

GEOTECHNICAL INVESTIGATION  
INDUSTRIAL WAREHOUSE BUILDING



**SLADDEN ENGINEERING**

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Soil Engineers and Geologists

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April 30, 2013

Project No. 644-13016

13-05-023

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Attn: Ms. Dawn Khanoyan  
  
Subject: Geotechnical Investigation  
  
Project: Proposed Industrial/Warehouse Building  
NEC Archibald Avenue & Seventh Street  
APN 0209-211-24  
Rancho Cucamonga, California

Sladden Engineering is pleased to present the results of our geotechnical investigation performed for the industrial/warehouse building proposed for the subject site located on the northeast corner of Archibald Avenue and Seventh Street in the City of Rancho Cucamonga, California. Our services were completed in accordance with our revised proposal for geotechnical engineering services dated April 16, 2013 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site in order to provide recommendations for foundation design and site preparation. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.

The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project should be feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented into design and carried out through construction.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,

SLADDEN ENGINEERING

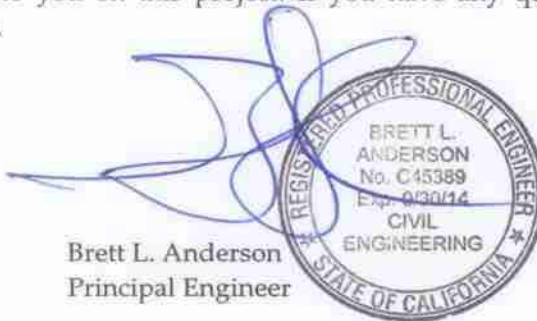
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GEOTECHNICAL INVESTIGATION  
PROPOSED INDUSTRIAL/WAREHOUSE BUILDING  
NEC ARCHIBALD AVENUE & SEVENTH STREET  
APN 0209-211-24  
RANCHO CUCAMONGA, CALIFORNIA

April 30, 2013

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## INTRODUCTION

This report presents the results of the geotechnical investigation performed by Sladden Engineering (Sladden) for the industrial/warehouse building proposed for the subject site located on the northeast corner of Archibald Avenue and 7<sup>th</sup> Street in the City of Rancho Cucamonga, California. The site is located at approximately 34.0891 degrees North latitude and 117.5906 degrees West longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in-situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

## PROJECT DESCRIPTION

It is our understanding that the proposed development will consist of constructing a new industrial/warehouse building on the subject site. In addition, we expect that the project will include paved parking areas, exterior concrete flatwork, underground utilities, landscape areas and various other site improvements. For our analyses we expect that the proposed building will be of reinforced concrete tilt-up construction supported on conventional shallow spread footings and concrete slabs-on-grade.

Based on the relatively level nature of the site, it appears that grading will consist of minor cuts and fills in order to achieve the final pad elevations and to provide adequate gradients for site drainage. This does not include remedial grading consisting of the removal and recompaction of primary foundation bearing soil within the building areas. Upon completion of the precise grading plans, Sladden should be retained in order to ensure that the recommendations presented within in this report are incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight concrete tilt-up or reinforced masonry structures, we expect that isolated column loads will be less than 80 kips and continuous wall loads will be less than 5.0 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

### SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Exploration of the site was achieved, by drilling ten (10) exploratory boreholes to depths between approximately 4 and 51 feet below the existing ground surface (bgs). Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site.
- The excavation of ten (10) exploratory boreholes to depths varying from approximately 4 to 51 feet bgs in order to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses.
- The performance of laboratory testing on selected samples to evaluate their engineering characteristics.
- The review of geologic literature with respect to potential geologic hazards.
- The performance of engineering analyses to develop recommendations for foundation design and site preparation.
- The preparation of this report summarizing our work at the site.

### SITE CONDITIONS

The site is located on the northeast corner of Archibald Avenue and Seventh Street in the City of Rancho Cucamonga, California. The site is currently vacant; fill stockpiles and debris are located along the southern project boundary. The site is bounded by existing commercial/industrial development to the north and east, Archibald Avenue to the west and 7<sup>th</sup> Street to the immediate south.

The project site is relatively level with minimal surface gradients. According to the USGS 7.5' Guasti Quadrangle map (1981), the site is at an approximate elevation of 1095 feet above mean sea level (MSL).

No ponding water or surface seeps were observed at or near the site during our investigation conducted on April 22, 2013. Site drainage is controlled by sheet flow, surface infiltration and within City maintained storm sewers located along nearby streets. Regional drainage in the site vicinity is provided by the Cucamonga Creek, Deer Creek and Day Creek.



## GEOLOGIC SETTING

The project site is located in the northern portion of the Peninsular Ranges Physiographic Province of California. The Peninsular Ranges are mountainous areas that extend from the western edge of the continental borderland to the Salton Trough and from the Transverse Ranges Physiographic Province in the north to the tip of Baja California in the south. The province is characterized by elongated, northwest-southeast trending mountain ranges and valleys and is truncated at its northern margin by the east-west grain of the Transverse Ranges.

The site has been mapped by Morton and Miller (2003) to be immediately underlain by Quaternary-age alluvial fan deposits (Qyf4). The geologic setting for the site and site vicinity is presented on the Regional Geologic Map (Figure 2).

## SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by drilling ten (10) exploratory boreholes on the site. The approximate locations of the boreholes are illustrated on the Borehole Location Photograph (Figure 3). The boreholes were advanced using a truck-mounted CME-75 drill-rig equipped with 8-inch outside diameter hollow stem augers. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analysis.

During our field investigation, artificial fill/disturbed soil and native alluvial materials were encountered to the maximum explored depth of approximately 51.5 feet bgs. Artificial fill soil was encountered near the surface within each of our bores. The artificial fill soil was generally less than 2 to 3 feet in depth within our bores. The native soil consists primarily of silty sand (SM) and sand (SP-SW) with scattered gravels and cobbles. Sampler penetration resistance as measured by field blow counts indicates that density generally increases with depth. Detailed descriptions of the materials encountered during our investigation are indicated on the bore logs included in Appendix A of this report.

Groundwater was not encountered within our boreholes. Based upon our bores, it is our opinion that groundwater is at a sufficient depth as not to be a factor during construction of the proposed structure. However, following periods of heavy or prolonged rainfall, perched groundwater may be encountered.

## SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults that splay or step from the main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

Table 1 lists the closest known active faults that were generated in part using the EQFAULT computer programs (Blake, 2000), as modified using the fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al, 2003). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

TABLE 1  
CLOSEST KNOWN ACTIVE FAULTS

Fault Name	Distance (Km)	Maximum Event
Cucamonga	8.7	6.9
San Jose	9.6	6.4
Sierra Madre	14.2	6.7
Chino – Central Ave. (Elsinore)	15.2	6.7
San Jacinto – San Bernardino	17.4	6.7
San Andreas – San Bernardino	24.0	7.5
San Andreas – Southern	24.0	7.2
San Andreas – Mojave	25.3	7.4

#### 2010 CBC DESIGN PARAMETERS

Sladden has reviewed the 2010 California Building Code (CBC) to provide the current seismic design parameters for the proposed structures. The seismic design category for a structure may be determined in accordance with Section 1613 of the 2010 CBC or ASCE7. According to the 2010 CBC, Site Class D may be used to estimate design seismic loading for the proposed structure. The 2010 CBC Seismic Design Parameters are summarized below.

Occupancy Category (Table 1604.5): II  
 Site Class (Table 1613.5.5): D  
 $S_s$  (Figure 1613.5.1): 1.500g  
 $S_1$  (Figure 1613.5.1): 0.600g  
 $F_a$  (Table 1613.5.3(1)): 1.0  
 $F_v$  (Table 1613.5.3(2)): 1.5  
 $S_{ms}$  (Equation 16-37 ( $F_a \times S_s$ )): 1.500g  
 $S_{m1}$  (Equation 16-38 ( $F_v \times S_1$ )): 1.900  
 $S_{DS}$  (Equation 16-39 ( $2/3 \times S_{ms}$ )): 1.000g  
 $S_{D1}$  (Equation 16-40 ( $2/3 \times S_{m1}$ )): 0.600g  
 Seismic Design Category: D



## GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below.

- I. Surface Rupture. Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on review of Jennings (1994), Hart and Bryant (1997) and Morton and Miller (2003) faults are not mapped on the site. In addition, no signs of active surface faulting were observed during our review of non-stereo digitized photographs of the site and site vicinity (Google, 2013; Terra Server 2002). Finally, no signs of active surface rupture or secondary seismic effects (lateral spreading, lurching etc.) were identified on-site during our field investigation. Therefore, it is our opinion that risks associated with primary surface ground rupture should be considered "low".
- II. Ground Shaking. The site has been subjected to past ground shaking by faults that traverse through the region. Strong seismic shaking from nearby active faults is expected to produce high ground accelerations during the design life of the proposed project. A probabilistic approach was employed to estimate the peak ground acceleration ( $a_{max}$ ) that could be experienced at the site.

Based on the USGS Probabilistic Hazard Curves (USGS, 2011) the site could be subjected to ground accelerations on the order of 0.52g. The peak ground acceleration at the site is judged to have a 475 year return period and a 10 percent chance of exceedence in 50 years.

- III. Liquefaction/Seismic Settlement. Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular sand volume and a positive increase in pore pressures. Generally, liquefaction can occur if all of the following conditions apply: liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking. Based on the depth to ground water in the site vicinity (>100ft.) (CWMP, 2008), risks associated with liquefaction are considered negligible.

Seismic settlement is often caused when loose granular soil densifies during seismic shaking, potentially resulting in damage to overlying structures and improvements. Sladden has evaluated the potential effects of seismic settlement affecting the project site. The peak ground acceleration used in our analyses was  $S_{ps}/2.5$  (0.4g), in accordance with current guidelines (CGS, 2011).



A review of the seismically induced settlement of the top 50 feet of the soil profile revealed total analysis settlements of approximately 0.17 inches. Our seismic settlement estimates are presented on the seismic settlement data sheets within Appendix C. Based on our analysis we expect that the potential differential settlements should be negligible.

- IV. Tsunamis and Seiches. Because the site is situated at an elevated inland location, and is not immediately adjacent to any impounded bodies of water, risk associated with tsunamis and seiches is considered negligible.
- V. Slope Failure, Landsliding, Rock Falls. The site is situated on relatively level ground and is not immediately adjacent to any slopes or hillsides that could be potentially susceptible to slope instability. No signs of slope instability in the form of landslides, rock falls, earthflows or slumps were observed at or near the subject site during our investigation. As such, risks associated with slope instability should be considered "negligible".
- VI. Expansive Soil. Expansion Index testing of select samples was performed in order to evaluate the expansive potential of the materials underlying the site. Based the results of our laboratory testing (EI = 1), the materials present near the ground surface are considered to have a "very low" expansion potential. Accordingly, risk of structural damage caused by volumetric changes in the subgrade soil should be minimal. However, the surface soil should be tested subsequent to grading and final foundation and slab design should be based upon post-grading expansion test results. Specific expansive soil design criteria can be provided subsequent to building pad grading.
- VII. Settlement. Settlement resulting from the anticipated foundation loads should be tolerable provided that the recommendations included in this report are considered in foundation design and construction. The estimated ultimate settlement is calculated to be approximately one inch when using the recommended bearing values. As a practical matter, differential settlement between footings can be assumed as one-half of the total settlement.
- VIII. Flooding and Erosion. No signs of flooding or erosion were observed during our field investigation. Therefore, risks associated with flooding and erosion should be considered "negligible".

## CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations provided in this report are incorporated into design and carried out through construction. The main geotechnical concern in the design and construction of the proposed project is the presence of artificial fill and potentially compressible surface and near surface native soil and potential liquefaction related seismic settlement.

Because of the somewhat soft and compressible condition of the near surface soil, remedial grading including overexcavation and recompaction is recommended for the proposed building and foundation areas. We recommend that remedial grading within the proposed building areas include over-excavation and/or re-compaction of the artificial fill soil and the primary foundation bearing soil. Specific recommendations for site preparation are presented in the Earthwork and Grading section of this report.

Groundwater was not encountered within our bores that extended to a depth of approximately 51.5. Historic high groundwater for the site has been reported by the CWMP (2008) at depths greater than 100 feet bgs at the site. It is our opinion that groundwater should not be a factor during the construction of the proposed project.

Caving did occur to varying degrees within each of our exploratory bores and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOSHA excavation criteria. On the basis of our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOSHA as Type B or C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

The following recommendations present more detailed design criteria that have been developed on the basis of our field and laboratory investigation.

## EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the surface soil, should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earth work should be performed under the observation and testing of a qualified soil engineer. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing and geotechnical engineering analyses.

- a. Stripping. Areas to be graded should be cleared of the scattered weeds and surface vegetation. All areas scheduled to receive fill should be cleared of surface improvements, artificial fill and any unsuitable matter. The unsuitable materials should be removed from the site. Existing artificial fill soil should be removed in its entirety and replaced as engineering fill. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.



- b. Preparation of Building Areas. In order to achieve a firm and unyielding bearing surface, we recommend overexcavation and recompaction throughout the building areas. All artificial fill and native low density near surface soil should be removed to competent native soil expected at depths of approximately 3 to 4 feet below the existing ground surface or to a minimum depth of 3 feet below the bottom of the footings, whichever is deeper. Remedial grading should extend laterally, a minimum of five feet beyond perimeter wall foundations. The exposed surface soil should then be scarified, moisture conditioned to within two percent of optimum moisture content, and compacted to at least 90 percent relative compaction.
- c. Compaction. Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in their loose state. If import fill is required, the material should be of a low to non-expansive nature and should meet the following criteria:

Plastic Index	Less than 12
Liquid Limit	Less than 35
Percent Soil Passing #200 Sieve	Between 15% and 35%
Maximum Aggregate Size	3 inches

The subgrade and all fills material should be compacted with acceptable compaction equipment, to at least 90 percent relative compaction. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed on all lifts in order to ensure proper placement of the fill materials. Table 2 provides a summary of the excavation and compaction recommendations.

**TABLE 2**  
**SUMMARY OF RECOMMENDATIONS**

*Remedial Grading	Excavation and recompaction within the building envelope and extending laterally at least 5 feet beyond the building limits and to competent native soil or a minimum depth of 3 feet below the bottom of the footings, whichever is deeper.
Native / Import Engineered Fill	Place in thin lifts not exceeding 6 inches in the loose state, compact to a minimum of 90 percent relative compaction.
Asphalt Concrete Sections	Compact the top 12 inches to at least 95 percent compaction within 2 percent of optimum moisture content.

\*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.



- d. Shrinkage and Subsidence. Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage could vary from 10 to 15 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

#### FOUNDATIONS: CONVENTIONAL SHALLOW SPREAD FOOTINGS

Exterior footings should extend at least 18 inches beneath lowest adjacent grade and interior footings should extend at least 12 inches below slab subgrade. Isolated square or rectangular footings at least 2 feet square and continuous footings at least 12 inches wide may be designed using allowable bearing pressures of 2000 and 1800 pounds per square foot, respectively. The allowable bearing pressure may be increased by approximately 250 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth, if desired. The maximum allowable bearing pressure should be limited to 3000 psf unless confirmed by Sladden Engineering subsequent to performing specific settlement calculations. The allowable bearing pressures are for dead and frequently applied live loads and may be increased by 1/3 to resist wind, seismic or other transient loading.

The allowable bearing pressure may be increased by one-third when considering transient live loads, including seismic and wind forces. All footings should be reinforced in accordance with the project structural engineer's recommendations.

Based on the allowable bearing pressures recommended above, total settlement of the shallow footings are anticipated to be less than one inch, provided that foundation preparation conforms to the recommendations provided in this report. Differential settlement is anticipated to be approximately one-half the total settlement for similarly loaded footings spaced approximately 40 feet apart.

Resistance to lateral loads may be provided by a combination of friction acting at the base of the slabs or foundations and passive earth pressure along the sides of the foundations. A coefficient of friction of 0.40 between soil and concrete may be used for dead load forces only. A passive earth pressure of 250 pounds per square foot, per foot of depth, may be used for the sides of footings that are placed against properly compacted native soil. Passive earth pressure should be ignored within the upper 1 foot except where confined.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork.

### SLABS-ON-GRADE

In order to reduce the risk of heave, cracking and settlement, concrete slabs-on-grade must be placed on properly compacted fill as outlined in the previous sections. The slab subgrades should remain near optimum moisture content and should not be permitted to dry. Prior to concrete pour, all slab subgrades should be firm and unyielding. Disturbed soils should be removed and then replaced and compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the structural engineer. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height. Considering the expected uses, we recommend a minimum slab thickness of 6.0 inches within warehouse areas and 4.0 inches within office areas.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor barrier consisting of a polyvinyl chloride membrane such as 10-mil Visqueen. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete and to limit damage. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface can not be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

### PRELIMINARY PAVEMENT DESIGN

Asphalt concrete pavements should be designed in accordance with Topic 610 of the Caltrans Highway Design Manual based on R-Value and Traffic Index. The R-Value of the near surface soil is expected to exceed 40. On-site soil and any imported soil should be tested for R-Value prior to establishing final pavement design sections.

For preliminary pavement design, Traffic Indices (TI) of 5.0 and 6.5 were used for the light duty and heavy duty pavements, respectively. We assumed Asphalt Concrete (AC) over Class II Aggregate Base (AB). The preliminary flexible pavement layer thickness is as follows:

RECOMMENDED ASPHALT PAVEMENT SECTION LAYER THICKNESS		
Pavement Material	Recommended Thickness	
	TI=5.0	TI=6.5
Asphalt Concrete Surface Course	3.0 inches	4.0 inches
Class II Aggregate Base Course	6.0 inches	8.0 inches
Compacted Subgrade Soil	12 inches	12 inches

Asphalt concrete should conform to Sections 203 and 302 of the latest edition of the Standard Specifications for Public Works Construction (Caltrans or Greenbook). Class II aggregate base should conform to Section 26 of the Caltrans Standard Specifications or Greenbook, latest edition. The aggregate base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557.



### **SOLUBLE SULFATES**

Soluble sulfate concentrations of the near surface soil were determined to have "negligible" corrosive potential with respect to concrete (less than 1000 ppm). The use of Type V and/or sulfate resistant mix design will likely not be necessary. Soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

### **UTILITY TRENCH BACKFILL**

All utility trench backfill should be compacted to a minimum relative compaction of 90 percent. Trench backfill materials should be placed in lifts no greater than six inches in their loose state, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture conditions, and then mechanically compacted in place to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should test the backfills to verify adequate compaction.

### **EXTERIOR CONCRETE FLATWORK**

To minimize cracking of concrete flatwork, the subgrade soil below concrete flatwork areas should first be compacted to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soil.

### **DRAINAGE**

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.



