20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

GEOTECHNICAL EXPLORATION

SUBMITTED TO
Mr. Todd Deutscher
Catalyst Development Partners
18 Crow Canyon Court, Suite 190
San Ramon, CA 94583

PREPARED BY
ENGEIO Incorporated

March 22, 2017

PROJECT NO.
13255.000.000
March 22, 2017

Mr. Todd Deutscher
Catalyst Development Partners
18 Crow Canyon Court, Suite 190
San Ramon, CA 94583

Subject: 20785 and 20957 Baker Road
Castro Valley, California

GEOTECHNICAL EXPLORATION

Dear Mr. Deutscher:

As requested, we completed this geotechnical exploration for the proposed Baker Road residential development in Castro Valley, California. The accompanying report presents our field exploration and laboratory testing with our conclusions and recommendations regarding development at the site.

Our findings indicate that the project site is suitable for the proposed residential structure provided the recommendations and guidelines provided in this report are implemented during project planning and construction. We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses.

Sincerely,

ENGEO Incorporated

Teresa Klitzback, EIT

Jeff Fippin, GE
# TABLE OF CONTENTS

**LETTER OF TRANSMITTAL**

1.0 INTRODUCTION .............................................................................................................. 1

1.1 SITE LOCATION AND DESCRIPTION ......................................................................... 1

1.2 FORMER AND CURRENT USE OF PROPERTY .............................................................. 1

1.3 PROPOSED DEVELOPMENT ......................................................................................... 1

1.4 SCOPE OF SERVICES .................................................................................................. 1

1.5 PREVIOUS SITE EXPLORATIONS .............................................................................. 2

2.0 GEOLOGY AND SEISMICITY ......................................................................................... 2

2.1 GEOLOGIC SETTING AND SITE GEOLOGY ................................................................. 2

2.2 FAULTING AND SEISMICITY ...................................................................................... 2

2.3 FIELD EXPLORATION ................................................................................................ 3

2.4 SUBSURFACE STRATIGRAPHY .................................................................................... 3

2.5 GROUNDWATER ......................................................................................................... 3

2.6 LABORATORY TESTING ............................................................................................... 4

3.0 DISCUSSION ................................................................................................................ 4

3.1 EXPANSIVE SOIL........................................................................................................ 4

3.2 SEISMIC HAZARDS ................................................................................................... 5

3.2.1 Ground Rupture ..................................................................................................... 5

3.2.2 Ground Shaking .................................................................................................... 5

3.2.3 Soil Liquefaction .................................................................................................. 5

3.2.4 Lateral Spreading .................................................................................................. 6

3.3 2016 CBC SEISMIC DESIGN PARAMETERS .............................................................. 6

3.5 SOIL CORROSION POTENTIAL .................................................................................. 7

4.0 RECOMMENDATIONS AND CONCLUSIONS ............................................................. 7

4.1 GRADING .................................................................................................................... 8

4.2 ACCEPTABLE FILL ...................................................................................................... 8

4.3 FILL PLACEMENT ....................................................................................................... 8

4.4 SUBGRADE TREATMENT ............................................................................................ 9

4.5 BUILDING FOUNDATION .......................................................................................... 9

4.5.1 Post-Tensioned Mat Foundation System .................................................................. 9

4.5.2 Secondary Slab-on-Grade Construction ................................................................. 10

4.6 PRELIMINARY PAVEMENT DESIGN ........................................................................ 11

4.7 DRAINAGE ................................................................................................................ 11

4.8 UTILITIES .................................................................................................................. 12

5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS .................................................. 13

SELECTED REFERENCES

FIGURES

APPENDIX A – Exploration Logs

APPENDIX B – Laboratory Test Data

APPENDIX C – Liquefaction Analysis Results
1.0 INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

We prepared this geotechnical exploration report for the proposed new Baker Road residential project located at the 20785 and 20957 Baker Road in Castro Valley, California (Figure 1). The project site is identified by APN 84A-16-11-1 and 84A-16-5-9 and measures 1.1 acres in area. The site is bound to the west by Rutledge Road and to the east by Baker Road. A former equipment storage yard is located to the south of the property. Multi-family housing is present to the north and south of the property. An automotive shop is present to the west, and multi-family housing occupies the properties to the east of Baker Road.

1.2 FORMER AND CURRENT USE OF PROPERTY

According to aerial photographs, the property was previously used for dry farming. In 2004, AEI Consultants (AEI) removed two 1,000-gallon tanks from below the site under the observation of an inspector from Alameda County Environmental Health Services. The historic aerial photographs indicate that the aboveground structure previously occupied the south end of the site from approximately the 1980s until removal in 2004.

Currently, a fence traversing the east-west direction is present on the property. The northwestern portion of the property is overgrown with vegetation, and a remnant concrete building is present. The northeastern portion is occupied with a home and detached garage. The southern portion of the site is mostly covered with asphalt concrete pavement. The site is generally flat.

1.3 PROPOSED DEVELOPMENT

Based on the site plans prepared by William Hezmalhalch Architects Inc., dated July 19, 2016, the proposed development will include construction of new approximately 1.1-acre, three-story townhome structures to provide 20 units with at-grade garage space. Associated access roadways, landscaping areas, and new underground utilities are expected. Structural loads were not available at the time of writing this report but based on the building type, we anticipate relatively light to moderate loads.

1.4 SCOPE OF SERVICES

We prepared this report as outlined in our agreement dated January 27, 2017. Our scope of services included the following:

- Perform field exploration and laboratory testing of soil samples collected during exploration.
- Analysis of the geological and geotechnical data.
- Provide recommendations on mitigation measures for identified geotechnical constraints.
- Preparation of this report summarizing our findings and recommendations for site development.

This report was prepared for the exclusive use of Catalyst Development Partners and its consultants for design of this project. In the event that changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to determine whether modifications are necessary.
1.5 PREVIOUS SITE EXPLORATIONS

AEI previously drilled eight exploratory borings at the property on May 18, 2005, with the purpose of determining the extent of soil contamination and its impact on groundwater. Soil borings were advanced to depths ranging from 14 to 18 feet below ground surface using a Geoprobe direct-push drilling rig. Locations are shown on Figure 2 in 2005 and the field logs are presented in Appendix A.

2.0 GEOLOGY AND SEISMICITY

2.1 GEOLOGIC SETTING AND SITE GEOLOGY

The site is located within the Coast Ranges physiographic province of California. The Coast Ranges physiographic province is typified by a system of northwest-trending, fault-bounded mountain ranges and intervening alluviated valleys. Bedrock in the Coast Ranges consists of igneous, metamorphic, and sedimentary rocks that range in age from Jurassic to Pleistocene. The present physiography and geology of the Coast Ranges are the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the area include the San Andreas, Hayward, and Calaveras faults, as well as other lesser-order faults.

According to published geologic mapping covering the site by Dibblee (2005), the project site is underlain by Quaternary Alluvial deposits consisting of alluvial gravel, sand, and clay deposits as shown on Figure 3.

2.2 FAULTING AND SEISMICITY

Because of the presence of nearby active faults, the Bay Area Region is considered seismically active. An active fault is defined by the California Geological Survey as one that has had surface displacement within Holocene time (about the last 11,000 years) (Hart, 1997). Numerous small earthquakes occur every year in the region, and large (greater than Moment Magnitude, \( M_w \) 7) earthquakes have been recorded and can be expected to occur in the future. The site is not located within a State of California Earthquake Fault Zone. Figure 4 shows the approximate location of active and potentially active faults and significant historic earthquakes mapped within the San Francisco Bay Region. Using the 2008 USGS Quaternary Fault and Fold Database (QFFD), we provide distances to and estimated moment magnitudes of nearby mapped active faults in Table 2.2-1.

**TABLE 2.2-1: Summary of Nearby Active Faults**

<table>
<thead>
<tr>
<th>FAULT NAME</th>
<th>APPROXIMATE DISTANCE FROM SITE (MILES)</th>
<th>MAXIMUM MOMENT MAGNITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hayward</td>
<td>0.7</td>
<td>7.3</td>
</tr>
<tr>
<td>Calaveras</td>
<td>7.7</td>
<td>7.0</td>
</tr>
<tr>
<td>Mount Diablo Thrust</td>
<td>11.2</td>
<td>6.7</td>
</tr>
<tr>
<td>Green Valley</td>
<td>15.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Greenville</td>
<td>18.5</td>
<td>7.0</td>
</tr>
<tr>
<td>San Andreas</td>
<td>18.9</td>
<td>8.1</td>
</tr>
</tbody>
</table>
The Uniform California Earthquake Rupture Forecast (UCERF 3, 2015) evaluated the 30-year probability of a $M_w$ 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area, including the Hayward fault. The UCERF generated an overall probability of 72 percent for the Bay Area as whole, and a probability of 14 percent for the Hayward fault, 7 percent for the Calaveras fault, and 6 percent for the San Andreas fault.

