisted of one boring
3. Performed laboratory tests to provide engineering criteria.
4. The preparation and writing of this report which presents our findings, conclusions and recommendations.

Our findings indicate that the proposed development is feasible from a geotechnical standpoint provided the recommendations in this report are included into the project plans and specifications and adhered to during and after construction.

## 2.0 SITE LOCATIONS AND DESCRIPTION

The site is located on 18081 Los Gatos Saratoga, Monte Sereno, CA. The proposed project is understood to consist of construction (3) Two-story residence. The site is 4 to 1 (horizontal to vertical) slope from existing flat and the surrounding lots of the site are developed with residence. The above description is base on site reconnaissance by the project engineer and a site plan.

## 3.0 FIELD INVESTIGATION

The field investigation was performed on February 15, 2017 and included a site reconnaissance by the project engineer and the drilling of three (3) exploratory boring.

The borings were drilled to a maximum depth of 20 feet below the existing ground surface. The drilling was performed with a truck-mounted rig using power driven, six inches diameter flight auger. Drilling was performed by Pacific Drilling Company.

Visually classifications were made from the auger cuttings and the samples in the field. As the drilling proceeded, undisturbed samples were obtained by means of a 2.5 inches split-tube sampler (Outer Diameter of Sampler). The sampler was driven under the impact of a 140 pounds hammer with a free fall of 30 inches.

The number of blows required driving the sampler the last 12 inches were adjusted to the standard penetration resistance (N-Value) and are presented in the Log of Test Borings (Figure 3, 4 & 5).

## 3.0 SOIL CONDITIONS

The soil conditions were derived from our site reconnaissance and the information and samples obtained from our exploratory borings. Detailed descriptions of the materials encountered in the laboratory borings and the results of the laboratory tests are presented on "Log of Test Boring" (Figure 3, 4 & 5).

The subsurface soils condition, as encountered in the boring were found to consist of a dark brown silty clay with gravel to terminate depth 20' of boring.

No ground water was encountered during drilling operations. However, fluctuations in the groundwater table are anticipated with seasonal rainfall variations. The boring was backfilled on the date of excavation.

## 5.0 LABORATORY TESTINGS

5.1 All samples were visually classified in the laboratory in accordance with the Unified Soil Classification System per ASTM D-2487 and/or D-2488 in order to verify the field classification.

5.2 The natural moisture contents and dry unit weights were determined for all undisturbed samples per ASTM D-2216.

5.3 Gradation tests were performed on selective samples per ASTM D-442 in order to provide engineering characteristics of the material and for liquefaction potential evaluation.

The results of sieve analysis tests indicate that the near surface soils exhibit a medium percentage of fines and are subject to a medium swell/shrink potential with variation in moisture content. (P.I = 16.5)

## 6.0 C.B.C (2016 EDITION) EARTHQUAKE DESIGN CRITERIA

The seismic design parameters for the site per Chapter 16 of the California Building Code (2016 Edition) are follows:

Latitude: 37.233440 (degrees) Longitude: -121.987204 (degrees)
Site Class = C
Short Term Spectral Response Parameter, Ss = 2.678 g
Short Term Design Spectral Response Parameter, $S_{DS}$= 1.794 g
1 Second Spectral Response Parameter, $S_1$= 1.009 g
1 Second Design Spectral Response Parameter, $S_{D1}$= 0.874 g

## 7.0 LIQUEFACTION POTENTIAL EVALUATION

Liquefaction occurs primarily in relatively loose, saturated, cohesionless soils which can be subjected to a temporary loss of strength due to the buildup pore pressures, especially as a result of cyclic loading such as induced by earthquakes.

Evaluation of liquefaction potential on this site was based on the soil type, density of the site soils, and the presence of groundwater. Based on the data obtained during our field and laboratory investigations, it is our opinion that the liquefaction potential at this site is nil.

## 8.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

### 8.1 General

From a geotechnical standpoint, for the proposed addition development is feasible for construction on the subject site provided the recommendations presented in this report are carefully followed and are incorporated into the project plans and specifications.