### LIMITATIONS

The findings and recommendations presented in this report are based upon an interpolation of the soil conditions between the exploratory boring locations and extrapolation of these conditions throughout the proposed building area. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to assure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

### ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded on/or penetrate into the recommended soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for subgrade soils and 95 percent for Class II aggregate base as obtained by the ASTM D1557-91 test method. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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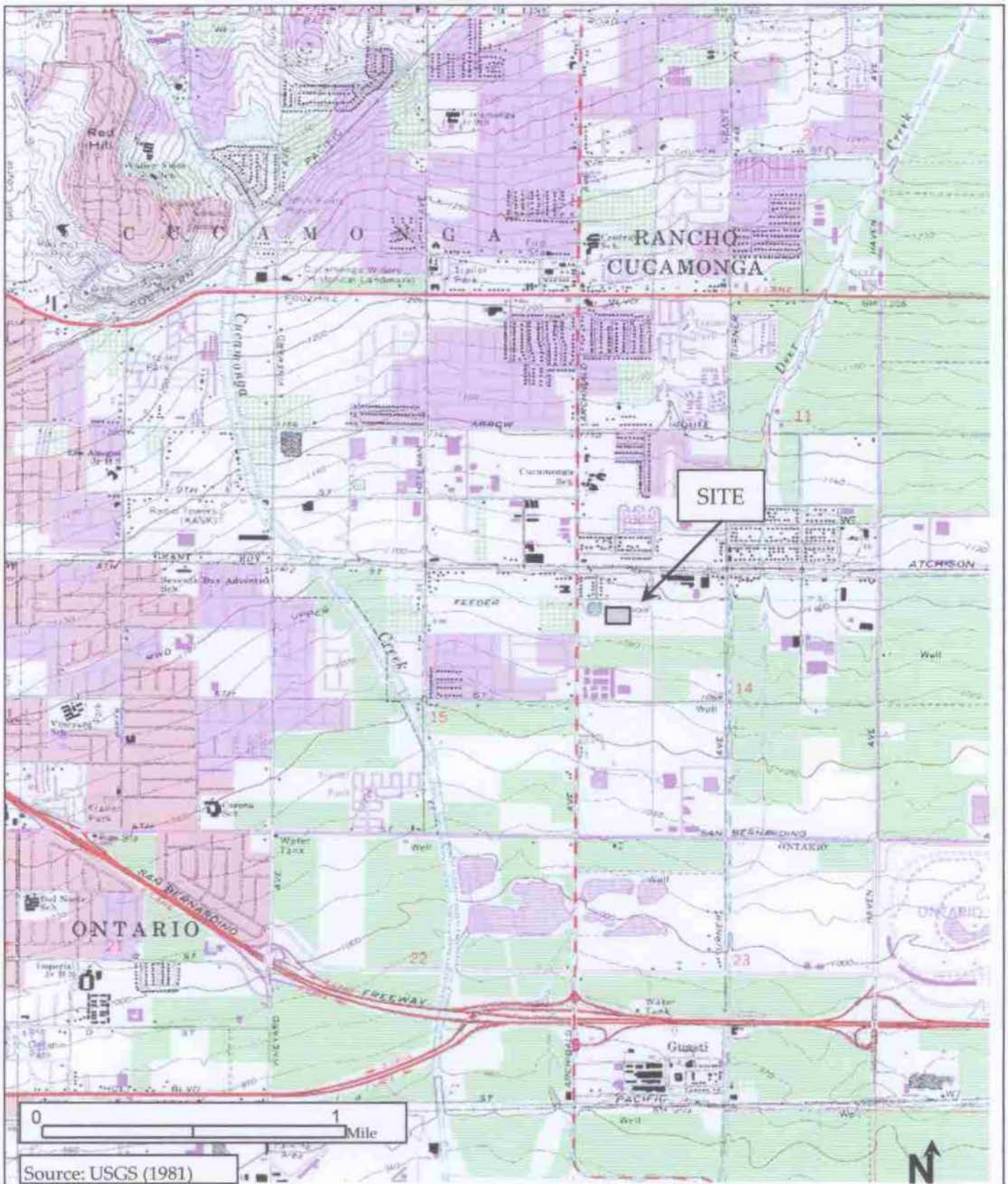
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United States Geological Survey (USGS), 2011, "Seismic Hazard Curves and Uniform Hazard Response Spectra, Version 5.1.0.

## FIGURES

SITE LOCATION MAP  
REGIONAL GEOLOGIC MAP  
BOREHOLE LOCATION PHOTOGRAPH





## SITE LOCATION MAP

FIGURE

1



Sladden Engineering

Project Number:

644-13016

Report Number:

13-05-023

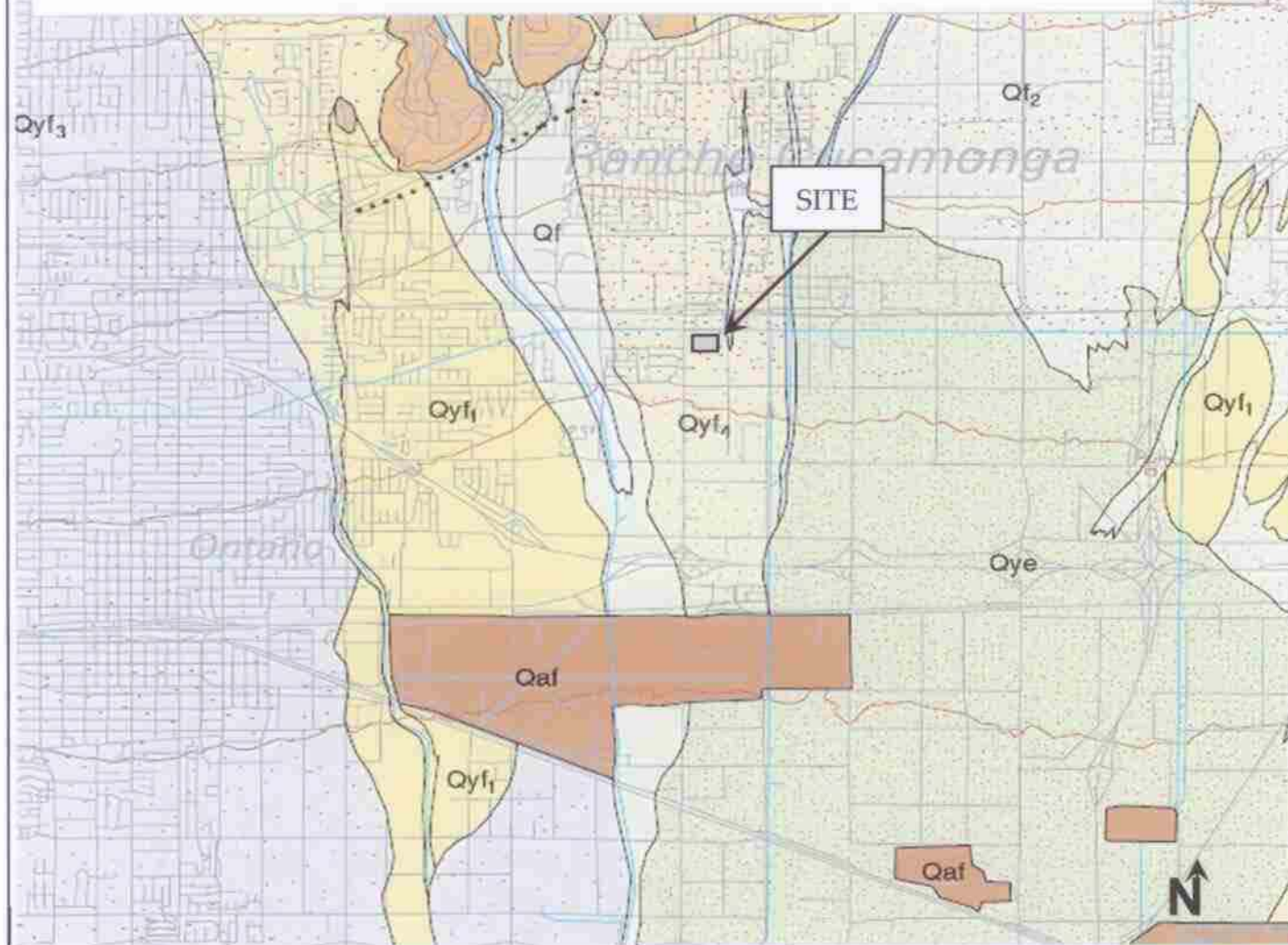
Date:

April 30, 2013



Qyf<sub>4</sub>

**Young alluvial-fan deposits, Unit 4 (late Holocene)**—Unconsolidated to slightly consolidated silt, sand, and coarse-grained sand to bouldery alluvial fan deposits having slightly to moderately dissected surfaces. Stage S<sub>7</sub> soils in Devore area. Fans emanating from canyons on south side of San Gabriel Mountains contain large proportion of coarse boulders, especially in upper parts. Fans emanating from canyons on south side of San Bernardino Mountains contain coarse boulders in upper parts, but grade over short distances southward into sand and pebble alluvium. On south side of both ranges, typically braided stream pattern on surfaces of fans related to deposition is only slightly modified. Large area of Qyf<sub>4</sub> between Granite Mountains and Mojave River is slightly consolidated silt and sand, that contains lenses and individual matrix-supported clasts generally less than 2 cm across. Represents large area of coalesced fan material. Surface is smooth and undulating, showing only slight dissection in upper parts. Unit in this part of quadrangle may contain some axial-valley deposits, especially near western end of Granite Mountains. Age relative to Qyf<sub>5</sub> and Qyf<sub>3</sub> based mainly on overlap relations of adjacent fans and degree of dissection compared to fans in general area.



## REGIONAL GEOLOGIC MAP

FIGURE

2



Sladden Engineering

Project Number:

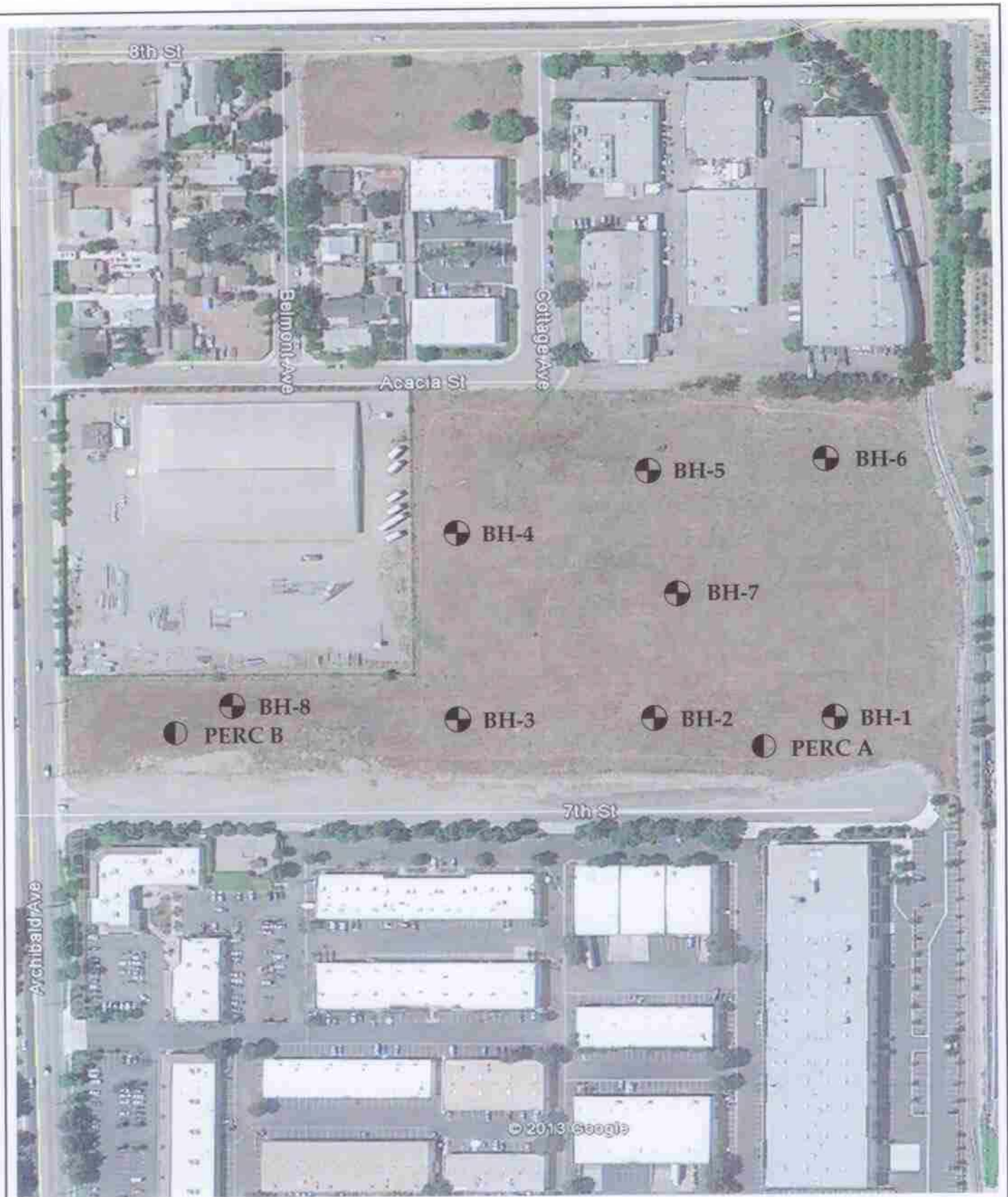
644-13016

Report Number:

13-05-023

Date:

April 30, 2013



Sladden Engineering

## BOREHOLE LOCATION PHOTOGRAPH

Project Number:	644-13016
Report Number:	13-05-023
Date:	April 30, 2013

FIGURE

3



## APPENDIX A

### FIELD EXPLORATION

## APPENDIX A

### FIELD EXPLORATION

For our field investigation ten (10) exploratory bores were excavated on April 22, 2013 utilizing a truck mounted hollow stem auger rig (CME-75). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our bores by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observations and testing.

# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN No.200 SIEVE	GRAVELS  MORE THAN HALF COARSE FRACTION IS LARGER THAN No.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY-GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS  MORE THAN HALF COARSE FRACTION IS SMALLER THAN No.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN No.200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, CLEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS: LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
	HIGHLY ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

## EXPLANATION OF BORE LOG SYMBOLS

-  California Split-spoon Sample
-  Unrecovered Sample
-  Standard Penetration Test Sample
-  Groundwater depth

Note: The stratification lines on the borelogs represent the approximate boundaries between the soil types; the transitions may be gradational.







SLADDEN ENGINEERING								BORE LOG			
								Drill Rig: CME-75		Date Drilled: 4/22/2013	
								Elevation: 1,095 Feet (MSL)		Boring No: BH-1	
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
	5/6/8	1	1	29.7	2.8	113.7	2		Silty Sand (SM); yellowish brown, dry, loose, fine-grained, bioturbated (Fill/Disturbed).		
	9/23/26			23.4	3.0		4		Silty Sand (SM); yellowish brown, dry, dense, fine-grained with gravel (Alluvium). Gravels/Cobbles encountered at ~7 Ft.		
							6				
	3/3/4			35.2	7.4		8				
							10		Silty Sand (SM); yellowish brown, moist, loose, fine-grained (Alluvium). Gravels/Cobbles encountered at ~13 Ft.		
							12				
	8/10/12			46.8	13.5	137.4	14				
							16		Silty Sand (SM); yellowish brown, moist, medium dense, fine-grained (Alluvium).		
							18				
	21/32/33			7.1	2.3		20				
							22		Sand (SP); light yellowish brown, dry, very dense, fine- to coarse-grained with gravel (Alluvium).		
							24				
	50-4"			11.2	4.0		26				
							28		Sand (SP); light yellowish brown, slightly moist, very dense, fine- to coarse-grained with gravel (Alluvium). Gravels/Cobbles encountered at 26 - 30 Ft.		
							30				
	17/50-5"			10.2	2.1		32				
							34		Sand (SP); yellowish brown, dry, very dense, fine- to coarse-grained (Alluvium).		
							36				
	14/24/35			50.0	12.7	119.6	38				
							40		Silty Sand to Sandy Silt (SM/ML); yellowish brown, moist, dense/hard, fine-grained/low plasticity (Alluvium).		
	14/21/28			8.3	2.4		42				
							44				
	18/50-4"			11.1	4.7	117.2	46		Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained (Alluvium).		
							48				
							50				
	21/28/28			10.9	4.5				Sand (SP); yellowish brown, slightly moist, very dense, fine- to coarse-grained (Alluvium).		
Completion Notes:									PROPOSED INDUSTRIAL/WAREHOUSE BUILDING		
Terminated at ~51.5 Feet bgs.									ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA		
No Bedrock Encountered.									Project No: 644-13016		
No Groundwater or Seepage Encountered.									Report No: 13-05-023		
									Page 1		

SLADDEN ENGINEERING								BORE LOG			
								Drill Rig: CME-75		Date Drilled: 4/22/2013	
								Elevation: 1,095 Feet (MSL)		Boring No: BH-2	
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
	8/15/18			43.7	5.1	113.4	4		Silty Sand (SM); yellowish brown, dry to slightly moist, medium dense, fine-grained (Alluvium).		
							6				
	4/5/7			37.0	5.6		8				
							10		Silty Sand (SM); yellowish brown, slightly moist, medium dense, fine-grained (Alluvium).		
							12				
	6/19/41			19.0	3.8	125.1	14				
							16		Silty Sand (SM); yellowish brown, dry, very dense, fine-grained with gravel (Alluvium). Gravels/Cobbles encountered at ~17 Ft.		
							18				
	15/22/25			7.7	1.5		20				
							22		Sand (SW); pale brown, dry, dense, fine- to coarse-grained with gravel (Alluvium).		
							24				
							26				
							28		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
								Project No: 644-13016			
								Report No: 13-05-023			
								Page	2		

SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	BH-3
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
							4				
█	10/8/5			23.7	3.3		6		Silty Sand (SM); yellowish brown, dry, medium dense, fine-grained (Alluvium).		
							8				
█	4/4/4			12.9	3.4	112.5	10		Silty Sand (SM); yellowish brown, dry, very loose, fine-grained (Alluvium).		
							12				
							14				
█	6/9/13			13.6	3.8		16		Silty Sand (SM); yellowish brown, dry, medium dense, fine-grained with gravel (Alluvium). Gravels/Cobbles encountered at ~16 Ft.		
							18				
█	21/31/45			7.0	2.0		20		Sand (SP); yellowish brown, dry, very dense, fine- to coarse-grained (Alluvium).		
							22				
							24		Terminated at ~21.5 Feet bgs.		
							26		No Bedrock Encountered.		
							28		No Groundwater or Seepage Encountered.		
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
								Project No: 644-13016			
								Report No: 13-05-023			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	BH-4
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
	15/28/35			40.7	4.9	116.9	4		Silty Sand (SM); yellowish brown, slightly moist to moist, dense, fine-grained (Alluvium).		
							6				
	2/2/3			40.0	9.0		8		Silty Sand (SM); yellowish brown, moist, loose, fine-grained (Alluvium).		
							10				
							12		Gravels/Cobbles encountered at ~14 Ft.		
							14				
	12/22/27			6.7	2.4	123.0	16		Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained with gravel (Alluvium).		
							18		Practical Auger Refusal at ~18.0 Ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							20				
							22				
							24				
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
								Project No: 644-13016			
								Report No: 13-05-023			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	BH-5
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
							4				
	6/6/8			33.5	5.6		6		Silty Sand (SM); yellowish brown, moist, medium dense, fine-grained (Alluvium).		
							8				
	6/10/13			28.5	6.5	116.5	10		Silty Sand (SM); yellowish brown, moist, medium dense, fine-grained with gravel (Alluvium).		
							12				
							14				
	4/6/8			14.0	4.4		16		Silty Sand (SM); yellowish brown, slightly moist, medium dense, fine-grained (Alluvium). Gravel/Cobbles encountered at ~17 Ft.		
							18				
	29/50-3"						20		No Recovery.		
							22				
							24		Terminated at ~21.0 Feet bgs.		
							26		No Bedrock Encountered.		
							28		No Groundwater or Seepage Encountered.		
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
								Project No: 644-13016			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	BH-6
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
	5/5/7			45.5	6.9		4		Silty Sand (SM); yellowish brown, moist, medium dense, fine-grained (Alluvium).		
							6				
	5/11/14			34.2	7.2	116.5	10				
							12				
							14		Silty Sand (SM); yellowish brown, moist, medium dense, fine-grained (Alluvium).		
	2/4/9			24.6	6.0		16				
							18				
							20				
	19/50-6"			10.0	2.2	118.7	20		Gravelly Sand (SW-GW); yellowish brown, dry, very dense, fine- to coarse-grained (Alluvium).		
							22		Terminated at ~21.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							24				
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	BH-7
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
	15/31/41			34.5	4.1	120.2	4		Silty Sand (SM); yellowish brown, slightly moist, dry, dense, fine-grained (Alluvium).		
							6				
							8				
	6/9/11			9.9	2.3		10		Sand (SW); yellowish brown, dry, medium dense, fine- to coarse-grained with gravel (Alluvium).		
							12				
	50-3"			18.9	2.8		14		Gravels/Cobbles encountered at 14 Ft.		
							16		Silty Sand (SM); yellowish brown, dry, very dense, fine- to coarse-grained (Alluvium).		
							18				
	50-5"			8.5	2.1		20		Sand (SP); yellowish brown, dry, very dense, fine- to coarse-grained (Alluvium).		
							22		Terminated at ~20.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							24				
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING			
								ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
								Project No: 644-13016			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig: CME-75		Date Drilled: 4/22/2013	
								Elevation: 1,095 Feet (MSL)		Boring No: BH-8	
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
							4		Gravels/Cobbles encountered at ~4 Ft.		
6/7/6				19.1	4.6		6		Silty Sand (SM); yellowish brown, slightly moist, medium dense, fine-grained (Alluvium).		
							8				
11/13/13				5.7	2.8	113.8	10		Sand (SP); yellowish brown, dry, medium dense, fine- to coarse-grained (Alluvium).		
							12				
							14				
3/9/14				9.5	3.7		16		Sand (SP); yellowish brown, dry, medium dense, fine- to coarse-grained with gravel (Alluvium).		
							18				
							20		Sand (SP); yellowish brown, dry, very dense, fine- to coarse-grained with gravel (Alluvium).		
7/32/37							22				
							24		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	PERC A
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
							4		Silty Sand (SM); yellowish brown, dry, fine-grained (Alluvium).		
							6		Terminated at ~4.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							8				
							10				
							12				
							14				
							16				
							18				
							20				
							22				
							24				
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA Project No: 644-13016 Report No: 13-05-023			
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SLADDEN ENGINEERING								BORE LOG			
								Drill Rig:	CME-75	Date Drilled:	4/22/2013
								Elevation:	1,095 Feet (MSL)	Boring No:	PERC B
Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description		
							2		Silty Sand (SM); yellowish brown, dry, fine-grained, bioturbated (Fill/Disturbed).		
							4		Silty Sand (SM); yellowish brown, dry, fine-grained (Alluvium).		
							6		Terminated at ~4.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.		
							8				
							10				
							12				
							14				
							16				
							18				
							20				
							22				
							24				
							26				
							28				
							30				
							32				
							34				
							36				
							38				
							40				
							42				
							44				
							46				
							48				
							50				
Completion Notes:								PROPOSED INDUSTRIAL/WAREHOUSE BUILDING ARCHIBALD AVENUE & 7TH STREET, RANCHO CUCAMONGA Project No: 644-13016 Report No: 13-05-023			



## APPENDIX B

### LABORATORY TESTING

## APPENDIX B

### LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

### CLASSIFICATION AND COMPACTION TESTING

**Unit Weight and Moisture Content Determinations:** Each undisturbed sample was weighed and measured in order to determine its unit weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Bore Logs.

**Maximum Density-Optimum Moisture Determinations:** Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557-91, Test Method A. The results of testing are presented graphically in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

**Classification Testing:** Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soils and in selecting samples for further testing.

### SOIL MECHANIC'S TESTING

**Expansion Testing:** One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 18-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete.

**Direct Shear Testing:** One (1) bulk sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 800 to 2300 pounds per square foot.

**Consolidation Testing:** Two (2) relatively undisturbed samples were selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 11520 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load. The specimens were saturated at 575 psf or 720 psf load increment.

**Corrosion Series Testing:** The soluble sulfate concentrations of the surface soil was determined in accordance with California Test Method Number (CA) 417. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 422.





# Sladden Engineering

450 Egan Avenue, Beaumont CA 92223 (951) 845-7743 Fax (951) 845-8863

## Maximum Density/Optimum Moisture

ASTM D698/D1557

Project Number: 644-13016  
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga  
Lab ID Number: LN6-13164  
Sample Location: BH-1 Bulk 1 @ 0-5'  
Description: Brown Silty Sand (SM)

May 2, 2013

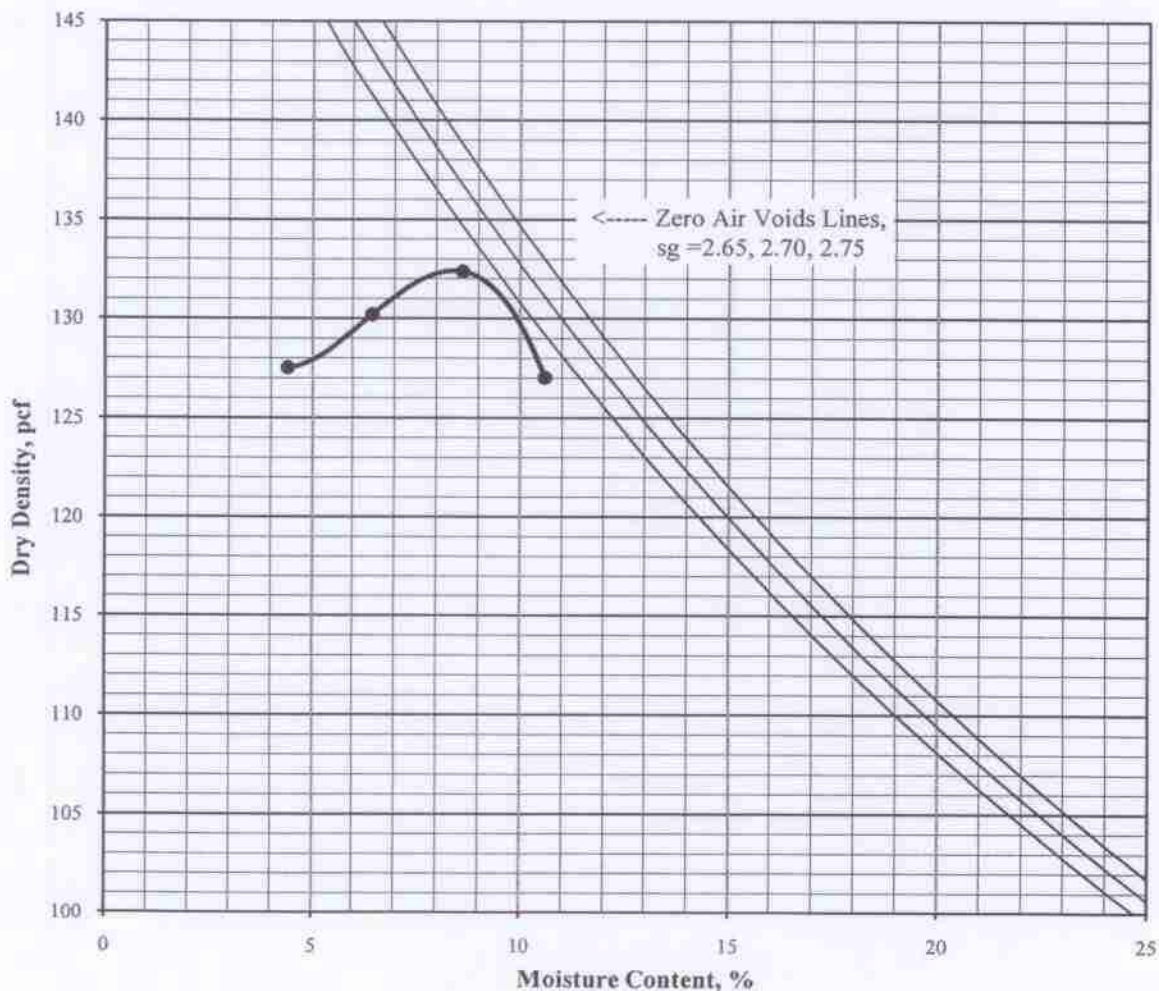
ASTM D-1557 A  
Rammer Type: Machine

Maximum Density: 135 pcf

Optimum Moisture: 8%

Corrected for Oversize (ASTM D4718)

Sieve Size	% Retained
3/4"	
3/8"	
#4	9.0





# Sladden Engineering

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## Expansion Index

ASTM D 4829

Job Number: 644-13016  
Job Name: Archibald Avenue & 7th Street, Rancho Cucamonga  
Lab ID Number: LN6-13164  
Sample ID: BH-1 Bulk 1 @ 0-5'  
Soil Description: Brown Silty Sand (SM)

May 2, 2013

Wt of Soil + Ring:	591.7
Weight of Ring:	190.7
Wt of Wet Soil:	401.0
Percent Moisture:	7.5%
Sample Height, in	0.95
Wet Density, pcf:	127.9
Dry Denstiy, pcf:	119.0

% Saturation:	48.7
---------------	------

### Expansion

Rack # 4

Date/Time	4/30/2013	1:25 PM
Initial Reading	0.0000	
Final Reading	0.0011	

### Expansion Index

1

(Final - Initial) x 1000



# Sladden Engineering

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## Direct Shear ASTM D 3080-04 (modified for unconsolidated condition)

Job Number: 644-13016

May 2, 2013

Job Name Archibald Avenue & 7th Street, Rancho Cucamonga

Initial Dry Density: 119.0 pcf

Lab ID No. LN6-13164

Initial Moisture Content: 8.6 %

Sample ID BH-1 Bulk 1 @ 0-5'

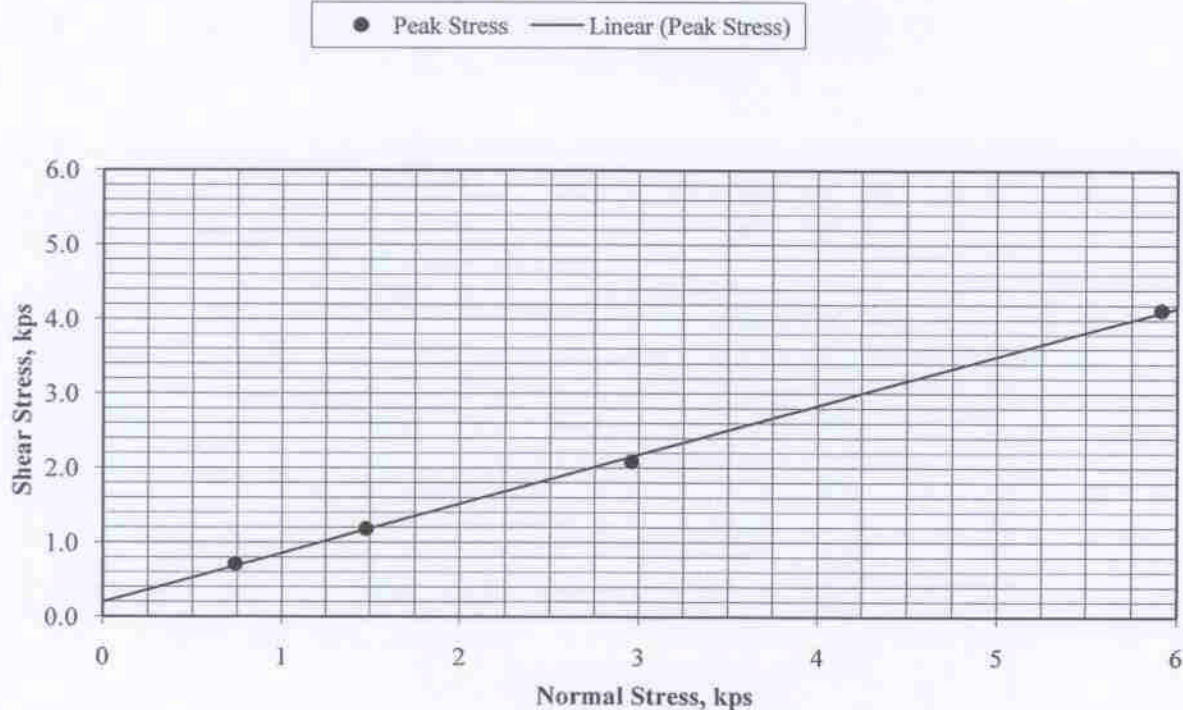
Peak Friction Angle ( $\phi$ ): 33°

Classification Brown Silty Sand (SM)

Cohesion (c): 190 psf

Sample Type Remolded @ 90% of Maximum Density

Test Results	1	2	3	4	Average
Moisture Content, %	14.3	14.3	14.3	14.3	14.3
Saturation, %	92.6	92.6	92.6	92.6	92.6
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.710	1.183	2.086	4.130	







# Sladden Engineering

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## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

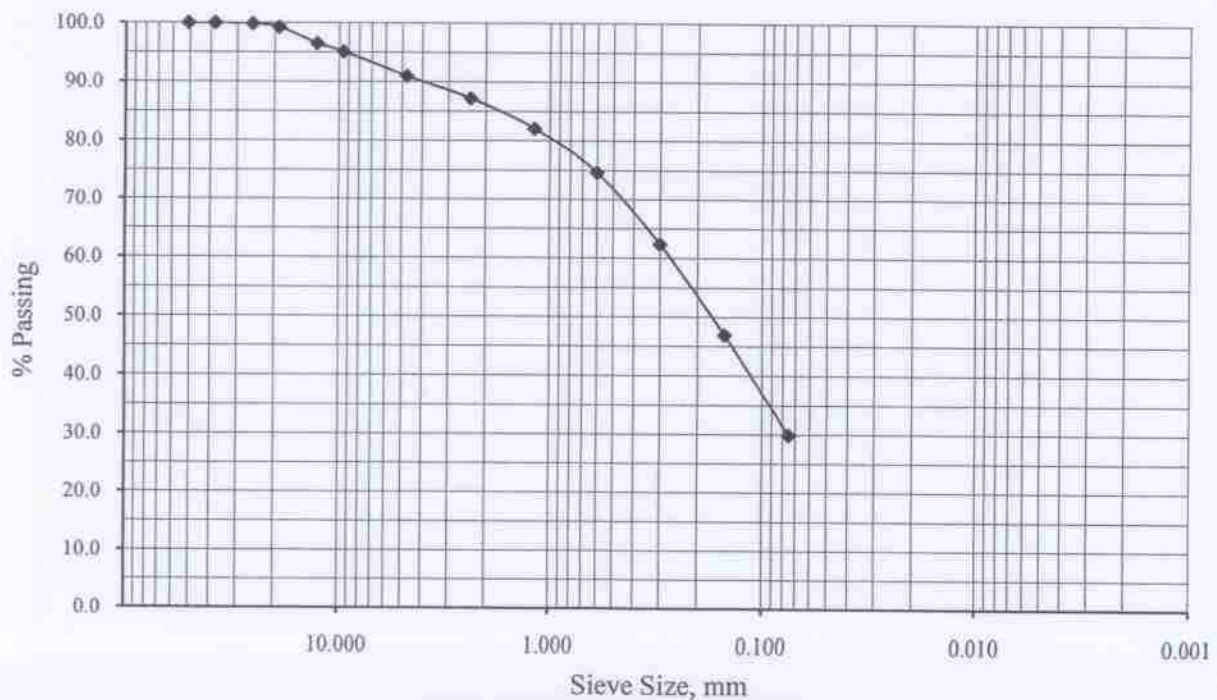
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-1 Bulk 1 @ 0-5'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	99.9
3/4"	19.1	99.2
1/2"	12.7	96.5
3/8"	9.53	95.1
#4	4.75	91.0
#8	2.36	87.2
#16	1.18	82.0
#30	0.60	74.7
#50	0.30	62.4
#100	0.15	46.9
#200	0.075	29.9





# Sladden Engineering

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## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