### 2.3 FIELD EXPLORATION

We conducted our field exploration on February 28, 2017. Our exploration included drilling five 4-inch diameter solid-flight auger borings with a truck-mounted drill rig. The five borings extended to depths of approximately 8½ to 18½ feet below existing grade at the locations shown on Figure 2; each of our borings terminated in refusal conditions in bedrock. An engineer from our firm logged the borings in the field and collected soil samples using either a 2½-inch-inside-diameter (I.D.) California-type split-spoon sampler fitted with 6-inch-long brass liners or a 2-inch-outside-diameter (O.D.) Standard Penetration Test (SPT) split-spoon sampler. The split-spoon samplers were driven with a 140-pound hammer falling a distance of 30 inches. The hammer was lifted with a rope and cathead system. The penetration of the samplers into the soil materials was field recorded as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows required for the last 1 foot of penetration, and the blow counts reported on the logs have not been converted using any correction factors. The field logs were used to develop the report boring logs presented in Appendix A.

The logs of the borings depict subsurface conditions at the time the exploration was conducted. Subsurface conditions at other locations may differ from conditions occurring at these locations. Stratification lines represent the approximate boundaries between soil types and the transition may be gradual. We backfilled all of the borings on the day of drilling with cement grout under the observation and approval by a representative from the Alameda County Public Works.

### 2.4 SUBSURFACE STRATIGRAPHY

Based on information obtained from our exploration program and review of AEI's exploratory borings, the near-surface material consists of a layer of aggregate base followed by a layer of dark gray moderately plastic clay material extending to a depth of 3 to 6 feet below ground surface (bgs). Test results for this near surface clay indicate a Plasticity Index (PI) of 26 to 30, which is considered moderately expansive. Due to the known history of the site and the consistency of the material, this clay has likely been re-worked for agricultural purposes. On the eastern side of the property, shallow weathered claystone was encountered below this clay at 6 to 7 feet bgs. On the western side of the property, the soil encountered beneath the dark gray clay material consists of medium stiff to very stiff clays with inter-bedded layers of clayey to silty sand between approximately 7 and 15 feet bgs. The sandy layers are loose to very dense. Weathered claystone was encountered at approximately 11 to 15 bgs.

### 2.5 GROUNDWATER

Groundwater was encountered at a depth of between 7 to 9 feet bgs after completion of drilling. Fluctuations in groundwater levels will occur seasonally and over a period of years because of precipitation, temperature, tidal effects, changes in drainage patterns, pumping, and/or irrigation. Based on the historically highest groundwater levels in the project area, the groundwater level at the site is mapped as less than 10 feet deep.
2.6 LABORATORY TESTING

Following drilling, we re-examined the samples in our laboratory to confirm field classifications. We tested representative driven samples for the following physical characteristics:

<table>
<thead>
<tr>
<th>TEST</th>
<th>DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content/Dry Density</td>
<td>ASTM D-2216</td>
</tr>
<tr>
<td>Gradation</td>
<td>ASTM D-422</td>
</tr>
<tr>
<td>Atterberg Limits</td>
<td>ASTM D-4318</td>
</tr>
<tr>
<td>Unconfined Compression</td>
<td>ASTM D-2166</td>
</tr>
<tr>
<td>Sulfate Testing</td>
<td>CT-417</td>
</tr>
</tbody>
</table>

Laboratory test results from samples recovered are included on the associated boring logs in Appendix A and on the laboratory test data in Appendix B.

3.0 DISCUSSION

Based on a review of the findings of the subsurface exploration and laboratory test results, we conclude that the proposed residential development and associated improvements are feasible from a geotechnical standpoint, provided that the recommendations included in this report, along with other sound engineering practices, are incorporated in the design and construction of the project.

The primary geotechnical considerations to address during site development are the presence of:

- Expansive near-surface soil.
- Potentially liquefiable material and subsequent post liquefaction settlement.
- High seismic loads due to the proximity to the Hayward fault.
- Undocumented fill underlying existing and remnant structures.

3.1 EXPANSIVE SOIL

We performed sampling and testing of the site soil. The results indicate a plasticity index (PI) range of 26 to 30 within the area of potential foundation soil indicating a moderate to high expansion potential. Expansive soil shrinks and swells as a result of moisture changes. This can cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations.

Successful construction on expansive soil requires special attention during grading. It is imperative to keep exposed soil moist by occasional sprinkling. If the soil dries, it is extremely difficult to remoisturize the soil (because of its clayey nature) without excavation, moisture conditioning, and recompaction.

Conventional grading operations, incorporating fill placement specifications tailored to the expansive characteristics of the soil, and use of a mat foundation (either post-tensioned or conventionally reinforced) and deepen footings are common, generally cost-effective measures to address the expansive potential of the foundation soils.
3.2 SEISMIC HAZARDS

Seismic hazards can generally be classified as primary and secondary. The potential primary seismic hazard resulting from a nearby moderate to major earthquake is ground rupture, also called surface faulting. Common secondary seismic hazards include ground shaking, soil liquefaction, liquefaction-induced settlement, dynamic densification, lateral spreading, earthquake-induced landslides, regional subsidence or uplift, and tsunamis and seiches. The site is not located in a mapped liquefaction or landslide hazard zone as per the California Geologic Survey.

3.2.1 Ground Rupture

No known active faults have been mapped at the location of the proposed improvements. We therefore conclude that the potential for ground rupture is low.

3.2.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, all structures should be designed using sound engineering judgment and the current California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.2.3 Soil Liquefaction

Soil liquefaction is a phenomenon where saturated, cohesionless, loose soil experience a temporary, but essentially total, loss of shear strength when subjected to the reversing cyclic shear stresses caused by earthquake ground shaking.

We have reviewed the map for Seismic Hazard Zones of the project area (USGS, 2003) and we have found no historical evidence of ground failure, earthquake-induced settlement or liquefaction at this site or in the general vicinity of the site. Additionally, according to the California Geologic Survey, Earthquake Zones of Required Investigation map (CGS, 2012), the project site is not located within a mapped liquefaction hazard zone. We have performed a liquefaction analysis based on the findings from the subsurface exploration assuming the groundwater level at a depth of 8 feet, a peak ground acceleration (PGA) of 0.93g and a Moment Magnitude (Mw) of 7.3 contributed by the Hayward fault; these values are based on the 2013 California Building Code and the commonly accepted potential earthquake magnitude of the closest faults. In general, our analysis indicates that the majority of the material encountered in our borings has sufficient fines content that is characteristic of soils that are not susceptible to
liquefaction. An exception to this is the presence of a silty/clayey sand layer encountered at borings 1-B4 and 1-B5 between a depth of 8 feet and 15 feet. Based on blow counts and limited thickness of the layer, the estimated liquefaction-induced settlement ranges from ½ inch to 1 inch in this area; this amount of liquefaction-induced settlement, should it occur, would be nominal in the building performance. The results of our analysis can be found in Appendix C.

3.2.4 Lateral Spreading

Lateral spreading involves lateral ground movement caused by seismic shaking. This lateral ground movement is often associated with a weakening or failure of an embankment or soil mass overlying a layer of liquefied or weak soils. The effects of lateral spreading are often amplified by a “free face”. Since the site is essentially flat and not near any free face, the risk of lateral spreading is negligible.

3.3 2016 CBC SEISMIC DESIGN PARAMETERS

In accordance with Chapter 16A of the 2016 CBC, the building shall be assigned to Seismic Design Category D.

TABLE 3.3-1: Seismic Design Parameters
Latitude: 37.6941, Longitude: -122.0843

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DESIGN VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Class</td>
<td>D</td>
</tr>
<tr>
<td>0.2 second Spectral Response Acceleration, $S_0$</td>
<td>2.40</td>
</tr>
<tr>
<td>1.0 second Spectral Response Acceleration, $S_1$</td>
<td>1.00</td>
</tr>
<tr>
<td>Site Coefficient, $F_A$</td>
<td>1.0</td>
</tr>
<tr>
<td>Site Coefficient, $F_V$</td>
<td>1.5</td>
</tr>
<tr>
<td>Maximum considered earthquake spectral response accelerations for short periods, $S_{MS}$</td>
<td>2.40</td>
</tr>
<tr>
<td>Maximum considered earthquake spectral response accelerations for 1-second periods, $S_{M1}$</td>
<td>1.50</td>
</tr>
<tr>
<td>Design spectral response acceleration at short periods, $S_{DS}$</td>
<td>1.60</td>
</tr>
<tr>
<td>Design spectral response acceleration at 1-second periods, $S_{D1}$</td>
<td>1.00</td>
</tr>
<tr>
<td>Mapped MCE Geometric Mean Peak Ground Acceleration, PGA (g)</td>
<td>0.93</td>
</tr>
<tr>
<td>Site Coefficient, $F_{PGA}$</td>
<td>1.0</td>
</tr>
<tr>
<td>MCE Geometric mean Peak Ground Acceleration, $PGA_{M}$ (g)</td>
<td>0.93</td>
</tr>
<tr>
<td>Long period transition-period, $T_L$</td>
<td>8</td>
</tr>
</tbody>
</table>

3.4 EXISTING NON-ENGINEERED FILL

Due to site access issues and the presence of existing structures, we did not advance any explorations in or near the existing structures. However, we anticipate the presence of some amount of existing fill underlying these structures from previous site development activities. Due to the age of the structures, any existing fill would not be engineered in accordance with current practices. Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. Without proper documentation of existing fill placed on the site, we recommend complete removal and recompaction of any existing fill. A field representative of our firm should
be present during foundation removal and grading activities to determine the depth and extent of fill material. We present fill treatment recommendations in Section 4.0.