### 8.2 Grading & Compaction

8.2.1 Prior to any grading, demolition of the site should be completed. This should include the removal of the existing residential structure and any concrete foundations, underground utilities or any other surface or sub-surface structure which may be encountered. Any tree root system, debris or trashes that are encountered should also be removed. It is vital that *CAPEX ENGINEERING INC.* observe the demolition operation and be notified in ample time to ensure that no sub-surface structures are covered and that any tree root system completely removed.

8.2.2 All on-site material having an organic content of less than 1% by volume and free from other deleterious materials are suitable for use as fill on site. All fill material should have a maximum particle size of 6 inches with no more than 15% larger than 2.5 inches.

8.2.3 Any import fills which is predominately granular in nature and with plasticity index of 12 or less can be used. The soil engineer should give final approval of any import fill material prior to placement. The contractor shall notify the soil engineer 5 working days in advance of his intention to import soil from any other source outside the site area and shall permit the engineer to sample as necessary for the purpose of performing tests to establish the qualities of the material.

8.2.4 After preparation of the native ground soils, the site may be brought to the desired finish grade by placing on-site native material or import material in lifts not to exceed 8 inches in uncompacted thickness. Compacted to a minimum of 90% as determined by ASTM D-1557-91 laboratory testing procedure.

8.2.5 The moisture content of the fill material should be 0 to 3% above optimum and sufficient to obtain the required density. Water should be added or other satisfactory method shall aerate the fill material in order to have acceptable range for moisture.

**8.3 Foundations**

The proposed new residence could be drilled piers and grade beams foundations:

Drill 18" Ø with 12' (Twelve feet from the bottom of grade beams) deep piers and the design parameters as following:

a. Skin Friction ---------- 500 psf
b. Lateral passive pressure ---------- 250 pcf
c. Minimum pier diameter ---------- 18 inches
d. Minimum Pier depth ---------- 12 feet
e. Minimum Pier Spacing ---3 pier diameters, center to center.
f. Maximum Pier Spacing --- To be determined by structural engineer based on load distribution capacity of grade beams.
g. Neglecting skin friction in the upper 2 feet of soil for design purposes.
h. **Construction ---------- (I) Pier holes must be cleaned of spoils and the bottoms tamped (II) Trim " mushroomed" concrete from around each pier and from along the sides of the grade beams.**
i. **All pier excavations should be inspected and approved by the soil engineer prior to the placement of reinforcing steel.**

**8.4 CONCRETE SLAB ON GRADE**

8.4.2 Concrete slab should be structurally reinforced using at least No. 4 bars, within the middle of slab, at 18 inch on centers both ways. The structural engineer may determine that additional reinforcement is required based on the intended use and loading of the slab.

8.4.3 Slab on grade should be underlain by a minimum of 4 inches of granular material conforming to Caltrains Specifications for Class II permeable material in order to provide a capillary moisture break. An impervious membrane of 10 mils minimum thickness should be placed over the granular material in order to provide vapor barrier.

## 8.5 GENERAL CONSTRUCTION REQUIREMENTS

**Surface Drainage and Irrigation:**

8.5.1 All finish grades should provide a positive gradient to an adequate discharge point in order to provide rapid removal of surface water runoff away from all foundations. No stilling water should be allowed on the pad or adjacent to the foundations. These lot slopes should be provided to aid in the removal of water from the pads and to reduce the amount of water to seep beneath the buildings. Surface drainage should be provided as designed by the project engineer and maintained by the property owner at all times afterwards.

8.5.2 All finish grade drainage swales must be cut into compacted finish grade. Construction of the drainage swales using uncompacted loose surface fill does not meet the recommended grading requirement.

8.5.3 Continuous roof gutters are recommended with splash block direct the flow away from the house

8.5.4 Planters should be avoided adjacent to the foundation. Should planters be constructed, foliage requiring little irrigation should be considered to further reduce the amount of water that could affect the foundation. Alternatively, a watertight planter box with controlled discharge should be provided.