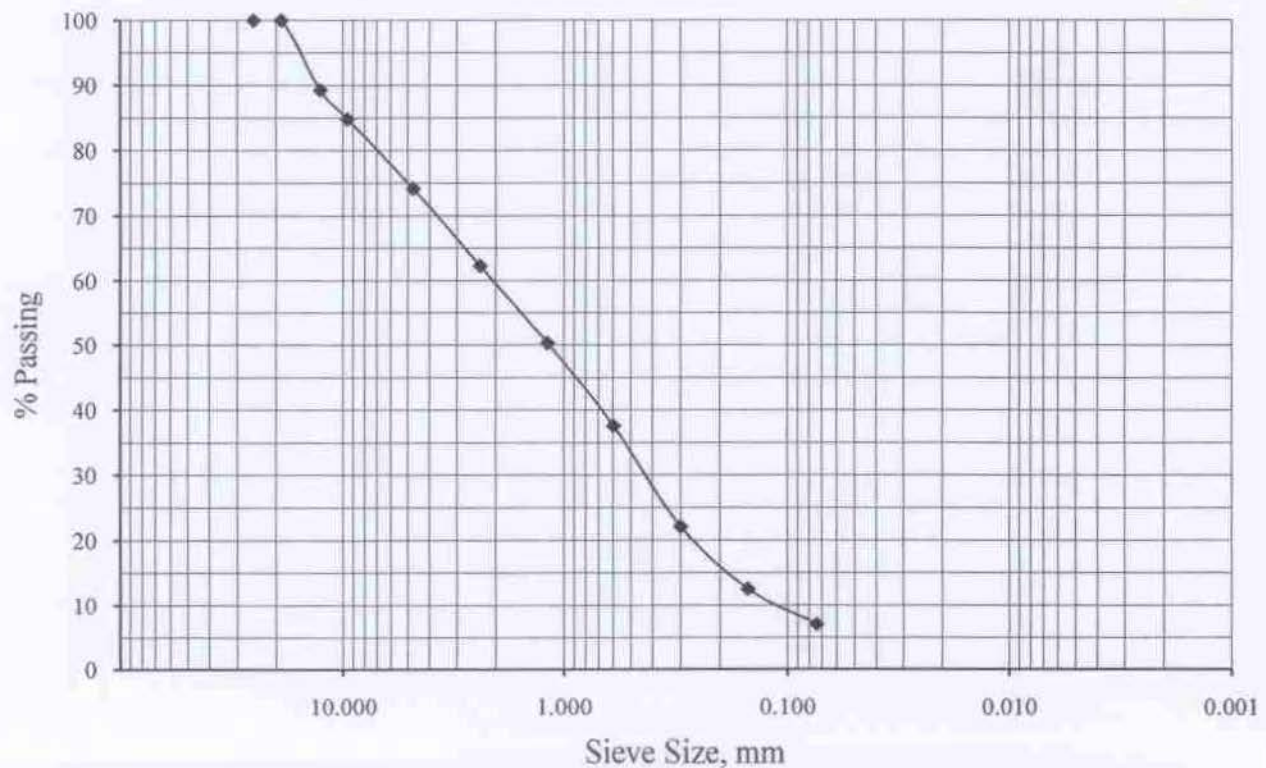
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-1 S-5 @ 20'

Soil Classification: SP-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	89.3
3/8"	9.53	84.8
#4	4.75	74.2
#8	2.36	62.3
#16	1.18	50.3
#30	0.60	37.6
#50	0.30	22.1
#100	0.15	12.5
#200	0.074	7.1





# Sladden Engineering

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## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

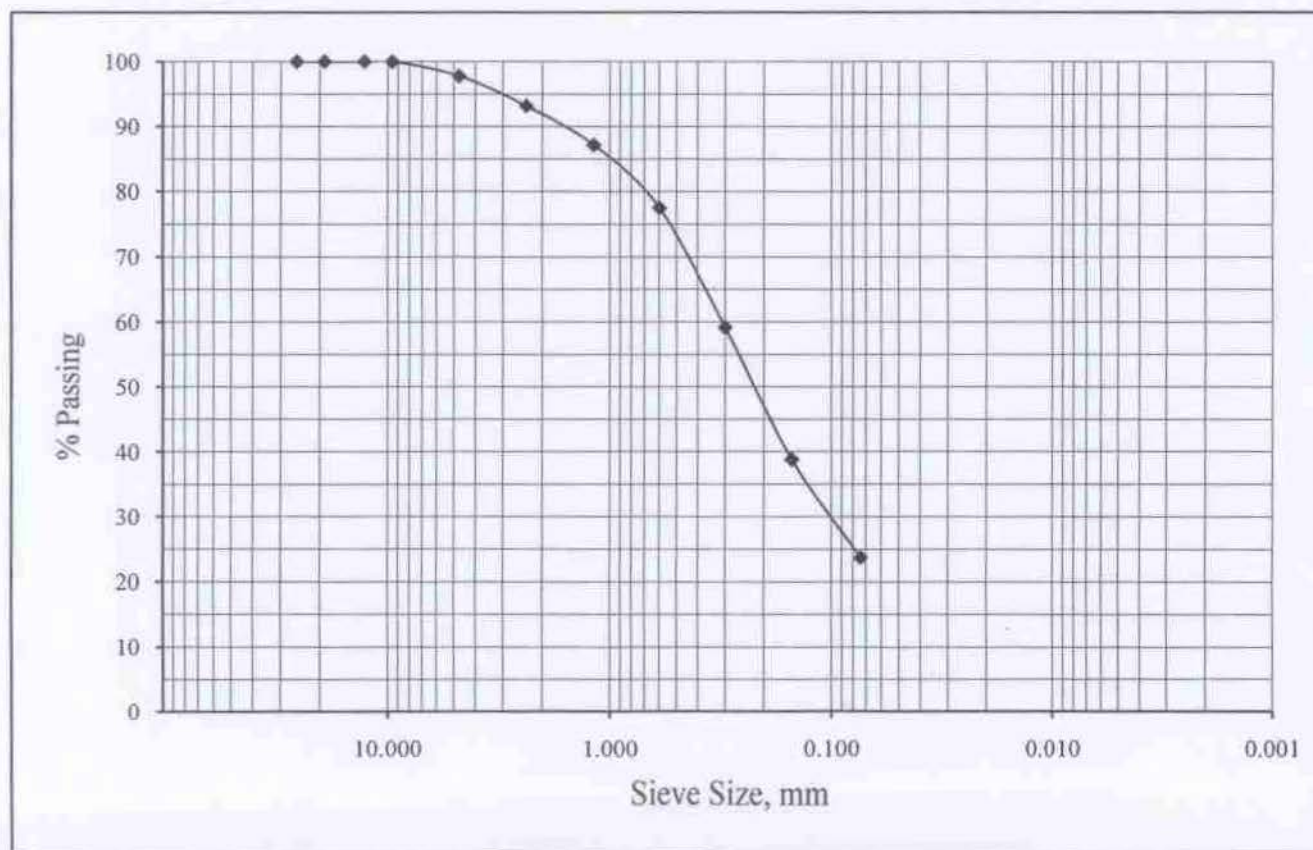
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-3 S-1 @ 5'

Soil Classification: SP-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	97.8
#8	2.36	93.2
#16	1.18	87.2
#30	0.60	77.5
#50	0.30	59.2
#100	0.15	38.8
#200	0.074	23.7







# Sladden Engineering

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## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

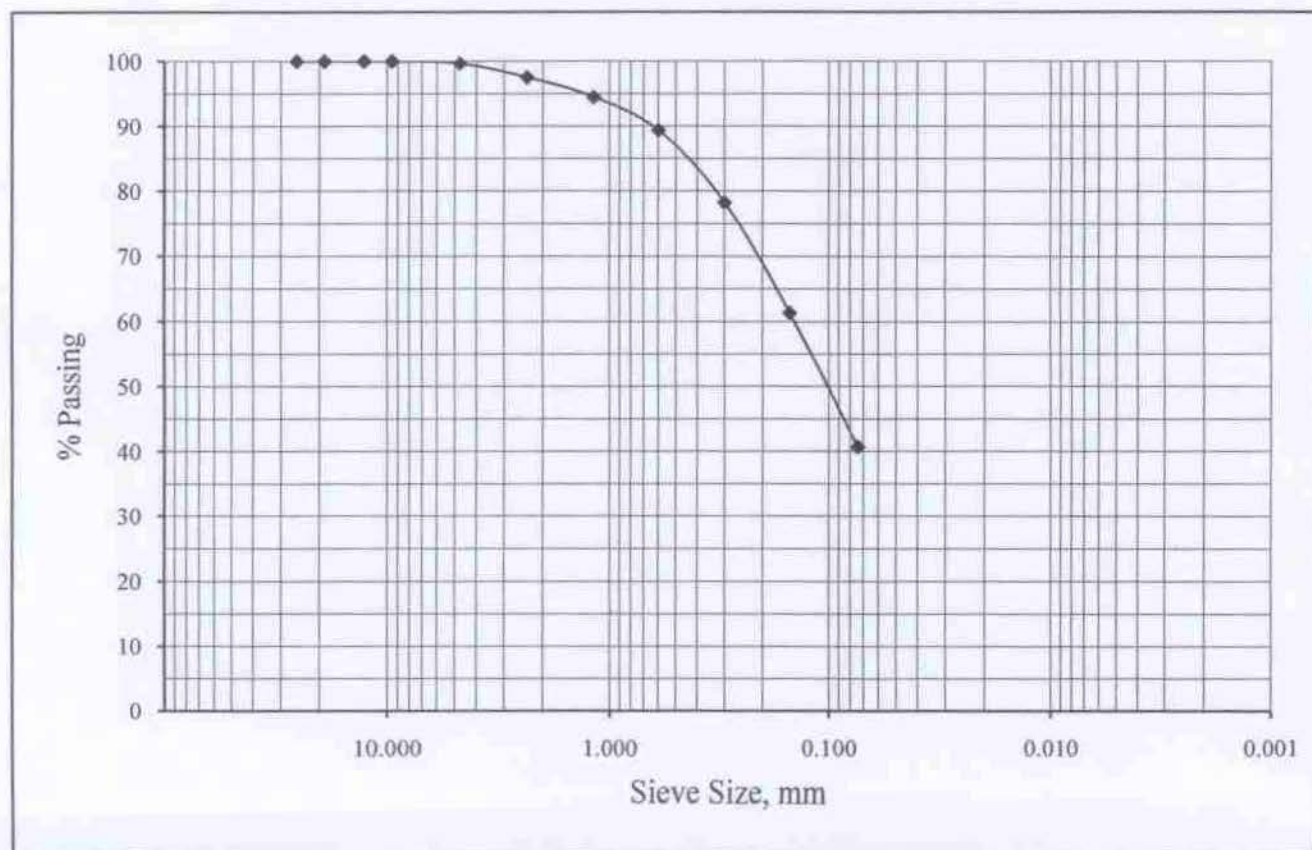
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-4 R-1 @ 5'

Soil Classification: SC-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.7
#8	2.36	97.5
#16	1.18	94.5
#30	0.60	89.4
#50	0.30	78.2
#100	0.15	61.3
#200	0.074	40.7





# Sladden Engineering

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## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

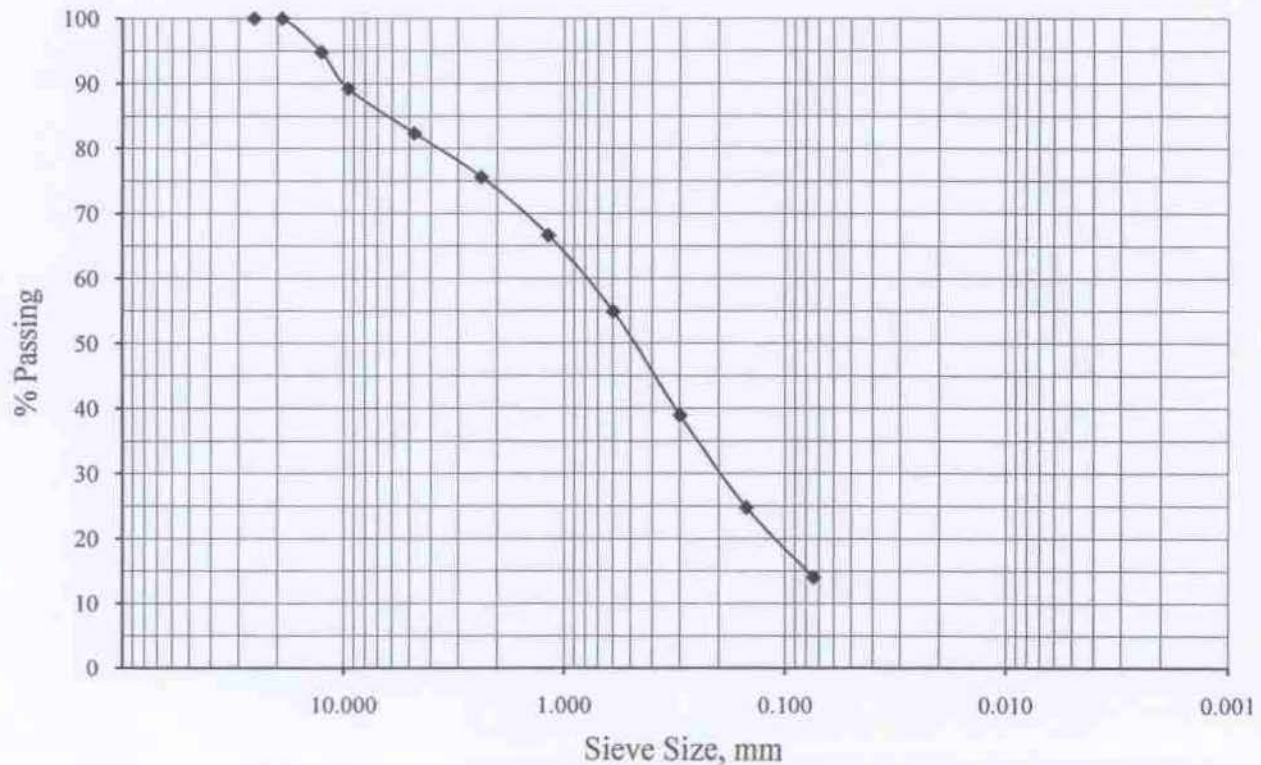
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-5 S-3 @ 15'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	94.8
3/8"	9.53	89.2
#4	4.75	82.4
#8	2.36	75.6
#16	1.18	66.6
#30	0.60	55.0
#50	0.30	38.9
#100	0.15	24.8
#200	0.074	14.0





# Sladden Engineering

450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

## Gradation

ASTM C117 & C136

Project Number: 644-13016

May 2, 2013

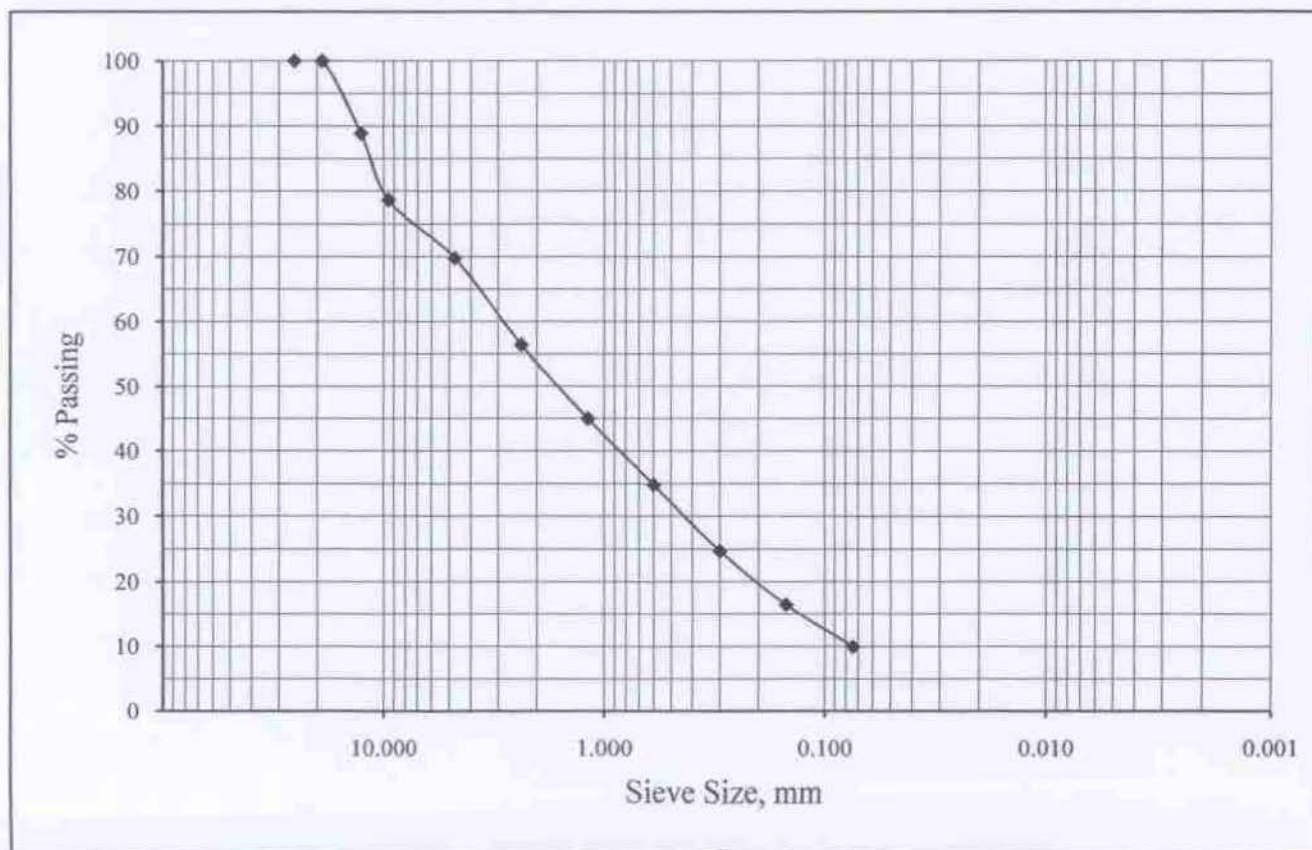
Project Name: Archibald Avenue & 7th Street, Rancho Cucamonga

Lab ID Number: LN6-13164

Sample ID: BH-7 S-2 @ 10'

Soil Classification: SW-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	88.9
3/8"	9.53	78.7
#4	4.75	69.8
#8	2.36	56.4
#16	1.18	45.0
#30	0.60	34.8
#50	0.30	24.7
#100	0.15	16.4
#200	0.074	9.9