3.5 SOIL CORROSION POTENTIAL

As part of this study, we obtained a representative soil sample and submitted to a qualified analytical lab for determination of pH, resistivity, sulfate, and chloride. The results are included in Appendix B and summarized in the table below.

**TABLE 3.5-1: Corrosivity Test Results**

<table>
<thead>
<tr>
<th>SAMPLE LOCATION</th>
<th>DEPTH (FEET)</th>
<th>PH</th>
<th>RESISTIVITY (OHMS-CM)</th>
<th>CHLORIDE (PPM)</th>
<th>SULFATE (PPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-B4</td>
<td>3.5</td>
<td>6.56</td>
<td>1.90</td>
<td>3.8</td>
<td>42.9</td>
</tr>
</tbody>
</table>

* pH and Min. Resistivity CA DOT Test #643 Mod. (Sm. Cell) Sulfate CA DOT Test #417, Chloride CA DOT Test #422 Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

The 2013 CBC references the 2011 American Concrete Institute Manual, ACI 318-11, Chapter 4, Sections 4.2.1 for structural concrete requirements.

In accordance with the criteria presented in ACI 318, the soil tested is categorized as Not Applicable, and are within the F0 freeze-thaw class, S0 sulfate exposure class, P0 exposure class and C0 corrosion class. Cement type, water-cement ratio, and concrete strength, are not specified for these ranges.

Considering a ‘Not Applicable’ sulfate exposure, there is no requirement for cement type or water-cement ratio, however, a minimum concrete compressive strength of 2,500 psi is specified by the building code. For this sulfate range, we recommend Type II cement and a concrete mix design for foundations and building slabs-on-grade that incorporates a maximum water-cement ratio of 0.50. It should be noted, however, that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

Based on the resistivity measurements, the soil is considered moderately corrosive to buried metal piping. The resulting value of chloride does not pose a significant impact to metals or concrete.

If desired to investigate this further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project.

4.0 RECOMMENDATIONS AND CONCLUSIONS

The proposed project is feasible from a geotechnical engineering viewpoint provided the geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

If there are significant changes to the Baker Road residential development including layout and grading, the recommendations presented herein may need to be refined and modified, as deemed appropriate by us. Geotechnical engineering recommendations contained in this report include site preparation and grading, foundation design criteria, pavements, underground utilities, and drainage.
4.1 GRADING

Grading should begin with the removal of existing structures and associated foundations, pavement, buried pipes, irrigation lines, water well systems, and any other deleterious materials. Underground pipelines and structures that will be abandoned or are expected to extend below proposed finished grades should be removed from the project site. Any organically contaminated materials should not be used in proposed building pads or pavement areas. Strip and stockpile the organics for use in landscape areas subject to the approval of the Landscape Architect or off haul. Remove any debris found within any areas to be graded.

A representative of our firm should determine the actual removal depth in the field based on conditions encountered during the site grading. Excavations resulting from demolition and stripping below design grades should be cleaned to a firm undisturbed, non-yielding soil surface as determined by our representative. Following clearing and grubbing, scarify, moisture condition and backfill all depressions with compacted engineered fill. The requirements for backfill materials and placement procedures are the same as those for engineered fill as described in the “Fill Placement” section.

The contractor should remove all existing non-engineered fill, vegetation and loose or compressible soils in areas to be graded, as necessary, for project requirements. A qualified representative of our firm should determine the material removal depth in the field at the time of grading. Evaluation of unsuitable deposits should be performed during grading and may include sampling and laboratory analyses.

After the site has been properly cleared and stripped, and necessary excavations have been made, scarify the surface at least 12 inches, moisture condition, and compact in accordance with the recommendations presented below in the “Fill Placement” section, prior to replacing and recompacting overlying soils as engineered fill. The compaction requirements for existing soil used for fill placement are the same as those for engineered fill, as described in a subsequent section of this report.

4.2 ACCEPTABLE FILL

Onsite soil is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 4 inches in maximum dimension.

Imported fill material should be approved by a qualified representative of our firm, meet the above requirements and have a plasticity index less than 20. Allow ENGEIO to sample and test proposed imported fill materials at least 72 hours prior to delivery to the site.

4.3 FILL PLACEMENT

We anticipate that site grade will remain similar to that of the existing elevation. Minor fill placement to achieve level building pads for the proposed townhomes may be performed. Areas to receive fill placement should be scarified to a minimum depth of 12 inches, moisture conditioned, and recompacted to provide adequate bonding with the initial lift of fill. All fills should be placed in thin lifts, with the lift thickness not to exceed 10 inches or the depth of penetration of the compaction equipment used, whichever is less.
The following compaction control requirements should be applied to onsite expansive materials (PI≥20):

**Test Procedures:** ASTM D-1557.

**Required Moisture Content:** Not less than 4 percentage points above optimum moisture content.

**Required Relative Compaction:** Not less than 87 to 92 percent.

The following compaction control requirements should be applied to low-expansive (PI less than 20) import or chemically treated site soil:

**Test Procedures:** ASTM D-1557.

**Required Moisture Content:** Not less than 2 percentage points above optimum moisture.

**Minimum Relative Compaction:** Not less than 90 percent.

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material. Additional compaction recommendations may be developed during construction.

### 4.4 SUBGRADE TREATMENT

We anticipate that a shallow foundation with post-tensioned mat foundation system will be used for the proposed residential structure. According to our exploration data, the shallow clay material has variable consistency. We recommend that the building pad and an area extending 5 feet out from the building perimeter be scarified and recompacted a minimum of 12 inches below proposed foundation elements. All processed material should be moisture conditioned and recompacted in accordance with the specifications presented above.

### 4.5 BUILDING FOUNDATION

This section provides recommendations for a shallow foundation system. It is our opinion that the proposed building can be supported on post-tensioned mat foundation system. The final foundation plans should be provided to us for review before submittal to the local authority.

#### 4.5.1 Post-Tensioned Mat Foundation System

We recommend that the proposed residential structure be supported on post-tensioned (PT) mat foundations bearing on prepared native soil or engineered fill.

We recommend that PT mats be approximately 10 inches thick or greater. The Structural Engineer should determine the actual PT mat thickness using the geotechnical recommendations in this report; we defer to the professional judgment of the Structural Engineer on the necessary mat thickness.

PT mats may be designed for an average allowable bearing pressure of up to 1,500 pounds per square foot (psf) for dead-plus-live loads with maximum localized bearing pressures of 2,000 psf.
at column or wall loads. Allowable bearing pressures can be increased by one-third for wind or seismic loads. PT mats should be designed using the criteria presented in Table 4.5-1 below.

**TABLE 4.5-1: Post-Tensioned Mat Design Recommendations**

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>CENTER LIFT</th>
<th>EDGE LIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Moisture Variation Distance, $\varepsilon_m$ (feet)</td>
<td>7.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Differential Soil Movement, $y_m$ (inches)</td>
<td>1.1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

The above values are based on the procedure presented by the Post-Tensioning Institute “Design of Post-Tensioned Slabs-on-Ground” Third Edition, including appropriate addenda (2004).

The subgrade material under the PT mat should be made uniform in regard to moisture content. The upper 12 inches of pad subgrade should be soaked to achieve a moisture content as described in Section 4.3 prior to placing the concrete in order to reduce the swell potential of the subgrade soils. The subgrade should not be allowed to dry prior to concrete placement.

When buildings are constructed with concrete slab-on-grade, such as PT mats, water vapor from beneath the slab will migrate through the slab and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the slab would be undesirable, we recommend the following to reduce, but not stop, water vapor transmission upward through the slab-on-grade.

1. Install a vapor retarder membrane directly beneath the slab. Seal the vapor retarder at all seams and pipe penetrations. Vapor retarders shall conform to Class A vapor retarder in accordance with ASTM E 1745, latest edition, “Standard Specification for Plastic Water Vapor Retarders used in Contact with Soil or Granular Fill under Concrete Slabs.”

2. Concrete shall have a concrete water-cement ratio of no more than 0.50.

3. Provide inspection and testing during concrete placement to check that the proper concrete and water cement ratio are used.

The structural engineer should be consulted as to the use of a layer of clean sand or pea gravel (less than 5 percent passing the U.S. Standard No. 200 Sieve) placed on top of the vapor retarder membrane to assist in concrete curing. If a layer of sand is used, we recommend the PT mat have a thickened edge to reduce water infiltration between the vapor retarder membrane and the bottom of the mat. The edge of the mat should be thickened by the thickness of the sand layer to provide this cutoff; the thickened edge, if used, should be 12 inches wide, at least.

### 4.5.2 Secondary Slab-on-Grade Construction

This section provides recommendations for secondary slabs such as exterior slabs, walkways, and steps. Secondary slabs-on-grade should be constructed structurally independent of the foundation system. This allows slab movement to occur with a reduced potential for foundation distress. Where slab-on-grade construction is anticipated, care must be exercised in attaining a near-saturation condition of the subgrade soil before concrete placement.
Slabs-on-grade should be designed specifically for their intended use and loading requirements. As the site soil has a high expansion potential, cracking of conventional slabs should be expected. Secondary slabs-on-grade should be reinforced for control of cracking.