**Utility Trenches:**

8.5.5 Any utility trenches extending under the building areas should be backfilled with native on-site soils or approved import materials. Backfill should be properly compacted to prevent water migration through the utility trenches extending underneath the structure.

8.5.6 Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to a relative compaction of 90% to within 12 inches of the subgrade. The upper 12 inches should be compacted to 95% relative compaction. Backfilling and compaction of these trenches must meet the requirement set forth by the City of Monte Sereno, Department of Public Works.

8.5.7 The soils generated from trenching may be used as backfill with the exception of cobbles greater than 6 inches in largest dimension. Compaction of the trench backfill should comply with the requirements set forth by the City of Monte Sereno, Department of Public Works.

**Trench Shoring and Temporary Slopes**

8.5.8 Applicable safety standards require that trenches in excess of 5 feet must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the soil engineer as to the type of soil and the resulting inclination. Slope of 1:1 (horizontal to vertical) may be utilized for stable cohesive soils while 2:1 will be required for the more granular loose soil.

## 9.0 CONSTRUCTION OBSERVATION

The recommendations of this report are based upon assumptions regarding design concepts, and construction materials and procedures. To validate these recommendations, Capex Engineering Inc. must be retained to:

a. Review the drainage and foundation plans.
b. Review the structural calculations related to the foundations.
c. Observe the preparation of the site for slab-on grade construction.
d. Observe the foundation excavations to determine if the exposed soil conditions are substantially the same as those encountered in this report; and, to make alternative recommendations based upon professional judgment.
e. Observe the initial and final site grading and installation of surface and subsurface drainage.

## 10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

10.1 The recommendations of this report are based on the assumption that the soil conditions do not deviate from those disclosed and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the construction, Capex Engineering Inc. will provide supplemental recommendations as dictated by the field conditions.

10.2 This report is issued with the understanding that it is the responsibility for owner or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect, Engineer and Contractor for the project and incorporated into the plans and that the necessary steps are taken to see that the contractor and subcontractor carry out such recommendations in the field.

10.3 This report specifically recommends that Capex Engineering Inc. be retained to review the project plans and to provide observations and/or testing services during construction. It is the responsibility of the client to retain Capex Engineering Inc. and to inform Capex Engineering Inc. of the need for such services.

10.4 The conclusions and recommendations contained in this report will not be considered valid after a period of two (2) years, unless the changes are reviewed and conclusions of this report modified or verified in writing.

10.5 Capex Engineering Inc. does not provide design services, nor does Capex Engineering Inc. act as a builder. Our professional findings and recommendations were prepared in accordance with generally accepted engineering principals and practices. NO other warranty, expressed or implied, is made.