# Sladden Engineering

450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

## One Dimensional Consolidation

ASTM D2435 & D5333

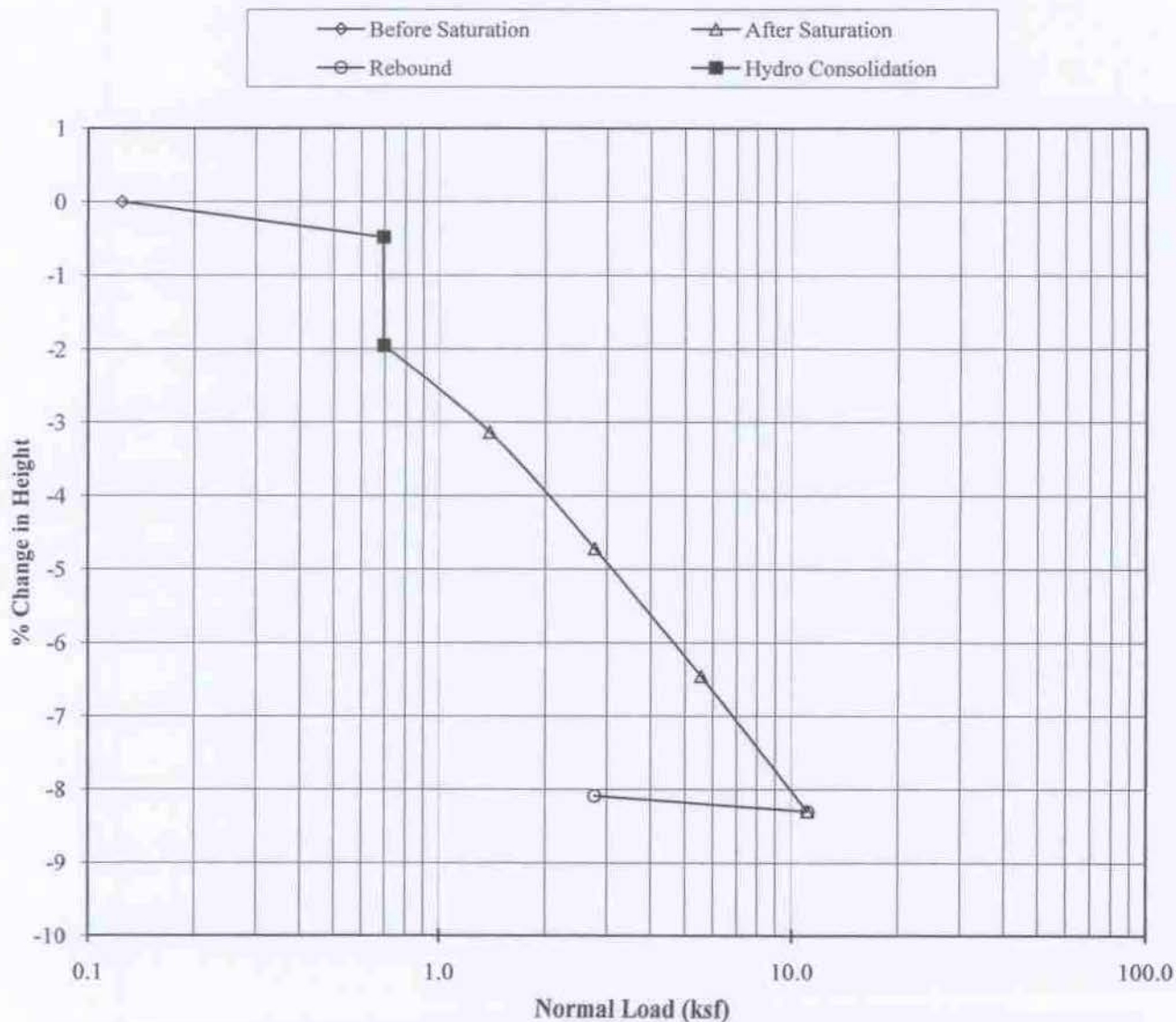
Job Number: 644-13016  
Job Name: Archibald Avenue & 7th Street, Rancho Cucamonga  
Lab ID Number: LN6-13164  
Sample ID: BH-2 R-1 @ 5'  
Soil Description: Brown Silty Sand (SM)

May 2, 2013

Initial Dry Density, pcf: 108.8  
Initial Moisture, %: 5.1  
Initial Void Ratio: 0.532  
Specific Gravity: 2.67

Hydrocollapse: 1.5% @ 0.694 ksf

% Change in Height vs Normal Pressure Diagram





# Sladden Engineering

450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

## One Dimensional Consolidation

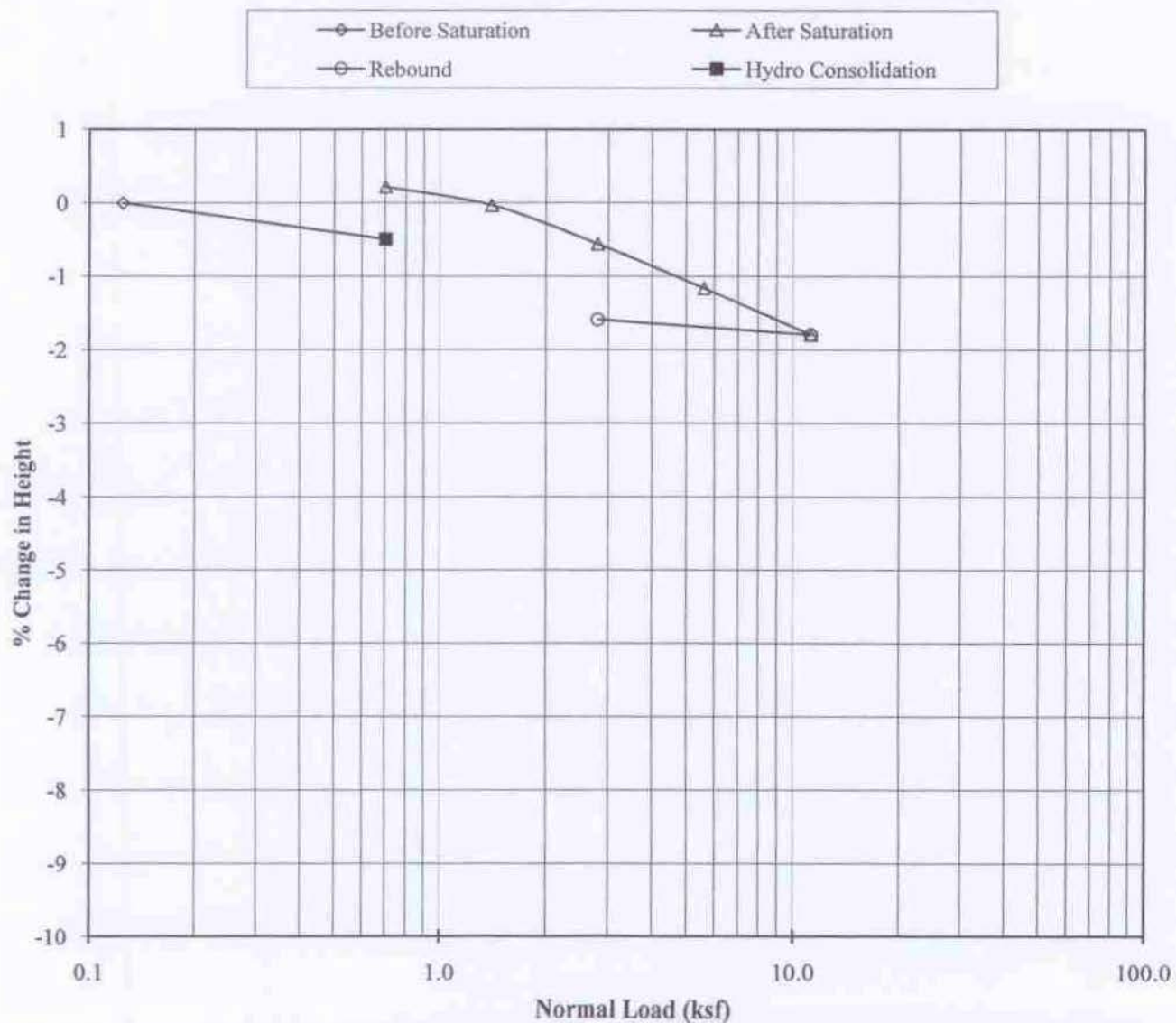
ASTM D2435 & D5333

Job Number: 644-13016  
Job Name: Archibald Avenue & 7th Street, Rancho Cucamonga  
Lab ID Number: LN6-13164  
Sample ID: BH-4 R-1 @ 5'  
Soil Description: Brown Silty Clayey Sand (SC-SM)

May 2, 2013

Initial Dry Density, pcf: 131.3  
Initial Moisture, %: 4.9  
Initial Void Ratio: 0.270  
Specific Gravity: 2.67

% Change in Height vs Normal Pressure Diagram





# Sladden Engineering

6782 Stanton Ave., Suite A, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369  
45090 Golf Center Pkwy., Suite F, Indio, CA 92201 (760) 863-0713 Fax (760) 863-0847  
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Date: May 2, 2013

Account No.: 644-13016

Customer: Schen Management

Location: Archibald Avenue & 7<sup>th</sup> Street, Rancho Cucamonga

## Analytical Report

---

### Corrosion Series

	pH per CA 643	Soluble Sulfates per CA 417 ppm	Soluble Chloride per CA 422 ppm	Min. Resistivity per CA 643 ohm-cm
BH-1 @ 0-5'	6.7	10	50	11,000



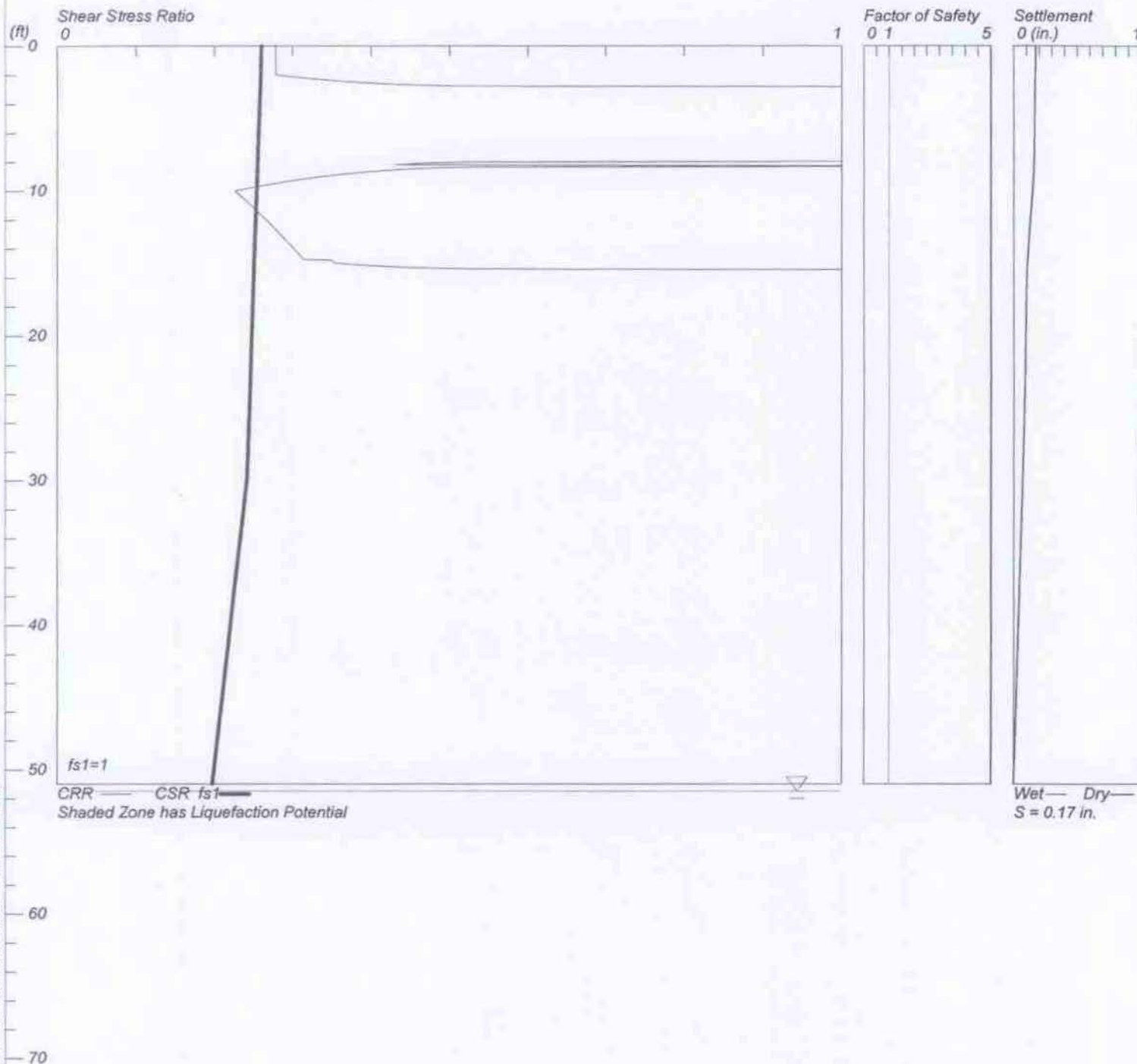
APPENDIX C  
SEISMIC SETTLEMENT

# Settlement Analysis

## Archibald Avenue and 7th Street

Hole No.=BH-1 Water Depth=51.5 ft Surface Elev.=1095

Magnitude=6.9  
Acceleration=0.4g



# Archibald and 7th.sum

\*\*\*\*\*  
\*\*\*\*\*

## LIQUEFACTION ANALYSIS CALCULATION SHEET

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(425) 453-6488 Fax (425) 453-5848

\*\*\*\*\*  
\*\*\*\*\*

Licensed to , 5/2/2013 11:21:03 AM

Input File Name: C:\Liquefy5\Archibald and 7th.liq  
Title: Archibald Avenue and 7th Street  
Subtitle: 644-13016

Surface Elev.=1095  
Hole No.=BH-1  
Depth of Hole= 51.0 ft  
Water Table during Earthquake= 51.5 ft  
Water Table during In-Situ Testing= 51.5 ft  
Max. Acceleration= 0.4 g  
Earthquake Magnitude= 6.9

### Input Data:

Surface Elev.=1095  
Hole No.=BH-1  
Depth of Hole=51.0 ft  
Water Table during Earthquake= 51.5 ft  
Water Table during In-Situ Testing= 51.5 ft  
Max. Acceleration=0.4 g  
Earthquake Magnitude=6.9

- Earthquake Magnitude=6.9  
2. Settlement Analysis Method: Ishihara / Yoshimine\*  
3. Fines Correction for Liquefaction: Stark/Olson et al.\*  
4. Fine Correction for Settlement: During Liquefaction\*  
5. Settlement Calculation in: All zones\*  
6. Hammer Energy Ratio,  
7. Borehole Diameter,  
8. Sampling Method,  
9. User request factor of safety (apply to CSR) , User= 1  
Plot one CSR curve (fs1=1)  
10. Use Curve Smoothing: Yes\*  
\* Recommended Options

Ce = 1.25  
Cb= 1  
Cs= 1

### In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.0	9.3	116.9	29.7
2.0	9.3	116.9	29.7
5.0	32.6	116.9	23.4
10.0	7.0	116.9	35.2
15.0	14.6	156.0	46.8
20.0	65.0	156.0	6.7
25.0	66.6	156.0	11.2
30.0	50.0	156.0	10.2
35.0	39.3	134.0	50.0
40.0	49.0	134.0	8.3
45.0	66.6	122.8	11.1



50.0      56.0      122.8      Archibald and 7th.sum  
10.9

Output Results:

Settlement of saturated sands=0.00 in.  
Settlement of dry sands=0.17 in.  
Total settlement of saturated and dry sands=0.17 in.  
Differential Settlement=0.086 to 0.114 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	0.28	0.26	5.00	0.00	0.17	0.17
0.05	0.28	0.26	5.00	0.00	0.17	0.17
0.10	0.28	0.26	5.00	0.00	0.17	0.17
0.15	0.28	0.26	5.00	0.00	0.17	0.17
0.20	0.28	0.26	5.00	0.00	0.17	0.17
0.25	0.28	0.26	5.00	0.00	0.17	0.17
0.30	0.28	0.26	5.00	0.00	0.17	0.17
0.35	0.28	0.26	5.00	0.00	0.17	0.17
0.40	0.28	0.26	5.00	0.00	0.17	0.17
0.45	0.28	0.26	5.00	0.00	0.17	0.17
0.50	0.28	0.26	5.00	0.00	0.17	0.17
0.55	0.28	0.26	5.00	0.00	0.17	0.17
0.60	0.28	0.26	5.00	0.00	0.17	0.17
0.65	0.28	0.26	5.00	0.00	0.17	0.17
0.70	0.28	0.26	5.00	0.00	0.17	0.17
0.75	0.28	0.26	5.00	0.00	0.17	0.17
0.80	0.28	0.26	5.00	0.00	0.17	0.17
0.85	0.28	0.26	5.00	0.00	0.17	0.17
0.90	0.28	0.26	5.00	0.00	0.17	0.17
0.95	0.28	0.26	5.00	0.00	0.17	0.17
1.00	0.28	0.26	5.00	0.00	0.17	0.17
1.05	0.28	0.26	5.00	0.00	0.17	0.17
1.10	0.28	0.26	5.00	0.00	0.17	0.17
1.15	0.28	0.26	5.00	0.00	0.17	0.17
1.20	0.28	0.26	5.00	0.00	0.17	0.17
1.25	0.28	0.26	5.00	0.00	0.17	0.17
1.30	0.28	0.26	5.00	0.00	0.17	0.17
1.35	0.28	0.26	5.00	0.00	0.17	0.17
1.40	0.28	0.26	5.00	0.00	0.17	0.17
1.45	0.28	0.26	5.00	0.00	0.17	0.17
1.50	0.28	0.26	5.00	0.00	0.17	0.17
1.55	0.28	0.26	5.00	0.00	0.17	0.17
1.60	0.28	0.26	5.00	0.00	0.17	0.17
1.65	0.28	0.26	5.00	0.00	0.17	0.17
1.70	0.28	0.26	5.00	0.00	0.17	0.17
1.75	0.28	0.26	5.00	0.00	0.17	0.17
1.80	0.28	0.26	5.00	0.00	0.17	0.17
1.85	0.28	0.26	5.00	0.00	0.17	0.17
1.90	0.28	0.26	5.00	0.00	0.17	0.17
1.95	0.28	0.26	5.00	0.00	0.17	0.17
2.00	0.28	0.26	5.00	0.00	0.17	0.17
2.05	0.29	0.26	5.00	0.00	0.17	0.17
2.10	0.30	0.26	5.00	0.00	0.17	0.17
2.15	0.31	0.26	5.00	0.00	0.17	0.17
2.20	0.32	0.26	5.00	0.00	0.17	0.17
2.25	0.33	0.26	5.00	0.00	0.17	0.17
2.30	0.34	0.26	5.00	0.00	0.17	0.17
2.35	0.35	0.26	5.00	0.00	0.17	0.17
2.40	0.36	0.26	5.00	0.00	0.17	0.17
2.45	0.37	0.26	5.00	0.00	0.17	0.17
2.50	0.39	0.26	5.00	0.00	0.17	0.17