Reinforcement should be designed by the Structural Engineer. In our experience, welded wire mesh may not be sufficient to control slab cracking. As a minimum, secondary slabs-on-grade should be reinforced with No. 3 bars spaced 18 inches on center each way.

Slabs-on-grade should have a minimum thickness of 4 inches. A 4-inch-thick layer of compacted aggregate base should be placed under slabs. Exterior slabs should be constructed with thickened edges extending at least 6 inches into compacted soil to reduce water infiltration. Slabs should slope away from the building at a slope of at least 2 percent to prevent water from flowing toward the building. Frequent control joints should be provided to control the cracking.

4.6 PRELIMINARY PAVEMENT DESIGN

The following pavement sections have been determined based on a Traffic Index of 5 and 6 and an assumed R-value of 5, and according to the method contained in Chapter 630 of the Highway Design Manual by Caltrans.

<table>
<thead>
<tr>
<th>TRAFFIC INDEX</th>
<th>HMA (INCHES)</th>
<th>CLASS 2 AB (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>3.0</td>
<td>10.0</td>
</tr>
<tr>
<td>6.0</td>
<td>3.5</td>
<td>13.0</td>
</tr>
</tbody>
</table>

Note: HMA – Hot Mix Asphalt
      AB – Caltrans Class 2 aggregate base (R-value of 78)

The Traffic Index should be determined by the Civil Engineer or appropriate public agency. These sections are for estimating purposes only. Actual sections to be used should be based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading. Pavement construction and all materials should comply with the requirements of the Standard Specifications of the State of California Department of Transportation, and City of Castro Valley requirements.

4.7 DRAINAGE

The site must be positively graded at all times to provide for rapid removal of surface water runoff from the foundation systems and to prevent ponding of water under floors or seepage toward the foundation systems at any time during or after construction. Ponded water will cause undesirable soil swell and loss of strength.

Ponding of stormwater must not be permitted on the site during prolonged periods of inclement weather. As a minimum requirement, finished grades should have slopes of at least 3 to 5 percent (2 percent for paved areas) within 7 feet of the exterior building walls and at right angles to them to allow surface water to drain positively away from the structure. All surface water should be collected and discharged into the storm drain system. Landscape mounds must not interfere with this requirement.
All roof stormwater should be collected and directed to downspouts. Stormwater from roof downspouts should be directed to a solid pipe that discharges to the street or approved drainage structure.

### 4.8 UTILITIES

We recommend that utility trench backfilling be done under our observation. Pipe zone backfill (i.e. material beneath and immediately surrounding the pipe) may consist of a well-graded import or native material less than ¾ inch in maximum dimension compacted in accordance with recommendations provided above for engineered fill. Trench zone backfill (i.e. material placed between the pipe zone backfill and the ground surface) may consist of native soil compacted in accordance with recommendations for engineered fill.

Where import material is used for pipe zone backfill, we recommend it consist of fine- to medium-grained sand or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish grades. In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of: (1) soil into the relatively large void spaces present in this type of material, and (2) water along trenches backfilled with this type of material. All utility trenches entering buildings and paved areas must be provided with an impervious seal consisting of native materials or concrete where the trenches pass under the building perimeter or curb lines. The impervious plug should extend at least 3 feet to each side of the crossing. This is to prevent surface water percolation into the sands under foundations and pavements where such water would remain trapped in a perched condition, allowing clays to develop to their full expansion potential.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees.

Utility trenches in areas to be paved should be constructed in accordance with City of Castro Valley requirements. Compaction of trench backfill by jetting should not be allowed at this site. If there appears to be a conflict between City or other agency requirements and the recommendations contained in this report, this should be brought to the Owner’s attention for resolution prior to submitting bids.
5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is issued with the understanding that it is the responsibility of the owner to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, and designers for the project so that the necessary steps can be taken by the contractors and subcontractors to carry out such recommendations in the field. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO strives to perform its services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions available at the time of preparation of ENGEO's report. This document must not be subject to unauthorized reuse, that is, reuse without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time. If actual field or other conditions necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.
SELECTED REFERENCES

AEI Consultants, 2005, Preliminary Site Investigation Report, 20957 Baker Road, Castro Valley, California, Project No. 10509.

Association of Bay Area Governments (ABAG), 2001.


NETR Online Historical Aerial Photographs; Available years covering the site from 1946. www.historicaerials.com/


United States Geologic Survey (USGS); 2008, National Seismic Hazard Maps Fault Parameters.

USGS Quaternary Fault Database, November 2010.

FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Geologic Map
FIGURE 4: Regional Faulting and Seismicity Map
SITE PLAN
20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

EXPLANATION
ALL LOCATIONS ARE APPROXIMATE

1-B5  BORING (ENGEIO, 2017)
SB-8  BORING (AB CONSULTANTS, 2005)

SITE

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

PROJECT NO: 13255.000.000
SCALE: AS SHOWN
MAN: JCS
CHECKED BY: TIB
DRAWN: JCS
PRINTED: FIGURE PRINTS IN COLOR

ENGEIO
Expect Excellence
REGIONAL GEOLOGIC MAP
20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

EXPLANATION

--- DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED

--- DASHED WHERE CONCEALED,queried

Sawteeth are on upper plate of low angle thrust fault

Direction of landslide movement

Axis of fold

Strike and dip of strata

Inclined

Vertical

Overturned

Qa: Surficial sediments
Kpc: Conglomerate
JKk: Clay shale
rh: Leona rhyolite
gb: Gabbro-diabase

Copyright © 2017 by ENGEO Incorporated. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without the express written consent of ENGEO Incorporated.
APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

ENGEIO, February 28, 2017
AEI Consultants, May 18, 2005
## Key to Boring Logs

### Major Types

<table>
<thead>
<tr>
<th>Coarse Grains More Than Half</th>
<th>Fine Grains Smaller Than No. 4 Sieve Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravels More Than Half Coarse Fraction Is Larger Than No. 4 Sieve Size</td>
<td>Clean Gravels With Less Than 5% Fines</td>
<td>GW - Well graded gravels or gravel-sand mixtures</td>
</tr>
<tr>
<td></td>
<td>Gravels With Over 12% Fines</td>
<td>GP - Poorly graded gravels or gravel-sand mixtures</td>
</tr>
<tr>
<td>Sands More Than Half Coarse Fraction Is Smaller Than No. 4 Sieve Size</td>
<td>Clean Sands With Less Than 5% Fines</td>
<td>GM - Silty gravels, gravel-sand and silt mixtures</td>
</tr>
<tr>
<td></td>
<td>Sands With Over 12% Fines</td>
<td>GC - Clayey gravels, gravel-sand and clay mixtures</td>
</tr>
</tbody>
</table>

### Coarse Grained Soils More Than Half of Material Larger Than #200

<table>
<thead>
<tr>
<th>Silts and Clays Liquid Limit 50% or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML - Inorganic silt with low to medium plasticity</td>
</tr>
<tr>
<td>CL - Inorganic clay with low to medium plasticity</td>
</tr>
<tr>
<td>OL - Low plasticity organic silts and clays</td>
</tr>
</tbody>
</table>

### Fine Grained Soils Smaller Than #200

<table>
<thead>
<tr>
<th>Silts and Clays Liquid Limit Greater Than 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH - Elastic silt with high plasticity</td>
</tr>
<tr>
<td>CH - Fat clay with high plasticity</td>
</tr>
<tr>
<td>OH - Highly plastic organic silts and clays</td>
</tr>
<tr>
<td>PT - Peat and other highly organic soils</td>
</tr>
</tbody>
</table>

### Highly Organic Soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words “with sand” or “with gravel” (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words “sandy” or “gravelly” (whichever is predominant) are added to the group name.

## Grain Sizes

<table>
<thead>
<tr>
<th>U.S. Standard Series Sieve Size</th>
<th>Clear Square Sieve Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>40</td>
<td>3&quot;</td>
</tr>
<tr>
<td>10</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

### Relative Density

<table>
<thead>
<tr>
<th>Sands and Gravels</th>
<th>Bows/Foot (S.P.T.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0-4</td>
</tr>
<tr>
<td>Loose</td>
<td>4-10</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10-30</td>
</tr>
<tr>
<td>Dense</td>
<td>30-50</td>
</tr>
<tr>
<td>Very Dense</td>
<td>OVER 50</td>
</tr>
</tbody>
</table>

### Consistency

<table>
<thead>
<tr>
<th>Silts and Clays</th>
<th>Strength*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Soft</td>
<td>0-1/4</td>
</tr>
<tr>
<td>Soft</td>
<td>1/4-1/2</td>
</tr>
<tr>
<td>Medium Stiff</td>
<td>1/2-1</td>
</tr>
<tr>
<td>Stiff</td>
<td>2-4</td>
</tr>
<tr>
<td>Very Stiff</td>
<td>HARD OVER 4</td>
</tr>
</tbody>
</table>

### Moisture Condition

- Dry
- Dusty, dry to touch
- Moist
- Damp but no visible water
- Wet
- Visible freewater