# LOCATION MAP

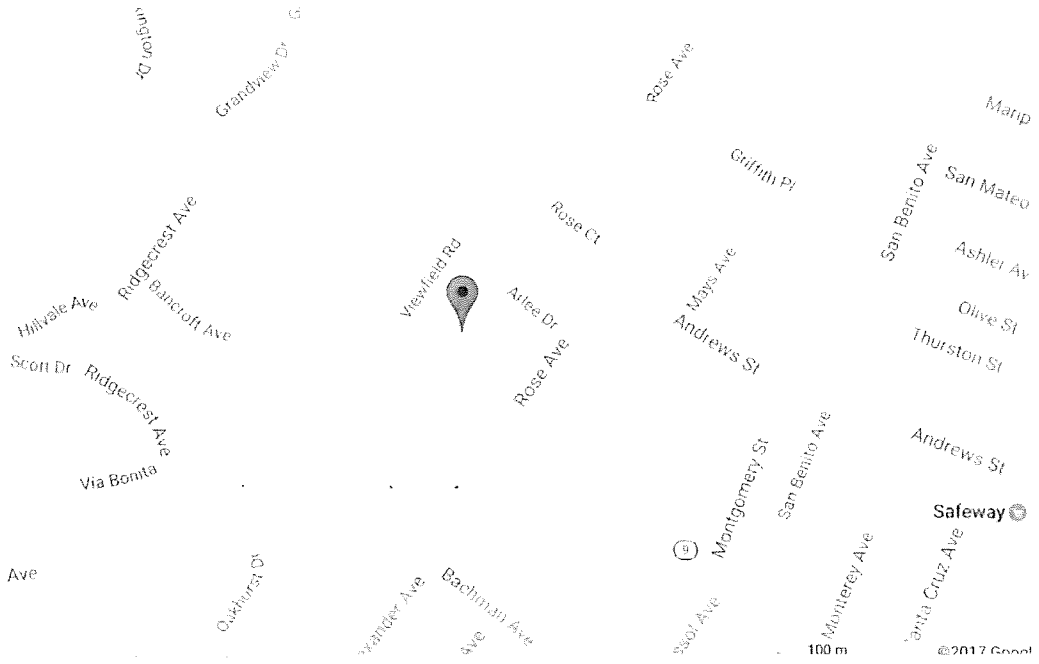
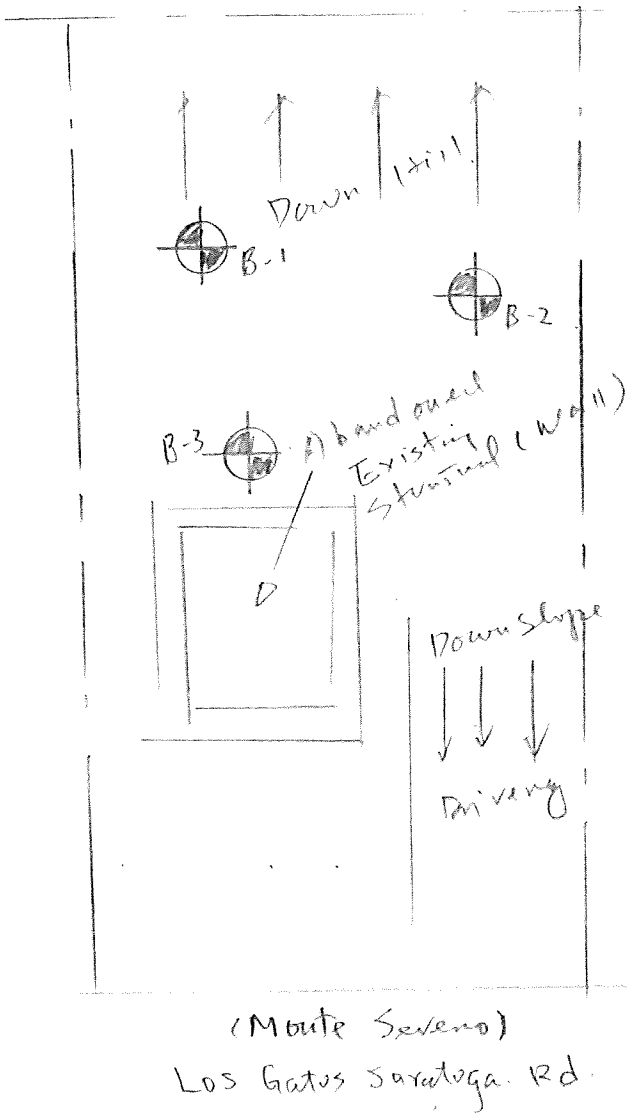



Figure 1

| | |
|---|---|
| Project No. 10926 | February 21, 2017 |
| *CAPEX ENGINEERING INC.* | 18081 Los Gatos Saratoga Rd.<br>Monte Sereno, CA |

# SITE PLAN




Approximate Location of Test Borings

Figure 2

| | |
|---|---|
| Project No. 10926 | February 21, 2017 |
| *CAPEX ENGINEERING INC* | 18081 Los Gatos Saratoga Rd.<br>Monte Sereno, CA |