## Archibald and 7th.sum

2.55	0.40	0.26	5.00	0.00	0.17	0.17
2.60	0.42	0.26	5.00	0.00	0.17	0.17
2.65	0.44	0.26	5.00	0.00	0.17	0.17
2.70	0.47	0.26	5.00	0.00	0.17	0.17
2.75	0.51	0.26	5.00	0.00	0.17	0.17
2.80	2.48	0.26	5.00	0.00	0.17	0.17
2.85	2.48	0.26	5.00	0.00	0.17	0.17
2.90	2.48	0.26	5.00	0.00	0.17	0.17
2.95	2.48	0.26	5.00	0.00	0.17	0.17
3.00	2.48	0.26	5.00	0.00	0.17	0.17
3.05	2.48	0.26	5.00	0.00	0.17	0.17
3.10	2.48	0.26	5.00	0.00	0.17	0.17
3.15	2.48	0.26	5.00	0.00	0.17	0.17
3.20	2.48	0.26	5.00	0.00	0.17	0.17
3.25	2.48	0.26	5.00	0.00	0.17	0.17
3.30	2.48	0.26	5.00	0.00	0.17	0.17
3.35	2.48	0.26	5.00	0.00	0.17	0.17
3.40	2.48	0.26	5.00	0.00	0.17	0.17
3.45	2.48	0.26	5.00	0.00	0.17	0.17
3.50	2.48	0.26	5.00	0.00	0.17	0.17
3.55	2.48	0.26	5.00	0.00	0.17	0.17
3.60	2.48	0.26	5.00	0.00	0.16	0.16
3.65	2.48	0.26	5.00	0.00	0.16	0.16
3.70	2.48	0.26	5.00	0.00	0.16	0.16
3.75	2.48	0.26	5.00	0.00	0.16	0.16
3.80	2.48	0.26	5.00	0.00	0.16	0.16
3.85	2.48	0.26	5.00	0.00	0.16	0.16
3.90	2.48	0.26	5.00	0.00	0.16	0.16
3.95	2.48	0.26	5.00	0.00	0.16	0.16
4.00	2.48	0.26	5.00	0.00	0.16	0.16
4.05	2.48	0.26	5.00	0.00	0.16	0.16
4.10	2.48	0.26	5.00	0.00	0.16	0.16
4.15	2.48	0.26	5.00	0.00	0.16	0.16
4.20	2.48	0.26	5.00	0.00	0.16	0.16
4.25	2.48	0.26	5.00	0.00	0.16	0.16
4.30	2.48	0.26	5.00	0.00	0.16	0.16
4.35	2.48	0.26	5.00	0.00	0.16	0.16
4.40	2.48	0.26	5.00	0.00	0.16	0.16
4.45	2.48	0.26	5.00	0.00	0.16	0.16
4.50	2.48	0.26	5.00	0.00	0.16	0.16
4.55	2.48	0.26	5.00	0.00	0.16	0.16
4.60	2.48	0.26	5.00	0.00	0.16	0.16
4.65	2.48	0.26	5.00	0.00	0.16	0.16
4.70	2.48	0.26	5.00	0.00	0.16	0.16
4.75	2.48	0.26	5.00	0.00	0.16	0.16
4.80	2.48	0.26	5.00	0.00	0.16	0.16
4.85	2.48	0.26	5.00	0.00	0.16	0.16
4.90	2.48	0.26	5.00	0.00	0.16	0.16
4.95	2.48	0.26	5.00	0.00	0.16	0.16
5.00	2.48	0.26	5.00	0.00	0.16	0.16
5.05	2.48	0.26	5.00	0.00	0.16	0.16
5.10	2.48	0.26	5.00	0.00	0.16	0.16
5.15	2.48	0.26	5.00	0.00	0.16	0.16
5.20	2.48	0.26	5.00	0.00	0.16	0.16
5.25	2.48	0.26	5.00	0.00	0.16	0.16
5.30	2.48	0.26	5.00	0.00	0.16	0.16
5.35	2.48	0.26	5.00	0.00	0.16	0.16
5.40	2.48	0.26	5.00	0.00	0.16	0.16
5.45	2.48	0.26	5.00	0.00	0.16	0.16
5.50	2.48	0.26	5.00	0.00	0.16	0.16
5.55	2.48	0.26	5.00	0.00	0.16	0.16
5.60	2.48	0.26	5.00	0.00	0.16	0.16
5.65	2.48	0.26	5.00	0.00	0.16	0.16



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5.70	2.48	0.26	5.00	0.00	0.16	0.16
5.75	2.48	0.26	5.00	0.00	0.16	0.16
5.80	2.48	0.26	5.00	0.00	0.16	0.16
5.85	2.48	0.26	5.00	0.00	0.16	0.16
5.90	2.48	0.26	5.00	0.00	0.16	0.16
5.95	2.48	0.26	5.00	0.00	0.16	0.16
6.00	2.48	0.26	5.00	0.00	0.16	0.16
6.05	2.48	0.26	5.00	0.00	0.16	0.16
6.10	2.48	0.26	5.00	0.00	0.16	0.16
6.15	2.48	0.26	5.00	0.00	0.16	0.16
6.20	2.48	0.26	5.00	0.00	0.16	0.16
6.25	2.48	0.26	5.00	0.00	0.16	0.16
6.30	2.48	0.26	5.00	0.00	0.16	0.16
6.35	2.48	0.26	5.00	0.00	0.16	0.16
6.40	2.48	0.26	5.00	0.00	0.16	0.16
6.45	2.48	0.26	5.00	0.00	0.16	0.16
6.50	2.48	0.26	5.00	0.00	0.16	0.16
6.55	2.48	0.26	5.00	0.00	0.16	0.16
6.60	2.48	0.26	5.00	0.00	0.16	0.16
6.65	2.48	0.26	5.00	0.00	0.16	0.16
6.70	2.48	0.26	5.00	0.00	0.16	0.16
6.75	2.48	0.26	5.00	0.00	0.16	0.16
6.80	2.48	0.26	5.00	0.00	0.16	0.16
6.85	2.48	0.26	5.00	0.00	0.16	0.16
6.90	2.48	0.26	5.00	0.00	0.16	0.16
6.95	2.48	0.26	5.00	0.00	0.16	0.16
7.00	2.48	0.26	5.00	0.00	0.16	0.16
7.05	2.48	0.26	5.00	0.00	0.16	0.16
7.10	2.48	0.26	5.00	0.00	0.16	0.16
7.15	2.48	0.26	5.00	0.00	0.16	0.16
7.20	2.48	0.26	5.00	0.00	0.16	0.16
7.25	2.48	0.26	5.00	0.00	0.16	0.16
7.30	2.48	0.26	5.00	0.00	0.16	0.16
7.35	2.48	0.26	5.00	0.00	0.16	0.16
7.40	2.48	0.26	5.00	0.00	0.16	0.16
7.45	2.48	0.26	5.00	0.00	0.16	0.16
7.50	2.48	0.26	5.00	0.00	0.16	0.16
7.55	2.48	0.26	5.00	0.00	0.16	0.16
7.60	2.48	0.26	5.00	0.00	0.16	0.16
7.65	2.48	0.26	5.00	0.00	0.16	0.16
7.70	2.48	0.26	5.00	0.00	0.16	0.16
7.75	2.48	0.26	5.00	0.00	0.16	0.16
7.80	2.48	0.26	5.00	0.00	0.16	0.16
7.85	2.48	0.26	5.00	0.00	0.16	0.16
7.90	2.48	0.26	5.00	0.00	0.16	0.16
7.95	2.48	0.26	5.00	0.00	0.16	0.16
8.00	0.52	0.26	5.00	0.00	0.16	0.16
8.05	0.48	0.26	5.00	0.00	0.16	0.16
8.10	0.46	0.26	5.00	0.00	0.16	0.16
8.15	0.45	0.26	5.00	0.00	0.16	0.16
8.20	0.43	0.26	5.00	0.00	0.16	0.16
8.25	2.48	0.25	5.00	0.00	0.16	0.16
8.30	2.48	0.25	5.00	0.00	0.16	0.16
8.35	0.53	0.25	5.00	0.00	0.16	0.16
8.40	0.49	0.25	5.00	0.00	0.16	0.16
8.45	0.46	0.25	5.00	0.00	0.16	0.16
8.50	0.44	0.25	5.00	0.00	0.16	0.16
8.55	0.43	0.25	5.00	0.00	0.16	0.16
8.60	0.41	0.25	5.00	0.00	0.16	0.16
8.65	0.40	0.25	5.00	0.00	0.16	0.16
8.70	0.39	0.25	5.00	0.00	0.16	0.16
8.75	0.38	0.25	5.00	0.00	0.16	0.16
8.80	0.37	0.25	5.00	0.00	0.16	0.16



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8.85	0.36	0.25	5.00	0.00	0.15	0.15
8.90	0.35	0.25	5.00	0.00	0.15	0.15
8.95	0.35	0.25	5.00	0.00	0.15	0.15
9.00	0.34	0.25	5.00	0.00	0.15	0.15
9.05	0.33	0.25	5.00	0.00	0.15	0.15
9.10	0.32	0.25	5.00	0.00	0.15	0.15
9.15	0.32	0.25	5.00	0.00	0.15	0.15
9.20	0.31	0.25	5.00	0.00	0.15	0.15
9.25	0.30	0.25	5.00	0.00	0.15	0.15
9.30	0.30	0.25	5.00	0.00	0.15	0.15
9.35	0.29	0.25	5.00	0.00	0.15	0.15
9.40	0.29	0.25	5.00	0.00	0.15	0.15
9.45	0.28	0.25	5.00	0.00	0.15	0.15
9.50	0.28	0.25	5.00	0.00	0.15	0.15
9.55	0.27	0.25	5.00	0.00	0.15	0.15
9.60	0.27	0.25	5.00	0.00	0.15	0.15
9.65	0.26	0.25	5.00	0.00	0.15	0.15
9.70	0.26	0.25	5.00	0.00	0.15	0.15
9.75	0.25	0.25	5.00	0.00	0.15	0.15
9.80	0.25	0.25	5.00	0.00	0.15	0.15
9.85	0.24	0.25	5.00	0.00	0.15	0.15
9.90	0.24	0.25	5.00	0.00	0.15	0.15
9.95	0.23	0.25	5.00	0.00	0.15	0.15
10.00	0.23	0.25	5.00	0.00	0.15	0.15
10.05	0.23	0.25	5.00	0.00	0.15	0.15
10.10	0.23	0.25	5.00	0.00	0.15	0.15
10.15	0.23	0.25	5.00	0.00	0.15	0.15
10.20	0.23	0.25	5.00	0.00	0.15	0.15
10.25	0.23	0.25	5.00	0.00	0.15	0.15
10.30	0.23	0.25	5.00	0.00	0.14	0.14
10.35	0.23	0.25	5.00	0.00	0.14	0.14
10.40	0.23	0.25	5.00	0.00	0.14	0.14
10.45	0.24	0.25	5.00	0.00	0.14	0.14
10.50	0.24	0.25	5.00	0.00	0.14	0.14
10.55	0.24	0.25	5.00	0.00	0.14	0.14
10.60	0.24	0.25	5.00	0.00	0.14	0.14
10.65	0.24	0.25	5.00	0.00	0.14	0.14
10.70	0.24	0.25	5.00	0.00	0.14	0.14
10.75	0.24	0.25	5.00	0.00	0.14	0.14
10.80	0.24	0.25	5.00	0.00	0.14	0.14
10.85	0.24	0.25	5.00	0.00	0.14	0.14
10.90	0.24	0.25	5.00	0.00	0.14	0.14
10.95	0.25	0.25	5.00	0.00	0.14	0.14
11.00	0.25	0.25	5.00	0.00	0.14	0.14
11.05	0.25	0.25	5.00	0.00	0.14	0.14
11.10	0.25	0.25	5.00	0.00	0.14	0.14
11.15	0.25	0.25	5.00	0.00	0.14	0.14
11.20	0.25	0.25	5.00	0.00	0.14	0.14
11.25	0.25	0.25	5.00	0.00	0.14	0.14
11.30	0.25	0.25	5.00	0.00	0.14	0.14
11.35	0.25	0.25	5.00	0.00	0.14	0.14
11.40	0.25	0.25	5.00	0.00	0.13	0.13
11.45	0.26	0.25	5.00	0.00	0.13	0.13
11.50	0.26	0.25	5.00	0.00	0.13	0.13
11.55	0.26	0.25	5.00	0.00	0.13	0.13
11.60	0.26	0.25	5.00	0.00	0.13	0.13
11.65	0.26	0.25	5.00	0.00	0.13	0.13
11.70	0.26	0.25	5.00	0.00	0.13	0.13
11.75	0.26	0.25	5.00	0.00	0.13	0.13
11.80	0.26	0.25	5.00	0.00	0.13	0.13
11.85	0.26	0.25	5.00	0.00	0.13	0.13
11.90	0.26	0.25	5.00	0.00	0.13	0.13
11.95	0.26	0.25	5.00	0.00	0.13	0.13

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12.00	0.27	0.25	5.00	0.00	0.13	0.13
12.05	0.27	0.25	5.00	0.00	0.13	0.13
12.10	0.27	0.25	5.00	0.00	0.13	0.13
12.15	0.27	0.25	5.00	0.00	0.13	0.13
12.20	0.27	0.25	5.00	0.00	0.13	0.13
12.25	0.27	0.25	5.00	0.00	0.13	0.13
12.30	0.27	0.25	5.00	0.00	0.13	0.13
12.35	0.27	0.25	5.00	0.00	0.13	0.13
12.40	0.27	0.25	5.00	0.00	0.13	0.13
12.45	0.27	0.25	5.00	0.00	0.13	0.13
12.50	0.27	0.25	5.00	0.00	0.13	0.13
12.55	0.28	0.25	5.00	0.00	0.13	0.13
12.60	0.28	0.25	5.00	0.00	0.12	0.12
12.65	0.28	0.25	5.00	0.00	0.12	0.12
12.70	0.28	0.25	5.00	0.00	0.12	0.12
12.75	0.28	0.25	5.00	0.00	0.12	0.12
12.80	0.28	0.25	5.00	0.00	0.12	0.12
12.85	0.28	0.25	5.00	0.00	0.12	0.12
12.90	0.28	0.25	5.00	0.00	0.12	0.12
12.95	0.28	0.25	5.00	0.00	0.12	0.12
13.00	0.28	0.25	5.00	0.00	0.12	0.12
13.05	0.28	0.25	5.00	0.00	0.12	0.12
13.10	0.29	0.25	5.00	0.00	0.12	0.12
13.15	0.29	0.25	5.00	0.00	0.12	0.12
13.20	0.29	0.25	5.00	0.00	0.12	0.12
13.25	0.29	0.25	5.00	0.00	0.12	0.12
13.30	0.29	0.25	5.00	0.00	0.12	0.12
13.35	0.29	0.25	5.00	0.00	0.12	0.12
13.40	0.29	0.25	5.00	0.00	0.12	0.12
13.45	0.29	0.25	5.00	0.00	0.12	0.12
13.50	0.29	0.25	5.00	0.00	0.12	0.12
13.55	0.29	0.25	5.00	0.00	0.12	0.12
13.60	0.29	0.25	5.00	0.00	0.12	0.12
13.65	0.30	0.25	5.00	0.00	0.12	0.12
13.70	0.30	0.25	5.00	0.00	0.12	0.12
13.75	0.30	0.25	5.00	0.00	0.12	0.12
13.80	0.30	0.25	5.00	0.00	0.12	0.12
13.85	0.30	0.25	5.00	0.00	0.11	0.11
13.90	0.30	0.25	5.00	0.00	0.11	0.11
13.95	0.30	0.25	5.00	0.00	0.11	0.11
14.00	0.30	0.25	5.00	0.00	0.11	0.11
14.05	0.30	0.25	5.00	0.00	0.11	0.11
14.10	0.30	0.25	5.00	0.00	0.11	0.11
14.15	0.30	0.25	5.00	0.00	0.11	0.11
14.20	0.31	0.25	5.00	0.00	0.11	0.11
14.25	0.31	0.25	5.00	0.00	0.11	0.11
14.30	0.31	0.25	5.00	0.00	0.11	0.11
14.35	0.31	0.25	5.00	0.00	0.11	0.11
14.40	0.31	0.25	5.00	0.00	0.11	0.11
14.45	0.31	0.25	5.00	0.00	0.11	0.11
14.50	0.31	0.25	5.00	0.00	0.11	0.11
14.55	0.31	0.25	5.00	0.00	0.11	0.11
14.60	0.31	0.25	5.00	0.00	0.11	0.11
14.65	0.31	0.25	5.00	0.00	0.11	0.11
14.70	0.31	0.25	5.00	0.00	0.11	0.11
14.75	0.31	0.25	5.00	0.00	0.11	0.11
14.80	0.35	0.25	5.00	0.00	0.11	0.11
14.85	0.35	0.25	5.00	0.00	0.11	0.11
14.90	0.35	0.25	5.00	0.00	0.11	0.11
14.95	0.35	0.25	5.00	0.00	0.11	0.11
15.00	0.35	0.25	5.00	0.00	0.11	0.11
15.05	0.37	0.25	5.00	0.00	0.11	0.11
15.10	0.38	0.25	5.00	0.00	0.11	0.11