### Line Types

- Solid - Layer Break
- Dashed - Gradational or approximate layer break

### Ground-Water Symbols

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer
<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Elevation in Feet</th>
<th>Sample Type</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>150</td>
<td></td>
<td>AGGREGATE BASE (AB)</td>
</tr>
<tr>
<td>155</td>
<td></td>
<td>LEAN CLAY (CL), dark gray, stiff, moist</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>LEAN CLAY (CL), yellowish brown mottled with orange, very stiff, moist</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>CLAYSTONE, light gray, very weak (R1), completely weathered (WC), up to 1/2&quot; stones present</td>
<td></td>
</tr>
</tbody>
</table>

End of boring at 8.5', terminated at refusal in bedrock
No groundwater encountered

<table>
<thead>
<tr>
<th>Water Level</th>
<th>Log Symbol</th>
<th>Blow Count/Foot</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>Fines Content (% passing #200 sieve)</th>
<th>Moisture Content (% dry weight)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Shear Strength (psf)</th>
<th>Unconfined Strength (tsf)</th>
<th>Field approximation</th>
<th>Strength Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td>42</td>
<td>16</td>
<td>26</td>
<td>20</td>
<td>106.9</td>
<td>1296*</td>
<td>1.5-2*</td>
<td>UC, PP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DATE DRILLED: 2/28/2017
HOLE DEPTH: 8.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead
### LOG OF BORING 1-B2

**Geotechnical**
20957 Baker Road
Castro Valley, CA
13255.000.000

**DATE DRILLED:** 2/28/2017  
**HOLE DEPTH:** 9 ft.  
**HOLE DIAMETER:** 4.0 in.  
**SURF ELEV (NAVD88):** 158 ft.

**LOGGED / REVIEWED BY:** T. Klotzback / JAF  
**DRILLING CONTRACTOR:** West Coast Exploration  
**DRILLING METHOD:** Solid Stem Auger  
**HAMMER TYPE:** 140 lb. rope and cathead

**Description**

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Log Symbol</th>
<th>Water Level</th>
<th>Blow Count/Foot</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>Moisture Content (% dry weight)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Shear Strength (psf)</th>
<th>Unconfined Strength (tsf)</th>
<th>Strength Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>20</td>
<td>22.6</td>
<td>101</td>
<td>2.0*</td>
<td>PP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td>39</td>
<td>48</td>
<td>16</td>
<td>32</td>
<td>2.5*</td>
<td>PP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sample Types**

- **AGGREGATE BASE (AB)**
- **LEAN CLAY (CL), dark gray, very stiff, moist**
- **LEAN CLAY (CL), yellowish brown mottled with orange, very stiff, moist, claystone inclusions**
- **CLAYSTONE, pale gray to light yellowish brown, very weak (R1), highly weathered (WH)**

End of boring at 9', terminated at refusal in bedrock  
No groundwater encountered
<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>DESCRIPTION</th>
<th>Log Symbol</th>
<th>Water Level</th>
<th>Blow Count/Foot</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>Fines Content (% passing #200 sieve)</th>
<th>Moisture Content (% dry weight)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Shear Strength (psf)</th>
<th>Unconfined Strength (tsf)</th>
<th>Strength Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>AGGREGATE BASE (AB)</td>
<td>LEAN CLAY (CL), dark grayish brown mottled with orange, very stiff, moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less orange mottling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>SILTY CLAY (CL-ML), reddish brown mottled with gray, very stiff, moist</td>
<td></td>
<td></td>
<td>37</td>
<td>48</td>
<td>18</td>
<td>30</td>
<td>22.3</td>
<td>2.5*</td>
<td>PP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>CLAYEY SAND (SC), reddish yellow, very dense, moist, &lt;1/4&quot; to 1&quot; gravels present</td>
<td></td>
<td></td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5*</td>
<td>PP</td>
<td>2.5*</td>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td></td>
<td>CLAYSTONE, light gray, extremely weak (R0), residual soil (RS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>Becomes highly weathered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Atterberg Limits

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>DESCRIPTION</th>
<th>Log Symbol</th>
<th>Water Level</th>
<th>Blow Count/Foot</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>Fines Content (% passing #200 sieve)</th>
<th>Moisture Content (% dry weight)</th>
<th>Dry Unit Weight (pcf)</th>
<th>Shear Strength (psf)</th>
<th>Unconfined Strength (tsf)</th>
<th>Strength Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>AGGREGATE BASE (AB)</td>
<td>LEAN CLAY (CL), dark grayish brown mottled with orange, very stiff, moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less orange mottling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>SILTY CLAY (CL-ML), reddish brown mottled with gray, very stiff, moist</td>
<td></td>
<td></td>
<td>37</td>
<td>48</td>
<td>18</td>
<td>30</td>
<td>22.3</td>
<td>2.5*</td>
<td>PP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>CLAYEY SAND (SC), reddish yellow, very dense, moist, &lt;1/4&quot; to 1&quot; gravels present</td>
<td></td>
<td></td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5*</td>
<td>PP</td>
<td>2.5*</td>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td></td>
<td>CLAYSTONE, light gray, extremely weak (R0), residual soil (RS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>Becomes highly weathered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AGGREGATE BASE (AB)

LEAN CLAY (CL), dark gray, stiff, moist

SILTY CLAY (CL-ML), light gray mottled with orange, stiff, moist

LEAN CLAY (CL), yellowish brown, moist

SILTY SAND (SM), yellowish brown, medium dense, moist

More gravels present

CLAYSTONE, light gray with orange, very weak (R1), very closely fractured, highly weathered (WH)

End of boring at 18.5', terminated at refusal in bedrock
Groundwater encountered at 9'

*Field approximation

DATE DRILLED: 2/28/2017
HOLE DEPTH: 18.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead
AGGREGATE BASE (AB)

LEAN CLAY (CL), dark brown, medium stiff, moist

LEAN CLAY (CL), yellowish brown mottled with orange, medium stiff, moist, silt

CLAYEY SAND (SC), reddish yellow, medium dense, moist, <1/4" gravels present

Becomes loose

CLAYSTONE, light gray with orange, very weak (R1), very closely fractured, highly weathered (WH)

End of boring at 18', terminated at refusal in bedrock

Groundwater encountered at 8'

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 18 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet
Elevation in Feet
Sample Type

AGGREGATE BASE (AB)

LEAN CLAY (CL), dark brown, medium stiff, moist

LEAN CLAY (CL), yellowish brown mottled with orange, medium stiff, moist, silt

CLAYEY SAND (SC), reddish yellow, medium dense, moist, <1/4" gravels present

Becomes loose

CLAYSTONE, light gray with orange, very weak (R1), very closely fractured, highly weathered (WH)

End of boring at 18', terminated at refusal in bedrock

Groundwater encountered at 8'

Atterberg Limits

Blow Count/Foot
Liquid Limit
Plastic Limit
Plasticity Index
Fines Content (% passing #200 sieve)
Moisture Content (% dry weight)
Dry Unit Weight (pcf)
Shear Strength (psf)*field approximation
Unconfined Strength (tsf)*field approximation
Strength Test Type

5
10
15
20
25
30
35
40

50/3"
Log of Boring SB-1

Date(s) Drilled: May 18, 2005
Logged By: Robert F. Flory
Checked By: Adrian Angel

Drilling Method: Geoprobe
Drill Rig Type: Geoprobe 5410
Groundwater Level and Date Measured: 8.75 feet ATD
Borehole Backfill: Cement Slurry

Date
Drilled
May 18, 2005

Drilling Method
Geoprobe

Drill Rig Type
Geoprobe 5410

Groundwater Level and Date Measured
8.75 feet ATD

Borehole Backfill
Cement Slurry

Sample Number
USCS Symbol
Graphic Log
MATERIAL DESCRIPTION
PID Reading, ppm
REMARKS AND OTHER TESTS

0
Asphalt
CL
Asphalt 2", base rock 4"

5
CL
Clay, black 10YR 2/1, firm, stiff, moist

SB1-3.5
CL
Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2

SB1-7.5
CL-ML
Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling

SB1-11.5
SM
Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist

Bottom of Boring at 14 feet bgs

Sand, strong brown 7.5 4/6, soft, loose, wet

Bottom of Boring at 14 feet bgs

Clayey Gravel, olive - olive brown 5y 4/4 - 2.5 4/4, firm, moist - (saprolite)

Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated

Boring sealed to surface with neat cement grout.

Boring sealed to surface with neat cement grout.

Bottom of Boring at 14 feet bgs

SB1-3.5
SB1-7.5
SB1-11.5
SP
GC

Asphalt 2", base rock 4"
Clay, black 10YR 2/1, firm, stiff, moist
Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2
Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling
Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist

Graphic Log

MATERIAL DESCRIPTION

Asphalt 2", base rock 4"

Clay, black 10YR 2/1, firm, stiff, moist

Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2

Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling

Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist

Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated

Boring sealed to surface with neat cement grout.

Boring sealed to surface with neat cement grout.

Bottom of Boring at 14 feet bgs

SB1-7.5
SB1-11.5
SP
GC

0
5
10
15
20

Elevation, feet
Depth, feet
Sample Type
Sample Number

Asphalt
CL
SB1-3.5
CL
SB1-7.5
CL-ML
SM
SB1-11.5
SP
GC
Claystone

Asphalt 2", base rock 4"
Clay, black 10YR 2/1, firm, stiff, moist
Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2
Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling
Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist

Boring sealed to surface with neat cement grout.