| Depth (Feet) | Description | Sample No. | Unified Soil Classification | Blows/Foot (350 Ft.-Lbs) | Dry Density (P.C.F) | Moisture (% Dry Density) | Pocket Penet. (T.S.F) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Light brown Silty Clay, moist | | | | | | | |
| 3 | Light brown brown Silty Clay, moist , hard | 1-1 | CL | 50/6" | 117.0 | 14.0 | 4.0 | Unconfined Compression Test Uc=3,105 psf |
| 4 | | | | | | | | Atterberg Limits P.I= 16.5 |
| 5 | Same As Above | | | | | | | |
| 8 | | | | | | | | |
| 9 | Light brown Silty Clay, moist , stiff | 1-2 | CL | 50/4" | 118.0 | 14.5 | >4.5 | |
| 12 | Same As Above | | | | | | | |
| 13 | | | | | | | | |
| 14 | Light brown Silty Clay, moist, hard | 1-3 | CL | 50/6" | 119.0 | 15.0 | >4.5 | |
| 17 | Same As Above | | | | | | | |
| 18 | | | | | | | | |
| 19 | Light brown Silty Clay, moist, hard | 1-4 | CL | 46/6" | 118.5 | 15.5 | >4,5 | |
| 20 | | | | | | | | |
| 21 | Terminated of Boring at depth of 20 feet, groundwater was not encountered during boring | | | | | | | |
| 25 | | | | | | | | |

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***BORING LOG NO. 1***

*Date Drilled:* 2/15/17 *By:* G.H

*Figure No. 3*

*Project No. 10926*

| Depth (Feet) | Description | Sample No. | Unified Soil Classification | Blows/Foot (350 Ft.-Lbs) | Dry Density (P.C.F) | Moisture (% Dry Density) | Pocket Penet. (T.S.F) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Light brown Silty Clay, moist | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | Light brown brown Silty Clay, moist , hard | 2-1 | CL | 50/6" | 118.5 | 14.0 | >4.5 | Unconfined Compression Test Uc=2,975 psf |
| 5 | Same As Above | | | | | | | Atterberg Limits P.I= 16.0 |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | Light brown Silty Clay, moist , stiff | 2-2 | CL | 50/4" | 119.0 | 14.5 | >4.5 | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | Same As Above | | | | | | | |
| 13 | | | | | | | | |
| 14 | Light brown Silty Clay, moist, hard | 2-3 | CL | 50/6" | 119.5 | 15.0 | >4.5 | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | Same As Above | | | | | | | |
| 18 | | | | | | | | |
| 19 | Light brown Silty Clay, moist, hard | 2-4 | CL | 50/6" | 119.0 | 15.5 | >4.5 | |
| 20 | | | | | | | | |
| 21 | Terminated of Boring at depth of 20 feet, groundwater was not encountered during boring | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |

CAPEX ENGINEERING INC.

***BORING LOG NO. 2***

*Date Drilled:* 2/15/17 *By:* G.H

*Figure No. 4*

*Project No. 10926*

| Depth (Feet) | Description | Sample No. | Unified Soil Classification | Blows/Foot (350 Ft.-Lbs) | Dry Density (P.C.F) | Moisture (% Dry Density) | Pocket Penet. (T.S.F) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Light brown Silty Clay, moist | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | Light brown brown Silty Clay, moist , hard | 3-1 | CL | 50/6" | 119.5 | 14.5 | >4.5 | Unconfined Compression Test Uc=2,950 psf |
| 5 | Same As Above | | | | | | | Atterberg Limits P.I= 15.5 |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | Light brown Silty Clay, moist , hard | 3-2 | CL | 50/4" | 118.0 | 14.5 | >4.5 | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | Same As Above | | | | | | | |
| 13 | | | | | | | | |
| 14 | Light brown Silty Clay, moist, hard | 3-3 | CL | 50/6" | 118.5 | 15.5 | >4.5 | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | Same As Above | | | | | | | |
| 18 | | | | | | | | |
| 19 | Light brown Silty Clay, moist, hard | 3-4 | CL | 50/6" | 120.0 | 15.0 | >4.5 | |
| 20 | | | | | | | | |
| 21 | Terminated of Boring at depth of 20 feet, groundwater was not encountered during boring | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |

CAPEX ENGINEERING INC.

***BORING LOG NO. 3***

*Date Drilled:* 2/15/17 *By:* G.H

*Figure No. 5*

*Project No. 10926*