## Archibald and 7th.sum

15.15	0.39	0.25	5.00	0.00	0.10	0.10
15.20	0.41	0.25	5.00	0.00	0.10	0.10
15.25	0.43	0.25	5.00	0.00	0.10	0.10
15.30	0.45	0.25	5.00	0.00	0.10	0.10
15.35	0.48	0.25	5.00	0.00	0.10	0.10
15.40	0.53	0.25	5.00	0.00	0.10	0.10
15.45	2.48	0.25	5.00	0.00	0.10	0.10
15.50	2.48	0.25	5.00	0.00	0.10	0.10
15.55	2.48	0.25	5.00	0.00	0.10	0.10
15.60	2.48	0.25	5.00	0.00	0.10	0.10
15.65	2.48	0.25	5.00	0.00	0.10	0.10
15.70	2.48	0.25	5.00	0.00	0.10	0.10
15.75	2.48	0.25	5.00	0.00	0.10	0.10
15.80	2.48	0.25	5.00	0.00	0.10	0.10
15.85	2.48	0.25	5.00	0.00	0.10	0.10
15.90	2.48	0.25	5.00	0.00	0.10	0.10
15.95	2.48	0.25	5.00	0.00	0.10	0.10
16.00	2.48	0.25	5.00	0.00	0.10	0.10
16.05	2.48	0.25	5.00	0.00	0.10	0.10
16.10	2.48	0.25	5.00	0.00	0.10	0.10
16.15	2.48	0.25	5.00	0.00	0.10	0.10
16.20	2.48	0.25	5.00	0.00	0.10	0.10
16.25	2.48	0.25	5.00	0.00	0.10	0.10
16.30	2.48	0.25	5.00	0.00	0.10	0.10
16.35	2.48	0.25	5.00	0.00	0.10	0.10
16.40	2.48	0.25	5.00	0.00	0.10	0.10
16.45	2.48	0.25	5.00	0.00	0.10	0.10
16.50	2.48	0.25	5.00	0.00	0.10	0.10
16.55	2.48	0.25	5.00	0.00	0.10	0.10
16.60	2.48	0.25	5.00	0.00	0.10	0.10
16.65	2.48	0.25	5.00	0.00	0.10	0.10
16.70	2.48	0.25	5.00	0.00	0.10	0.10
16.75	2.48	0.25	5.00	0.00	0.10	0.10
16.80	2.48	0.25	5.00	0.00	0.10	0.10
16.85	2.48	0.25	5.00	0.00	0.10	0.10
16.90	2.48	0.25	5.00	0.00	0.10	0.10
16.95	2.48	0.25	5.00	0.00	0.10	0.10
17.00	2.48	0.25	5.00	0.00	0.10	0.10
17.05	2.48	0.25	5.00	0.00	0.10	0.10
17.10	2.48	0.25	5.00	0.00	0.10	0.10
17.15	2.48	0.25	5.00	0.00	0.10	0.10
17.20	2.48	0.25	5.00	0.00	0.10	0.10
17.25	2.48	0.25	5.00	0.00	0.10	0.10
17.30	2.48	0.25	5.00	0.00	0.10	0.10
17.35	2.48	0.25	5.00	0.00	0.10	0.10
17.40	2.48	0.25	5.00	0.00	0.10	0.10
17.45	2.48	0.25	5.00	0.00	0.10	0.10
17.50	2.48	0.25	5.00	0.00	0.10	0.10
17.55	2.48	0.25	5.00	0.00	0.10	0.10
17.60	2.48	0.25	5.00	0.00	0.10	0.10
17.65	2.48	0.25	5.00	0.00	0.10	0.10
17.70	2.48	0.25	5.00	0.00	0.10	0.10
17.75	2.48	0.25	5.00	0.00	0.10	0.10
17.80	2.48	0.25	5.00	0.00	0.10	0.10
17.85	2.48	0.25	5.00	0.00	0.10	0.10
17.90	2.48	0.25	5.00	0.00	0.10	0.10
17.95	2.48	0.25	5.00	0.00	0.10	0.10
18.00	2.48	0.25	5.00	0.00	0.10	0.10
18.05	2.48	0.25	5.00	0.00	0.10	0.10
18.10	2.48	0.25	5.00	0.00	0.10	0.10
18.15	2.48	0.25	5.00	0.00	0.10	0.10
18.20	2.48	0.25	5.00	0.00	0.10	0.10
18.25	2.48	0.25	5.00	0.00	0.10	0.10



## Archibald and 7th.sum

18.30	2.48	0.25	5.00	0.00	0.10	0.10
18.35	2.48	0.25	5.00	0.00	0.10	0.10
18.40	2.48	0.25	5.00	0.00	0.10	0.10
18.45	2.48	0.25	5.00	0.00	0.10	0.10
18.50	2.48	0.25	5.00	0.00	0.10	0.10
18.55	2.48	0.25	5.00	0.00	0.10	0.10
18.60	2.48	0.25	5.00	0.00	0.10	0.10
18.65	2.48	0.25	5.00	0.00	0.10	0.10
18.70	2.48	0.25	5.00	0.00	0.09	0.09
18.75	2.48	0.25	5.00	0.00	0.09	0.09
18.80	2.48	0.25	5.00	0.00	0.09	0.09
18.85	2.48	0.25	5.00	0.00	0.09	0.09
18.90	2.48	0.25	5.00	0.00	0.09	0.09
18.95	2.48	0.25	5.00	0.00	0.09	0.09
19.00	2.48	0.25	5.00	0.00	0.09	0.09
19.05	2.48	0.25	5.00	0.00	0.09	0.09
19.10	2.48	0.25	5.00	0.00	0.09	0.09
19.15	2.48	0.25	5.00	0.00	0.09	0.09
19.20	2.48	0.25	5.00	0.00	0.09	0.09
19.25	2.48	0.25	5.00	0.00	0.09	0.09
19.30	2.48	0.25	5.00	0.00	0.09	0.09
19.35	2.48	0.25	5.00	0.00	0.09	0.09
19.40	2.48	0.25	5.00	0.00	0.09	0.09
19.45	2.48	0.25	5.00	0.00	0.09	0.09
19.50	2.48	0.25	5.00	0.00	0.09	0.09
19.55	2.48	0.25	5.00	0.00	0.09	0.09
19.60	2.48	0.25	5.00	0.00	0.09	0.09
19.65	2.48	0.25	5.00	0.00	0.09	0.09
19.70	2.48	0.25	5.00	0.00	0.09	0.09
19.75	2.48	0.25	5.00	0.00	0.09	0.09
19.80	2.48	0.25	5.00	0.00	0.09	0.09
19.85	2.48	0.25	5.00	0.00	0.09	0.09
19.90	2.48	0.25	5.00	0.00	0.09	0.09
19.95	2.48	0.25	5.00	0.00	0.09	0.09
20.00	2.48	0.25	5.00	0.00	0.09	0.09
20.05	2.48	0.25	5.00	0.00	0.09	0.09
20.10	2.48	0.25	5.00	0.00	0.09	0.09
20.15	2.48	0.25	5.00	0.00	0.09	0.09
20.20	2.48	0.25	5.00	0.00	0.09	0.09
20.25	2.48	0.25	5.00	0.00	0.09	0.09
20.30	2.48	0.25	5.00	0.00	0.09	0.09
20.35	2.48	0.25	5.00	0.00	0.09	0.09
20.40	2.48	0.25	5.00	0.00	0.09	0.09
20.45	2.48	0.25	5.00	0.00	0.09	0.09
20.50	2.48	0.25	5.00	0.00	0.09	0.09
20.55	2.48	0.25	5.00	0.00	0.09	0.09
20.60	2.48	0.25	5.00	0.00	0.09	0.09
20.65	2.48	0.25	5.00	0.00	0.09	0.09
20.70	2.48	0.25	5.00	0.00	0.09	0.09
20.75	2.48	0.25	5.00	0.00	0.09	0.09
20.80	2.48	0.25	5.00	0.00	0.09	0.09
20.85	2.48	0.25	5.00	0.00	0.09	0.09
20.90	2.48	0.25	5.00	0.00	0.09	0.09
20.95	2.48	0.25	5.00	0.00	0.09	0.09
21.00	2.48	0.25	5.00	0.00	0.09	0.09
21.05	2.48	0.25	5.00	0.00	0.09	0.09
21.10	2.48	0.25	5.00	0.00	0.09	0.09
21.15	2.48	0.25	5.00	0.00	0.09	0.09
21.20	2.48	0.25	5.00	0.00	0.09	0.09
21.25	2.48	0.25	5.00	0.00	0.09	0.09
21.30	2.48	0.25	5.00	0.00	0.09	0.09
21.35	2.48	0.25	5.00	0.00	0.09	0.09
21.40	2.48	0.25	5.00	0.00	0.09	0.09

Archibald and 7th.sum

21.45	2.48	0.25	5.00	0.00	0.09	0.09
21.50	2.48	0.25	5.00	0.00	0.09	0.09
21.55	2.48	0.25	5.00	0.00	0.09	0.09
21.60	2.48	0.25	5.00	0.00	0.09	0.09
21.65	2.48	0.25	5.00	0.00	0.09	0.09
21.70	2.48	0.25	5.00	0.00	0.09	0.09
21.75	2.48	0.25	5.00	0.00	0.09	0.09
21.80	2.48	0.25	5.00	0.00	0.09	0.09
21.85	2.48	0.25	5.00	0.00	0.09	0.09
21.90	2.48	0.25	5.00	0.00	0.09	0.09
21.95	2.48	0.25	5.00	0.00	0.09	0.09
22.00	2.48	0.25	5.00	0.00	0.09	0.09
22.05	2.48	0.25	5.00	0.00	0.09	0.09
22.10	2.48	0.25	5.00	0.00	0.09	0.09
22.15	2.48	0.25	5.00	0.00	0.09	0.09
22.20	2.48	0.25	5.00	0.00	0.09	0.09
22.25	2.48	0.25	5.00	0.00	0.09	0.09
22.30	2.48	0.25	5.00	0.00	0.09	0.09
22.35	2.48	0.25	5.00	0.00	0.09	0.09
22.40	2.48	0.25	5.00	0.00	0.09	0.09
22.45	2.48	0.25	5.00	0.00	0.09	0.09
22.50	2.48	0.25	5.00	0.00	0.09	0.09
22.55	2.48	0.25	5.00	0.00	0.09	0.09
22.60	2.48	0.25	5.00	0.00	0.09	0.09
22.65	2.48	0.25	5.00	0.00	0.09	0.09
22.70	2.48	0.25	5.00	0.00	0.09	0.09
22.75	2.48	0.25	5.00	0.00	0.09	0.09
22.80	2.48	0.25	5.00	0.00	0.09	0.09
22.85	2.48	0.25	5.00	0.00	0.09	0.09
22.90	2.49	0.25	5.00	0.00	0.09	0.09
22.95	2.49	0.25	5.00	0.00	0.09	0.09
23.00	2.49	0.25	5.00	0.00	0.09	0.09
23.05	2.49	0.25	5.00	0.00	0.09	0.09
23.10	2.49	0.25	5.00	0.00	0.09	0.09
23.15	2.48	0.25	5.00	0.00	0.09	0.09
23.20	2.48	0.25	5.00	0.00	0.09	0.09
23.25	2.48	0.25	5.00	0.00	0.09	0.09
23.30	2.48	0.25	5.00	0.00	0.09	0.09
23.35	2.48	0.25	5.00	0.00	0.09	0.09
23.40	2.48	0.25	5.00	0.00	0.09	0.09
23.45	2.48	0.25	5.00	0.00	0.09	0.09
23.50	2.48	0.25	5.00	0.00	0.09	0.09
23.55	2.48	0.25	5.00	0.00	0.09	0.09
23.60	2.48	0.25	5.00	0.00	0.09	0.09
23.65	2.47	0.25	5.00	0.00	0.08	0.08
23.70	2.47	0.25	5.00	0.00	0.08	0.08
23.75	2.47	0.25	5.00	0.00	0.08	0.08
23.80	2.47	0.25	5.00	0.00	0.08	0.08
23.85	2.47	0.25	5.00	0.00	0.08	0.08
23.90	2.47	0.25	5.00	0.00	0.08	0.08
23.95	2.47	0.25	5.00	0.00	0.08	0.08
24.00	2.47	0.25	5.00	0.00	0.08	0.08
24.05	2.47	0.25	5.00	0.00	0.08	0.08
24.10	2.47	0.25	5.00	0.00	0.08	0.08
24.15	2.46	0.25	5.00	0.00	0.08	0.08
24.20	2.46	0.25	5.00	0.00	0.08	0.08
24.25	2.46	0.25	5.00	0.00	0.08	0.08
24.30	2.46	0.25	5.00	0.00	0.08	0.08
24.35	2.46	0.25	5.00	0.00	0.08	0.08
24.40	2.46	0.25	5.00	0.00	0.08	0.08
24.45	2.46	0.25	5.00	0.00	0.08	0.08
24.50	2.46	0.25	5.00	0.00	0.08	0.08
24.55	2.46	0.25	5.00	0.00	0.08	0.08



			Archibald and	7th.sum		
24.60	2.46	0.25	5.00	0.00	0.08	0.08
24.65	2.46	0.25	5.00	0.00	0.08	0.08
24.70	2.45	0.25	5.00	0.00	0.08	0.08
24.75	2.45	0.24	5.00	0.00	0.08	0.08
24.80	2.45	0.24	5.00	0.00	0.08	0.08
24.85	2.45	0.24	5.00	0.00	0.08	0.08
24.90	2.45	0.24	5.00	0.00	0.08	0.08
24.95	2.45	0.24	5.00	0.00	0.08	0.08
25.00	2.45	0.24	5.00	0.00	0.08	0.08
25.05	2.45	0.24	5.00	0.00	0.08	0.08
25.10	2.45	0.24	5.00	0.00	0.08	0.08
25.15	2.45	0.24	5.00	0.00	0.08	0.08
25.20	2.44	0.24	5.00	0.00	0.08	0.08
25.25	2.44	0.24	5.00	0.00	0.08	0.08
25.30	2.44	0.24	5.00	0.00	0.08	0.08
25.35	2.44	0.24	5.00	0.00	0.08	0.08
25.40	2.44	0.24	5.00	0.00	0.08	0.08
25.45	2.44	0.24	5.00	0.00	0.08	0.08
25.50	2.44	0.24	5.00	0.00	0.08	0.08
25.55	2.44	0.24	5.00	0.00	0.08	0.08
25.60	2.44	0.24	5.00	0.00	0.08	0.08
25.65	2.44	0.24	5.00	0.00	0.08	0.08
25.70	2.43	0.24	5.00	0.00	0.08	0.08
25.75	2.43	0.24	5.00	0.00	0.08	0.08
25.80	2.43	0.24	5.00	0.00	0.08	0.08
25.85	2.43	0.24	5.00	0.00	0.08	0.08
25.90	2.43	0.24	5.00	0.00	0.08	0.08
25.95	2.43	0.24	5.00	0.00	0.08	0.08
26.00	2.43	0.24	5.00	0.00	0.08	0.08
26.05	2.43	0.24	5.00	0.00	0.08	0.08
26.10	2.43	0.24	5.00	0.00	0.08	0.08
26.15	2.43	0.24	5.00	0.00	0.08	0.08
26.20	2.43	0.24	5.00	0.00	0.08	0.08
26.25	2.42	0.24	5.00	0.00	0.08	0.08
26.30	2.42	0.24	5.00	0.00	0.08	0.08
26.35	2.42	0.24	5.00	0.00	0.08	0.08
26.40	2.42	0.24	5.00	0.00	0.08	0.08
26.45	2.42	0.24	5.00	0.00	0.08	0.08
26.50	2.42	0.24	5.00	0.00	0.08	0.08
26.55	2.42	0.24	5.00	0.00	0.08	0.08
26.60	2.42	0.24	5.00	0.00	0.08	0.08
26.65	2.42	0.24	5.00	0.00	0.08	0.08
26.70	2.42	0.24	5.00	0.00	0.08	0.08
26.75	2.41	0.24	5.00	0.00	0.08	0.08
26.80	2.41	0.24	5.00	0.00	0.08	0.08
26.85	2.41	0.24	5.00	0.00	0.08	0.08
26.90	2.41	0.24	5.00	0.00	0.08	0.08
26.95	2.41	0.24	5.00	0.00	0.08	0.08
27.00	2.41	0.24	5.00	0.00	0.08	0.08
27.05	2.41	0.24	5.00	0.00	0.08	0.08
27.10	2.41	0.24	5.00	0.00	0.08	0.08
27.15	2.41	0.24	5.00	0.00	0.08	0.08
27.20	2.41	0.24	5.00	0.00	0.08	0.08
27.25	2.41	0.24	5.00	0.00	0.08	0.08
27.30	2.40	0.24	5.00	0.00	0.08	0.08
27.35	2.40	0.24	5.00	0.00	0.08	0.08
27.40	2.40	0.24	5.00	0.00	0.08	0.08
27.45	2.40	0.24	5.00	0.00	0.08	0.08
27.50	2.40	0.24	5.00	0.00	0.08	0.08
27.55	2.40	0.24	5.00	0.00	0.08	0.08
27.60	2.40	0.24	5.00	0.00	0.08	0.08
27.65	2.40	0.24	5.00	0.00	0.08	0.08
27.70	2.40	0.24	5.00	0.00	0.07	0.07



			Archibald	and	7th.sum	
27.75	2.40	0.24	5.00	0.00	0.07	0.07
27.80	2.40	0.24	5.00	0.00	0.07	0.07
27.85	2.39	0.24	5.00	0.00	0.07	0.07
27.90	2.39	0.24	5.00	0.00	0.07	0.07
27.95	2.39	0.24	5.00	0.00	0.07	0.07
28.00	2.39	0.24	5.00	0.00	0.07	0.07
28.05	2.39	0.24	5.00	0.00	0.07	0.07
28.10	2.39	0.24	5.00	0.00	0.07	0.07
28.15	2.39	0.24	5.00	0.00	0.07	0.07
28.20	2.39	0.24	5.00	0.00	0.07	0.07
28.25	2.39	0.24	5.00	0.00	0.07	0.07
28.30	2.39	0.24	5.00	0.00	0.07	0.07
28.35	2.39	0.24	5.00	0.00	0.07	0.07
28.40	2.38	0.24	5.00	0.00	0.07	0.07
28.45	2.38	0.24	5.00	0.00	0.07	0.07
28.50	2.38	0.24	5.00	0.00	0.07	0.07
28.55	2.38	0.24	5.00	0.00	0.07	0.07
28.60	2.38	0.24	5.00	0.00	0.07	0.07
28.65	2.38	0.24	5.00	0.00	0.07	0.07
28.70	2.38	0.24	5.00	0.00	0.07	0.07
28.75	2.38	0.24	5.00	0.00	0.07	0.07
28.80	2.38	0.24	5.00	0.00	0.07	0.07
28.85	2.38	0.24	5.00	0.00	0.07	0.07
28.90	2.38	0.24	5.00	0.00	0.07	0.07
28.95	2.37	0.24	5.00	0.00	0.07	0.07
29.00	2.37	0.24	5.00	0.00	0.07	0.07
29.05	2.37	0.24	5.00	0.00	0.07	0.07
29.10	2.37	0.24	5.00	0.00	0.07	0.07
29.15	2.37	0.24	5.00	0.00	0.07	0.07
29.20	2.37	0.24	5.00	0.00	0.07	0.07
29.25	2.37	0.24	5.00	0.00	0.07	0.07
29.30	2.37	0.24	5.00	0.00	0.07	0.07
29.35	2.37	0.24	5.00	0.00	0.07	0.07
29.40	2.37	0.24	5.00	0.00	0.07	0.07
29.45	2.37	0.24	5.00	0.00	0.07	0.07
29.50	2.36	0.24	5.00	0.00	0.07	0.07
29.55	2.36	0.24	5.00	0.00	0.07	0.07
29.60	2.36	0.24	5.00	0.00	0.07	0.07
29.65	2.36	0.24	5.00	0.00	0.07	0.07
29.70	2.36	0.24	5.00	0.00	0.07	0.07
29.75	2.36	0.24	5.00	0.00	0.07	0.07
29.80	2.36	0.24	5.00	0.00	0.07	0.07
29.85	2.36	0.24	5.00	0.00	0.07	0.07
29.90	2.36	0.24	5.00	0.00	0.07	0.07
29.95	2.36	0.24	5.00	0.00	0.07	0.07
30.00	2.36	0.24	5.00	0.00	0.07	0.07
30.05	2.35	0.24	5.00	0.00	0.07	0.07
30.10	2.35	0.24	5.00	0.00	0.07	0.07
30.15	2.35	0.24	5.00	0.00	0.07	0.07
30.20	2.35	0.24	5.00	0.00	0.07	0.07
30.25	2.35	0.24	5.00	0.00	0.07	0.07
30.30	2.35	0.24	5.00	0.00	0.07	0.07
30.35	2.35	0.24	5.00	0.00	0.07	0.07
30.40	2.35	0.24	5.00	0.00	0.07	0.07
30.45	2.35	0.24	5.00	0.00	0.07	0.07
30.50	2.35	0.24	5.00	0.00	0.07	0.07
30.55	2.35	0.24	5.00	0.00	0.07	0.07
30.60	2.35	0.24	5.00	0.00	0.07	0.07
30.65	2.34	0.24	5.00	0.00	0.07	0.07
30.70	2.34	0.24	5.00	0.00	0.07	0.07
30.75	2.34	0.24	5.00	0.00	0.07	0.07
30.80	2.34	0.24	5.00	0.00	0.07	0.07
30.85	2.34	0.24	5.00	0.00	0.07	0.07