Boring sealed to surface with neat cement grout.

Bottom of Boring at 14 feet bgs

Bottom of Boring at 14 feet bgs
**Log of Boring SB-2**

**Sheet 1 of 1**

**Date(s) Drilled**: May 18, 2005  
**Logged By**: Robert F. Flory  
**Checked By**: Adrian Angel

**Drilling Method**: Geoprobe  
**Drill Rig Type**: Geoprobe 5410

**Drill Bit Size/Type**: 2 inch  
**Groundwater Level and Date Measured**: 9.2 feet ATD

**Backfill**: Cement Slurry  
**Total Depth of Borehole**: 18 feet bgs

---

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Depth, feet</th>
<th>Sample Number</th>
<th>Sample Type</th>
<th>USCS Symbol</th>
<th>Graphic Log</th>
<th>PID Reading, ppm</th>
<th>REMARKS AND OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>SB2-3.5</td>
<td>GC</td>
<td>Clayey Gravel, black - dark yellow brown 10YR 2/1 - 3/4, firm, dry (FILL?)</td>
<td>No recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>SB2-7.5</td>
<td>ML</td>
<td>Clayey Silt, olive gray 5Y 5/2, moderately firm, moist</td>
<td>becoming sandy downward</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>10.5</td>
<td>SB2-11.5</td>
<td>SM</td>
<td>Silty Sand, olive gray 5Y 5/2, clayey, moderately firm, moist wet @ 9.3 (ATD) ²</td>
<td></td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>SB2-13</td>
<td>SP</td>
<td>Silty Sand, dark gray green 10GY 3/1, clayey, moderately firm,</td>
<td></td>
<td>175</td>
<td>Boring sealed to surface with neat cement grout</td>
</tr>
<tr>
<td>18.0</td>
<td></td>
<td>SW</td>
<td>Gravelly Sand, dark greenish gray 10GY 4/1, firm, wet</td>
<td></td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td></td>
<td>CL</td>
<td>Sandy Gravelly Clay, olive brown - dark grayish brown 2.5Y 4/4 - 4/2, firm, slightly moist (saprolite)</td>
<td>Sandy Gravelly Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Permit #**:  
**Location**:  
**Approximate Surface Elevation**:  
**EnProb**:  
**Drilling Contractor**:  
**Sampling Method(s)**: Tube

---

**Bottom of Boring at 18 feet bgs**

---

**AEI CONSULTANTS**

**ENVIRONMENTAL ENGINEERING**
Log of Boring SB-3

Date(s) Drilled: May 18, 2005
Logged By: Robert F. Flory
Checked By: Adrian Angel

Drilling Method: Geoprobe
Drill Bit Size/Type: 2 inch
Total Depth of Borehole: 16 feet bgs

Drill Rig Type: Geoprobe 5410
Drilling Contractor: EnProb
Approximate Surface Elevation

Groundwater Level and Date Measured: 8.56 feet ATD
Sampling Method(s): Tube
Permit #

Borehole Backfill: Cement Slurry
Location

Elevation, feet
0
5
10
15
20

Depth, feet
Asphalt
CL
SB3-3.5
CL
SB3-7.5
SM
SB3-11.5
SP
Claystone

Sample Type
Sample Number
Graphic Log

MATERIAL DESCRIPTION
Asphalt 2", base rock 4"
Clay, black 10YR 2/1, firm, stiff, moist
Silty Clay, dark yellowish brown 10YR3/4 with some very dark brown 10YR 2/2 mottling, firm, slightly moist
Clayey Silt - Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling
Silty Sand, strong brown 7.5 YR 5/6, firm, moist becoming wet @ 10.0 (ATD)
Clayey Sand, yellowish brown 10YR 4/6, moderately firm - moderately soft, wet
Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated, slightly moist

REMARKS AND OTHER TESTS
Borings sealed to surface with neat cement grout

PID Reading, ppm
0.5
1.0
1.2

AEI CONSULTANTS ENVIRONMENTAL & ENGINEERING
**Log of Boring SB-4**

**Project:** Piazza  
**Project Location:** 20957 Baker Road, Castro Valley, CA  
**Project Number:** 10509

---

**Date(s) Drilled:** May 18, 2005  
**Logged By:** Robert F. Flory  
**Checked By:** Adrian Angel

<table>
<thead>
<tr>
<th>Drilling Method</th>
<th>Drill Rig Type</th>
<th>Groundwater Level and Date Measured</th>
<th>Backfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoprobe</td>
<td>Geoprobe 5410</td>
<td>9.6 feet ATD</td>
<td>Cement Slurry</td>
</tr>
</tbody>
</table>

**Drill Bit Size/Type:** 2 inch  
**Drilling Method:** Geoprobe  
**Drilling Contractor:** EnProb  
**Groundwater Level and Date Measured:** 9.6 feet ATD

**Borehole Backfill:** Cement Slurry  
**Logged By:** Robert F. Flory  
**Drill Bit Size/Type:** 2 inch  
**Borehole Backfill:** Cement Slurry

**Total Depth of Borehole:** 13.5 feet bgs  
**Approximate Surface Elevation:**

<table>
<thead>
<tr>
<th>Depth, feet</th>
<th>Elevation, feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Sample Type</th>
<th>USCS Symbol</th>
<th>Graphic Log</th>
<th>PID Reading, ppm</th>
<th>REMARKS AND OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB4-3.5</td>
<td>Asphalt</td>
<td>CL</td>
<td>Asphalt 2&quot;, base rock 4&quot;</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SB4-7.5</td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2</td>
<td>CL-ML</td>
<td>Sandy Silty Clay - Clayey Sandy Silt, dark yellowish brown</td>
<td>0.3</td>
<td>becoming wet @ 9 feet</td>
</tr>
<tr>
<td></td>
<td>Silty Clay - Clayey Silt, yellowish brown 10YR 4/6, moderately firm, moist</td>
<td>CL-ML</td>
<td>becoming wet @ 9 feet (ATD)</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SB4-11.5</td>
<td>Clayey Sand, brownish yellow - light yellowish brown 10YR 6/6, firm - moderately firm, very moist</td>
<td>CL-ML</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SB4-12</td>
<td>Clayey Sand, light olive brown 2.5Y 5/6 - strong brown 7.5 YR 5/8 mottling, moderately firm, wet</td>
<td>SC</td>
<td></td>
<td>0.5</td>
<td>Refusal at 13.5 feet</td>
</tr>
</tbody>
</table>

**PB Reading, ppm**

- **SB4-3.5:** 1.0 ppm  
- **SB4-7.5:** 0.3 ppm  
- **SB4-11.5:** 0.5 ppm  
- **SB4-12:** 0.5 ppm

**Permit #**

- **Elevation, feet:**
  - 0 feet  
  - 5 feet  
  - 10 feet  
  - 15 feet  
  - 20 feet

**Graphic Log**

- **SB4-3.5:** Asphalt 2", base rock 4"  
- **SB4-7.5:** Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2  
- **SB4-11.5:** Clayey Sand, brownish yellow - light yellowish brown 10YR 6/6, firm - moderately firm, very moist  
- **SB4-12:** Clayey Sand, light olive brown 2.5Y 5/6 - strong brown 7.5 YR 5/8 mottling, moderately firm, wet

**Remarks and Other Tests**

- **Asphalt:** Asphalt 2", base rock 4"  
- **Clay:** Clay, black 10YR 2/1, firm, stiff, moist  
- **Sandy Silty Clay:** Sandy Silty Clay - Clayey Sandy Silt, dark yellowish brown 10YR 3/4 - 4/6 mottled,  
- **Sandy Clay:** Sandy Clay grading downward to Clayey Sand, dark yellowish brown - 10YR 6/6, firm, moist  
- **Clayey Sand:** Clayey Sand, brownish yellow - light yellowish brown 10YR 6/6, firm - moderately firm, very moist  
- **Clayey Sand:** Clayey Sand, light olive brown 2.5Y 5/6 - strong brown 7.5 YR 5/8 mottling, moderately firm, wet  

**Boring sealed to surface with neat cement grout.**
**Log of Boring SB-5**

**Project: Piazza**  
**Project Location:** 20957 Baker Road, Castro Valley, CA  
**Project Number:** 10509

**Date(s)** Drilled: May 18, 2005  
**Logged By:** Robert F. Flory  
**Checked By:** Adrian Angel

- **Drilling Method:** Geoprobe  
- **Drill Rig Type:** Geoprobe 5410  
- **Groundwater Level and Date Measured:** Dry feet ATD, 11.1 feet after 2.5 hrs  
- **Borehole Backfill:** Cement Slurry

<table>
<thead>
<tr>
<th>Depth, feet</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Graphic Log</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Asphalt</td>
<td>CL</td>
<td>Asphalt 2&quot;, base rock 4&quot;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CL</td>
<td></td>
<td>Clay, black 10YR 2/1, firm, stiff, moist</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CL</td>
<td>SBS-5.5</td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CL-ME</td>
<td>SBS-7.5</td>
<td>Clayey Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling, firm,slightly moist</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>SM</td>
<td>SBS-11.5</td>
<td>Sand, yellowish brown 10YR 4/6, very fine grained, clayey, firm - moderately firm, friable, very moist</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>SP</td>
<td>SBS-14 Claystone 15</td>
<td>Sand, yellowish brown 10YR 4/6, very fine grained - coarse grained, firm, wet ? (after 2.5 hrs)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>SP</td>
<td></td>
<td>Gravelly Clay - Silty Clay, olive - olive brown 5y 4/4 - 2.5 4/4, firm - hard, slightly moist - (saprolite)</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>CL</td>
<td></td>
<td>Silty Claysclastic, light olive brown 2.5Y 4/4, firm - hard, indurated</td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS AND OTHER TESTS**

- **PID Reading, ppm:** 0.1, 0.1, 0.3, 1.0

- **Boring sealed to surface with neat cement grout**

**Figure**
**Log of Boring SB-6**

**Project: Piazza**  
**Project Location: 20957 Baker Road, Castro Valley, CA**  
**Project Number: 10509**

**Date(s) Drilled:** May 18, 2005  
**Logged By:** Robert F. Flory  
**Checked By:** Adrian Angel

<table>
<thead>
<tr>
<th><strong>Date(s) Drilled</strong></th>
<th><strong>Logged By</strong></th>
<th><strong>Checked By</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>May 18, 2005</td>
<td>Robert F. Flory</td>
<td>Adrian Angel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Drilling Method</strong></th>
<th><strong>Drill Bit Size/Type</strong></th>
<th><strong>Drill Rig Type</strong></th>
<th><strong>Groundwater Level and Date Measured</strong></th>
<th><strong>Drilling Contractor</strong></th>
<th><strong>Backfill</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoprobe</td>
<td>2 inch</td>
<td>Geoprobe 5410</td>
<td>8.62 feet ATD</td>
<td>EnProb</td>
<td>Cement Slurry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Groundwater Level and Date Measured</strong></th>
<th><strong>Drilling Contractor</strong></th>
<th><strong>Backfill</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.62 feet ATD</td>
<td>EnProb</td>
<td>Cement Slurry</td>
</tr>
</tbody>
</table>

**Groundwater Level and Date Measured:** 8.62 feet ATD

**Approximate Surface Elevation:**

<table>
<thead>
<tr>
<th>Elevation, feet</th>
<th>Depth, feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**Material Description:**

<table>
<thead>
<tr>
<th>USCS Symbol</th>
<th>Graphic Log</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>SB6-3.5</td>
<td>Clay, black 10YR 2/1, soft, moist</td>
</tr>
<tr>
<td>CL</td>
<td>SB6-7.5</td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2</td>
</tr>
<tr>
<td>CL-ML</td>
<td>SB6-10.5</td>
<td>Sandy Silty Clay - Clayey Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling, firm, moist</td>
</tr>
<tr>
<td>SM</td>
<td>SB6-10.5</td>
<td>Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist - wet</td>
</tr>
<tr>
<td></td>
<td>SB6-10.5</td>
<td>becoming wet @ 9 feet</td>
</tr>
<tr>
<td>SP</td>
<td>SB6-10.5</td>
<td>Sand, strong brown 7.5 YR 5/8 with yellowish brown 10YR 5/4, moderately soft - soft, wet</td>
</tr>
</tbody>
</table>

**Remarks and Other Tests:**

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Sample Type</th>
<th>PID Reading, ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asphalt 2&quot;, clayey gravelly FILL</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Clay, black 10YR 2/1, soft, moist</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>Sandy Silty Clay - Clayey Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling, firm, moist</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist - wet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>becoming wet @ 9 feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sand, strong brown 7.5 YR 5/8 with yellowish brown 10YR 5/4, moderately soft - soft, wet</td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of Boring at 14 feet bgs**

**Boring sealed to surface with neat cement grout**

---

**AEI CONSULTANTS**

**ENVIRONMENTAL ENGINEERING**

**Figure**
# Log of Boring SB-7

**Project:** Piazza  
**Project Location:** 20957 Baker Road, Castro Valley, CA  
**Project Number:** 10509

**Date(s) Drilled:** May 18, 2005  
**Logged By:** Robert F. Flory  
**Checked By:** Adrian Angel

**Drilling Method:** Geoprobe  
**Drill Rig Type:** Geoprobe 5410  
**Groundwater Level and Date Measured:** 8.56 feet ATD  
**Borehole Backfill:** Cement Slurry

## Log of Boring SB-7

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Depth, feet</th>
<th>Elevation, feet</th>
<th>Sample Type</th>
<th>USCS Symbol</th>
<th>Graphic Log</th>
<th>PID Reading, ppm</th>
<th>REMARKS AND OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB7-3.5</td>
<td>3.5</td>
<td>0</td>
<td>Asphalt</td>
<td>CL</td>
<td>Asphalt 2&quot;, base rock 4&quot;</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>5</td>
<td>CL</td>
<td>CL</td>
<td>Clay, black 10YR 2/1, firm, stiff, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SB7-7.5</td>
<td>7.5</td>
<td>10</td>
<td>Silty Clay</td>
<td>CL</td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with some very dark brown 10YR 2/2 mottling, firm, slightly moist</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>15</td>
<td>CL-ML</td>
<td>CL-ML</td>
<td>Clayey Silt - Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SB7-11.5</td>
<td>11.5</td>
<td>15</td>
<td>Silty Sand</td>
<td>SM</td>
<td>Silty Sand, strong brown 7.5 YR 5/6, firm, moist becoming wet @ 10.0</td>
<td>1.1</td>
<td>Boring sealed to surface with neat cement grout</td>
</tr>
<tr>
<td></td>
<td>11.5</td>
<td>20</td>
<td>SP</td>
<td>SP</td>
<td>Clayey Sand, yellowish brown 10YR 4/6, moderately firm - moderately soft, wet</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>20</td>
<td>Claystone</td>
<td>Claystone</td>
<td>Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated, slightly moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB7-13.5</td>
<td>SB7-13.5</td>
<td>No recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB7-11.5</td>
<td>SB7-11.5</td>
<td>Bottom of Boring at 16 feet bgs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Log of Boring SB-8

**Date(s) Drilled:** May 18, 2005  
**Logged By:** Robert F. Flory  
**Checked By:** Adrian Angel  

**Drilling Method:** Geoprobe  
**Drill Rig Type:** Geoprobe 5410  
**Groundwater Level and Date Measured:** 8.7 feet ATD  
**Backfill:** Cement Slurry

<table>
<thead>
<tr>
<th>Depth, feet</th>
<th>Material Description</th>
<th>PID Reading, ppm</th>
<th>Remarks and Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Base rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sandy Silty Clay, reddish brown 5YR 5/4 - yellowish brown 10YR 5/6, mottled, firm slightly moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Clay, black 10YR 2/1, firm, moderately firm, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sandy Silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist</td>
<td>1.1</td>
<td>Moisture content increasing downward (ATD)</td>
</tr>
<tr>
<td>7.5</td>
<td>becoming wet @ 9 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Sand, strong brown 7.5 4/6, soft - moderately soft, wet</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>11.5</td>
<td>Sand, strong brown 7.5 4/6 - yellowish brown 10YR 5/6 mottled, locally clayey, moderately soft - moderately firm, wet</td>
<td>2.3</td>
<td>Boring sealed with neat cement grout</td>
</tr>
<tr>
<td>12.5</td>
<td>Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Bottom of Boring at 15 feet bgs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate Surface Elevation:** 10 feet

---

**Figure:**

---

**AEI Consultants:**

**Environmental Engineering & Inspection Services**
APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Particle Size Distribution Report
Unconfined Compression Test
Analytical Results of Soil Corrosion
LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>See exploration logs</td>
<td>42</td>
<td>16</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See exploration logs</td>
<td>48</td>
<td>16</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See exploration logs</td>
<td>48</td>
<td>18</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See exploration logs</td>
<td>23</td>
<td>17</td>
<td>6</td>
<td>40.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See exploration logs</td>
<td>34</td>
<td>16</td>
<td>18</td>
<td>71.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project No. 13255.000.000  Client: Catalyst Development Partners
Project: 20785 and 20957 Baker Road

- **Depth**: 3.0 feet  **Sample Number**: 1-B1 @ 3
- **Depth**: 3.5 feet  **Sample Number**: 1-B2 @ 3.5
- **Depth**: 3.0 feet  **Sample Number**: 1-B3 @ 3
- **Depth**: 12.5 feet  **Sample Number**: 1-B4 @ 12.5
- **Depth**: 10.0 feet  **Sample Number**: 1-B4 @ 10

Remarks:
- ASTM D4318, Wet method
- ASTM D4318, Wet method
- ASTM D4318, Wet method
- PI: ASTM D4318, Wet method
- GS: ASTM D1140
- PE: ASTM D4318, Wet method
- GS: ASTM D1140

Tested By: M. Quasem  Checked By: G. Criste
### LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>See exploration logs</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>33.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- **PI:** ASTM D4318, Wet method
- **GS:** ASTM D1140

**Project No.** 13255.000.000  **Client:** Catalyst Development Partners

**Project:** 20785 and 20957 Baker Road

**Depth:** 7.0 feet  **Sample Number:** 1-B5 @ 7

**Tested By:** M. Quasem  **Checked By:** G. Criste

**Project No.** 13255.000.000  **Client:** Catalyst Development Partners

**Project:** 20785 and 20957 Baker Road

**Depth:** 7.0 feet  **Sample Number:** 1-B5 @ 7

**Tested By:** M. Quasem  **Checked By:** G. Criste
Sample Number: 1-B4 @ 10     Depth: 10.0 feet

Date: 3/7/17

Client: Catalyst Development Partners
Project: 20785 and 20957 Baker Road
Project No: 13255.000.000

Tested By: M. Quasem  Checked By: G. Criste

Soil Description

See exploration logs

Atterberg Limits

\[
\begin{align*}
PL &= \ 16 \\
LL &= \ 34 \\
PI &= \ 18
\end{align*}
\]

Coefficients

\[
\begin{align*}
D_{90} &= \ D_{85} = \ D_{50} = \\
D_{30} &= \ C_{u} = \\
D_{10} &= \ C_{c} =
\end{align*}
\]

Classification

USCS= \ AASHTO=

Remarks

GS: ASTM D1140
PI: ASTM D4318, Wet method
### Soil Description

See exploration logs

#### Atterberg Limits

<table>
<thead>
<tr>
<th>PL = 17</th>
<th>PL = 6</th>
</tr>
</thead>
</table>

#### Coefficients

<table>
<thead>
<tr>
<th>D90</th>
<th>D85</th>
<th>D75</th>
<th>D60</th>
<th>D50</th>
<th>D40</th>
<th>D30</th>
<th>D20</th>
<th>D10</th>
<th>Cu</th>
<th>Cc</th>
</tr>
</thead>
</table>

#### Classification

USCS = 

AASHTO =

#### Remarks

GS: ASTM D1140
PI: ASTM D4318, Wet method

---

### Particle Size Distribution Report

#### Sample Number:

1-B4 @ 12.5

#### Depth:

12.5 feet

#### Date:

3/7/17

---

**Client:** Catalyst Development Partners  
**Project:** 20785 and 20957 Baker Road  
**Project No:** 13255.000.000

---

**Tested By:** M. Quasem  
**Checked By:** G. Criste
Sample Number: 1-B5 @ 7

Depth: 7.0 feet

Date: 3/7/17

**Soil Description**

See exploration logs

**Atterberg Limits**

\[
\begin{align*}
PL &= 15 \\
LL &= 25 \\
PI &= 10 \\
D_{10} &= D_{85} = D_{15} = D_{60} = D_{30} = D_{10} = C_u = C_c = 0 \\
USCS &= AASHTO =
\end{align*}
\]

**Classification**

GS: ASTM D1140

 PI: ASTM D4318, Wet method

**Remarks**

* (no specification provided)
UNCONFINED COMPRESSION TEST REPORT
(AM D2166)

Test Date: 03/06/17

Tested By: M. Quasem
Reviewed By: G. Criste

PROJECT NAME: 20785 and 20957 Baker Road
PROJECT NO: 13255.000.000
CLIENT: Catalyst Development Partners
LOCATION: Castro Valley, CA
PHASE NO: 005

Before Test

<table>
<thead>
<tr>
<th>SPECIMEN</th>
<th>1-B1 @ 3</th>
<th>1-B5 @ 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content (%)</td>
<td>20.0</td>
<td>23.7</td>
</tr>
<tr>
<td>Dry Density (pcf)</td>
<td>106.9</td>
<td>95.6</td>
</tr>
<tr>
<td>Saturation (%)</td>
<td>96.52</td>
<td>85.89</td>
</tr>
<tr>
<td>Void Ratio</td>
<td>0.55</td>
<td>0.73</td>
</tr>
<tr>
<td>Diameter (in)</td>
<td>2.392</td>
<td>2.396</td>
</tr>
<tr>
<td>Height (in)</td>
<td>4.998</td>
<td>4.694</td>
</tr>
<tr>
<td>Height-To-Diameter Ratio</td>
<td>2.089</td>
<td>1.959</td>
</tr>
</tbody>
</table>

Test Data

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>1-B1 @ 3</th>
<th>1-B5 @ 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconfined Compressive Strength (psf)</td>
<td>2592.500</td>
<td>1605.989</td>
</tr>
<tr>
<td>Undrained Shear Strength (psf)</td>
<td>1296.250</td>
<td>802.994</td>
</tr>
<tr>
<td>Strain Rate (in./min.)</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Specific Gravity (Assumed)</td>
<td>2.650</td>
<td>2.650</td>
</tr>
<tr>
<td>Strain at Failure (%)</td>
<td>13.12</td>
<td>11.60</td>
</tr>
</tbody>
</table>

Test Remarks

SPECIMEN | DESCRIPTION
-----------|-----------------------
1-B1 @ 3 | See exploration logs
1-B5 @ 3 | See exploration logs
To: Teresa Klotzback  
Engeo, Inc.  
2010 Crow Canyon PL. Ste #250  
San Ramon, CA 94583

From: Gene Oliphant, Ph.D. / Randy Horney  
General Manager  / Lab Manager

The reported analysis was requested for the following location:
Location: 13255.000.000  Site ID: 1-B4@3.5FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 73720-153746.

-----------------------------------------------
EVALUATION FOR SOIL CORROSION

Soil pH 6.56

Moisture 17.5 %

Minimum Resistivity 1.90 ohm-cm (x1000)

Chloride 3.8 ppm  0.000038 %

Sulfate 42.9 ppm  0.00429 %

Redox Potential (+) 231 mv

Sulfides Presence - NEGATIVE

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5
### Liquefaction Evaluation - Idriss and Boulanger (2008)

#### 1-B4

<table>
<thead>
<tr>
<th>Water Table depth at time of Exploration</th>
<th>Water Table depth at time of Liquefaction</th>
<th>amax/g</th>
<th>Mw</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7</td>
<td>0.93</td>
<td>7.33</td>
</tr>
</tbody>
</table>

#### Results

<table>
<thead>
<tr>
<th>Boring Designation</th>
<th>Depth [ft]</th>
<th>CRR</th>
<th>CSR</th>
<th>FS</th>
<th>Ht. of Layer (ft)</th>
<th>(N1)60cs</th>
<th>Soil Type (USCS)</th>
<th>Liquefiable?</th>
<th>Limiting Shear Strain γlim</th>
<th>Parameter Fo</th>
<th>Maximum Shear Strain ymax</th>
<th>ΔLDI</th>
<th>Volumetric Strain εv</th>
<th>ΔSi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-B4</td>
<td>13.0</td>
<td>0.32</td>
<td>0.66</td>
<td>0.50</td>
<td>4.00</td>
<td>31</td>
<td>SM</td>
<td>Yes</td>
<td>4%</td>
<td>-0.14</td>
<td>4%</td>
<td>0.17</td>
<td>0.81%</td>
<td>0.39</td>
</tr>
</tbody>
</table>

TDL = Too Dense to Liquefy based on blowcount criteria

### Liquefaction Evaluation - Idriss and Boulanger (2008)

#### 1-B5

<table>
<thead>
<tr>
<th>Water Table depth at time of Exploration</th>
<th>Water Table depth at time of Liquefaction</th>
<th>amax/g</th>
<th>Mw</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>7</td>
<td>0.93</td>
<td>7.33</td>
</tr>
</tbody>
</table>

#### Results

<table>
<thead>
<tr>
<th>Boring Designation</th>
<th>Depth [ft]</th>
<th>CRR</th>
<th>CSR</th>
<th>FS</th>
<th>Ht. of Layer (ft)</th>
<th>(N1)60cs</th>
<th>Soil Type (USCS)</th>
<th>Liquefiable?</th>
<th>Limiting Shear Strain γlim</th>
<th>Parameter Fo</th>
<th>Maximum Shear Strain ymax</th>
<th>ΔLDI</th>
<th>Volumetric Strain εv</th>
<th>ΔSi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-B5</td>
<td>7.5</td>
<td>0.46</td>
<td>0.57</td>
<td>0.79</td>
<td>1.00</td>
<td>36</td>
<td>SC</td>
<td>Yes</td>
<td>2%</td>
<td>-0.48</td>
<td>2%</td>
<td>0.02</td>
<td>0.33%</td>
<td>0.04</td>
</tr>
<tr>
<td>1-B5</td>
<td>9.8</td>
<td>0.20</td>
<td>0.61</td>
<td>0.33</td>
<td>3.50</td>
<td>22</td>
<td>SC</td>
<td>Yes</td>
<td>13%</td>
<td>0.44</td>
<td>13%</td>
<td>0.47</td>
<td>2.17%</td>
<td>0.91</td>
</tr>
<tr>
<td>1-B5</td>
<td>12.5 THC</td>
<td>0.58</td>
<td>TDL</td>
<td>2.00</td>
<td>87</td>
<td>N/A</td>
<td>SC</td>
<td>N/A</td>
<td>0%</td>
<td>0.00</td>
<td>0%</td>
<td>0.00</td>
<td>0.00%</td>
<td>0.00</td>
</tr>
</tbody>
</table>

TDL = Too Dense to Liquefy based on blowcount criteria