			Archibald	and	7th.sum	
30.90	2.34	0.24	5.00	0.00	0.06	0.06
30.95	2.34	0.24	5.00	0.00	0.06	0.06
31.00	2.34	0.24	5.00	0.00	0.06	0.06
31.05	2.34	0.24	5.00	0.00	0.06	0.06
31.10	2.34	0.24	5.00	0.00	0.06	0.06
31.15	2.34	0.24	5.00	0.00	0.06	0.06
31.20	2.34	0.24	5.00	0.00	0.06	0.06
31.25	2.33	0.24	5.00	0.00	0.06	0.06
31.30	2.33	0.24	5.00	0.00	0.06	0.06
31.35	2.33	0.24	5.00	0.00	0.06	0.06
31.40	2.33	0.24	5.00	0.00	0.06	0.06
31.45	2.33	0.24	5.00	0.00	0.06	0.06
31.50	2.33	0.24	5.00	0.00	0.06	0.06
31.55	2.33	0.24	5.00	0.00	0.06	0.06
31.60	2.33	0.24	5.00	0.00	0.06	0.06
31.65	2.33	0.24	5.00	0.00	0.06	0.06
31.70	2.33	0.24	5.00	0.00	0.06	0.06
31.75	2.33	0.24	5.00	0.00	0.06	0.06
31.80	2.33	0.24	5.00	0.00	0.06	0.06
31.85	2.32	0.24	5.00	0.00	0.06	0.06
31.90	2.32	0.24	5.00	0.00	0.06	0.06
31.95	2.32	0.24	5.00	0.00	0.06	0.06
32.00	2.32	0.24	5.00	0.00	0.06	0.06
32.05	2.32	0.24	5.00	0.00	0.06	0.06
32.10	2.32	0.24	5.00	0.00	0.06	0.06
32.15	2.32	0.24	5.00	0.00	0.06	0.06
32.20	2.32	0.24	5.00	0.00	0.06	0.06
32.25	2.32	0.24	5.00	0.00	0.06	0.06
32.30	2.32	0.24	5.00	0.00	0.06	0.06
32.35	2.32	0.24	5.00	0.00	0.06	0.06
32.40	2.32	0.24	5.00	0.00	0.06	0.06
32.45	2.31	0.24	5.00	0.00	0.06	0.06
32.50	2.31	0.24	5.00	0.00	0.06	0.06
32.55	2.31	0.24	5.00	0.00	0.06	0.06
32.60	2.31	0.24	5.00	0.00	0.06	0.06
32.65	2.31	0.24	5.00	0.00	0.06	0.06
32.70	2.31	0.24	5.00	0.00	0.06	0.06
32.75	2.31	0.24	5.00	0.00	0.06	0.06
32.80	2.31	0.24	5.00	0.00	0.06	0.06
32.85	2.31	0.24	5.00	0.00	0.06	0.06
32.90	2.31	0.24	5.00	0.00	0.06	0.06
32.95	2.31	0.24	5.00	0.00	0.06	0.06
33.00	2.31	0.24	5.00	0.00	0.06	0.06
33.05	2.31	0.24	5.00	0.00	0.06	0.06
33.10	2.30	0.24	5.00	0.00	0.06	0.06
33.15	2.30	0.24	5.00	0.00	0.06	0.06
33.20	2.30	0.23	5.00	0.00	0.06	0.06
33.25	2.30	0.23	5.00	0.00	0.06	0.06
33.30	2.30	0.23	5.00	0.00	0.06	0.06
33.35	2.30	0.23	5.00	0.00	0.06	0.06
33.40	2.30	0.23	5.00	0.00	0.06	0.06
33.45	2.30	0.23	5.00	0.00	0.06	0.06
33.50	2.30	0.23	5.00	0.00	0.06	0.06
33.55	2.30	0.23	5.00	0.00	0.06	0.06
33.60	2.30	0.23	5.00	0.00	0.06	0.06
33.65	2.30	0.23	5.00	0.00	0.06	0.06
33.70	2.30	0.23	5.00	0.00	0.06	0.06
33.75	2.29	0.23	5.00	0.00	0.06	0.06
33.80	2.29	0.23	5.00	0.00	0.06	0.06
33.85	2.29	0.23	5.00	0.00	0.06	0.06
33.90	2.29	0.23	5.00	0.00	0.05	0.05
33.95	2.29	0.23	5.00	0.00	0.05	0.05
34.00	2.29	0.23	5.00	0.00	0.05	0.05



## Archibald and 7th.sum

34.05	2.29	0.23	5.00	0.00	0.05	0.05
34.10	2.29	0.23	5.00	0.00	0.05	0.05
34.15	2.29	0.23	5.00	0.00	0.05	0.05
34.20	2.29	0.23	5.00	0.00	0.05	0.05
34.25	2.29	0.23	5.00	0.00	0.05	0.05
34.30	2.29	0.23	5.00	0.00	0.05	0.05
34.35	2.29	0.23	5.00	0.00	0.05	0.05
34.40	2.29	0.23	5.00	0.00	0.05	0.05
34.45	2.28	0.23	5.00	0.00	0.05	0.05
34.50	2.28	0.23	5.00	0.00	0.05	0.05
34.55	2.28	0.23	5.00	0.00	0.05	0.05
34.60	2.28	0.23	5.00	0.00	0.05	0.05
34.65	2.28	0.23	5.00	0.00	0.05	0.05
34.70	2.28	0.23	5.00	0.00	0.05	0.05
34.75	2.28	0.23	5.00	0.00	0.05	0.05
34.80	2.28	0.23	5.00	0.00	0.05	0.05
34.85	2.28	0.23	5.00	0.00	0.05	0.05
34.90	2.28	0.23	5.00	0.00	0.05	0.05
34.95	2.28	0.23	5.00	0.00	0.05	0.05
35.00	2.28	0.23	5.00	0.00	0.05	0.05
35.05	2.28	0.23	5.00	0.00	0.05	0.05
35.10	2.28	0.23	5.00	0.00	0.05	0.05
35.15	2.27	0.23	5.00	0.00	0.05	0.05
35.20	2.27	0.23	5.00	0.00	0.05	0.05
35.25	2.27	0.23	5.00	0.00	0.05	0.05
35.30	2.27	0.23	5.00	0.00	0.05	0.05
35.35	2.27	0.23	5.00	0.00	0.05	0.05
35.40	2.27	0.23	5.00	0.00	0.05	0.05
35.45	2.27	0.23	5.00	0.00	0.05	0.05
35.50	2.27	0.23	5.00	0.00	0.05	0.05
35.55	2.27	0.23	5.00	0.00	0.05	0.05
35.60	2.27	0.23	5.00	0.00	0.05	0.05
35.65	2.27	0.23	5.00	0.00	0.05	0.05
35.70	2.27	0.23	5.00	0.00	0.05	0.05
35.75	2.27	0.23	5.00	0.00	0.05	0.05
35.80	2.27	0.23	5.00	0.00	0.05	0.05
35.85	2.27	0.23	5.00	0.00	0.05	0.05
35.90	2.26	0.23	5.00	0.00	0.05	0.05
35.95	2.26	0.23	5.00	0.00	0.05	0.05
36.00	2.26	0.23	5.00	0.00	0.05	0.05
36.05	2.26	0.23	5.00	0.00	0.05	0.05
36.10	2.26	0.23	5.00	0.00	0.05	0.05
36.15	2.26	0.23	5.00	0.00	0.05	0.05
36.20	2.26	0.23	5.00	0.00	0.05	0.05
36.25	2.26	0.23	5.00	0.00	0.05	0.05
36.30	2.26	0.23	5.00	0.00	0.05	0.05
36.35	2.26	0.23	5.00	0.00	0.05	0.05
36.40	2.26	0.23	5.00	0.00	0.05	0.05
36.45	2.26	0.23	5.00	0.00	0.05	0.05
36.50	2.26	0.23	5.00	0.00	0.05	0.05
36.55	2.26	0.23	5.00	0.00	0.05	0.05
36.60	2.25	0.23	5.00	0.00	0.05	0.05
36.65	2.25	0.23	5.00	0.00	0.05	0.05
36.70	2.25	0.23	5.00	0.00	0.05	0.05
36.75	2.25	0.23	5.00	0.00	0.05	0.05
36.80	2.25	0.23	5.00	0.00	0.05	0.05
36.85	2.25	0.23	5.00	0.00	0.05	0.05
36.90	2.25	0.23	5.00	0.00	0.05	0.05
36.95	2.25	0.23	5.00	0.00	0.05	0.05
37.00	2.25	0.23	5.00	0.00	0.04	0.04
37.05	2.25	0.23	5.00	0.00	0.04	0.04
37.10	2.25	0.23	5.00	0.00	0.04	0.04
37.15	2.25	0.23	5.00	0.00	0.04	0.04



## Archibald and 7th.sum

37.20	2.25	0.23	5.00	0.00	0.04	0.04
37.25	2.25	0.23	5.00	0.00	0.04	0.04
37.30	2.25	0.23	5.00	0.00	0.04	0.04
37.35	2.24	0.23	5.00	0.00	0.04	0.04
37.40	2.24	0.23	5.00	0.00	0.04	0.04
37.45	2.24	0.23	5.00	0.00	0.04	0.04
37.50	2.24	0.23	5.00	0.00	0.04	0.04
37.55	2.24	0.23	5.00	0.00	0.04	0.04
37.60	2.24	0.23	5.00	0.00	0.04	0.04
37.65	2.24	0.23	5.00	0.00	0.04	0.04
37.70	2.24	0.23	5.00	0.00	0.04	0.04
37.75	2.24	0.23	5.00	0.00	0.04	0.04
37.80	2.24	0.23	5.00	0.00	0.04	0.04
37.85	2.24	0.23	5.00	0.00	0.04	0.04
37.90	2.24	0.23	5.00	0.00	0.04	0.04
37.95	2.24	0.22	5.00	0.00	0.04	0.04
38.00	2.24	0.22	5.00	0.00	0.04	0.04
38.05	2.24	0.22	5.00	0.00	0.04	0.04
38.10	2.23	0.22	5.00	0.00	0.04	0.04
38.15	2.23	0.22	5.00	0.00	0.04	0.04
38.20	2.23	0.22	5.00	0.00	0.04	0.04
38.25	2.23	0.22	5.00	0.00	0.04	0.04
38.30	2.23	0.22	5.00	0.00	0.04	0.04
38.35	2.23	0.22	5.00	0.00	0.04	0.04
38.40	2.23	0.22	5.00	0.00	0.04	0.04
38.45	2.23	0.22	5.00	0.00	0.04	0.04
38.50	2.23	0.22	5.00	0.00	0.04	0.04
38.55	2.23	0.22	5.00	0.00	0.04	0.04
38.60	2.23	0.22	5.00	0.00	0.04	0.04
38.65	2.23	0.22	5.00	0.00	0.04	0.04
38.70	2.23	0.22	5.00	0.00	0.04	0.04
38.75	2.23	0.22	5.00	0.00	0.04	0.04
38.80	2.23	0.22	5.00	0.00	0.04	0.04
38.85	2.22	0.22	5.00	0.00	0.04	0.04
38.90	2.22	0.22	5.00	0.00	0.04	0.04
38.95	2.22	0.22	5.00	0.00	0.04	0.04
39.00	2.22	0.22	5.00	0.00	0.04	0.04
39.05	2.22	0.22	5.00	0.00	0.04	0.04
39.10	2.22	0.22	5.00	0.00	0.04	0.04
39.15	2.22	0.22	5.00	0.00	0.04	0.04
39.20	2.22	0.22	5.00	0.00	0.04	0.04
39.25	2.22	0.22	5.00	0.00	0.04	0.04
39.30	2.22	0.22	5.00	0.00	0.04	0.04
39.35	2.22	0.22	5.00	0.00	0.04	0.04
39.40	2.22	0.22	5.00	0.00	0.04	0.04
39.45	2.22	0.22	5.00	0.00	0.04	0.04
39.50	2.22	0.22	5.00	0.00	0.04	0.04
39.55	2.22	0.22	5.00	0.00	0.04	0.04
39.60	2.22	0.22	5.00	0.00	0.04	0.04
39.65	2.21	0.22	5.00	0.00	0.04	0.04
39.70	2.21	0.22	5.00	0.00	0.04	0.04
39.75	2.21	0.22	5.00	0.00	0.04	0.04
39.80	2.21	0.22	5.00	0.00	0.04	0.04
39.85	2.21	0.22	5.00	0.00	0.04	0.04
39.90	2.21	0.22	5.00	0.00	0.03	0.03
39.95	2.21	0.22	5.00	0.00	0.03	0.03
40.00	2.21	0.22	5.00	0.00	0.03	0.03
40.05	2.21	0.22	5.00	0.00	0.03	0.03
40.10	2.21	0.22	5.00	0.00	0.03	0.03
40.15	2.21	0.22	5.00	0.00	0.03	0.03
40.20	2.21	0.22	5.00	0.00	0.03	0.03
40.25	2.21	0.22	5.00	0.00	0.03	0.03
40.30	2.21	0.22	5.00	0.00	0.03	0.03

## Archibald and 7th.sum

40.35	2.21	0.22	5.00	0.00	0.03	0.03
40.40	2.20	0.22	5.00	0.00	0.03	0.03
40.45	2.20	0.22	5.00	0.00	0.03	0.03
40.50	2.20	0.22	5.00	0.00	0.03	0.03
40.55	2.20	0.22	5.00	0.00	0.03	0.03
40.60	2.20	0.22	5.00	0.00	0.03	0.03
40.65	2.20	0.22	5.00	0.00	0.03	0.03
40.70	2.20	0.22	5.00	0.00	0.03	0.03
40.75	2.20	0.22	5.00	0.00	0.03	0.03
40.80	2.20	0.22	5.00	0.00	0.03	0.03
40.85	2.20	0.22	5.00	0.00	0.03	0.03
40.90	2.20	0.22	5.00	0.00	0.03	0.03
40.95	2.20	0.22	5.00	0.00	0.03	0.03
41.00	2.20	0.22	5.00	0.00	0.03	0.03
41.05	2.20	0.22	5.00	0.00	0.03	0.03
41.10	2.20	0.22	5.00	0.00	0.03	0.03
41.15	2.20	0.22	5.00	0.00	0.03	0.03
41.20	2.19	0.22	5.00	0.00	0.03	0.03
41.25	2.19	0.22	5.00	0.00	0.03	0.03
41.30	2.19	0.22	5.00	0.00	0.03	0.03
41.35	2.19	0.22	5.00	0.00	0.03	0.03
41.40	2.19	0.22	5.00	0.00	0.03	0.03
41.45	2.19	0.22	5.00	0.00	0.03	0.03
41.50	2.19	0.22	5.00	0.00	0.03	0.03
41.55	2.19	0.22	5.00	0.00	0.03	0.03
41.60	2.19	0.22	5.00	0.00	0.03	0.03
41.65	2.19	0.22	5.00	0.00	0.03	0.03
41.70	2.19	0.22	5.00	0.00	0.03	0.03
41.75	2.19	0.22	5.00	0.00	0.03	0.03
41.80	2.19	0.22	5.00	0.00	0.03	0.03
41.85	2.19	0.22	5.00	0.00	0.03	0.03
41.90	2.19	0.22	5.00	0.00	0.03	0.03
41.95	2.19	0.22	5.00	0.00	0.03	0.03
42.00	2.19	0.22	5.00	0.00	0.03	0.03
42.05	2.18	0.22	5.00	0.00	0.03	0.03
42.10	2.18	0.22	5.00	0.00	0.03	0.03
42.15	2.18	0.22	5.00	0.00	0.03	0.03
42.20	2.18	0.22	5.00	0.00	0.03	0.03
42.25	2.18	0.22	5.00	0.00	0.03	0.03
42.30	2.18	0.22	5.00	0.00	0.03	0.03
42.35	2.18	0.22	5.00	0.00	0.03	0.03
42.40	2.18	0.22	5.00	0.00	0.03	0.03
42.45	2.18	0.22	5.00	0.00	0.03	0.03
42.50	2.18	0.22	5.00	0.00	0.03	0.03
42.55	2.18	0.22	5.00	0.00	0.03	0.03
42.60	2.18	0.22	5.00	0.00	0.03	0.03
42.65	2.18	0.22	5.00	0.00	0.03	0.03
42.70	2.18	0.21	5.00	0.00	0.03	0.03
42.75	2.18	0.21	5.00	0.00	0.03	0.03
42.80	2.18	0.21	5.00	0.00	0.03	0.03
42.85	2.18	0.21	5.00	0.00	0.03	0.03
42.90	2.17	0.21	5.00	0.00	0.02	0.02
42.95	2.17	0.21	5.00	0.00	0.02	0.02
43.00	2.17	0.21	5.00	0.00	0.02	0.02
43.05	2.17	0.21	5.00	0.00	0.02	0.02
43.10	2.17	0.21	5.00	0.00	0.02	0.02
43.15	2.17	0.21	5.00	0.00	0.02	0.02
43.20	2.17	0.21	5.00	0.00	0.02	0.02
43.25	2.17	0.21	5.00	0.00	0.02	0.02
43.30	2.17	0.21	5.00	0.00	0.02	0.02
43.35	2.17	0.21	5.00	0.00	0.02	0.02
43.40	2.17	0.21	5.00	0.00	0.02	0.02
43.45	2.17	0.21	5.00	0.00	0.02	0.02



Archibald and 7th.sum						
43.50	2.17	0.21	5.00	0.00	0.02	0.02
43.55	2.17	0.21	5.00	0.00	0.02	0.02
43.60	2.17	0.21	5.00	0.00	0.02	0.02
43.65	2.17	0.21	5.00	0.00	0.02	0.02
43.70	2.17	0.21	5.00	0.00	0.02	0.02
43.75	2.16	0.21	5.00	0.00	0.02	0.02
43.80	2.16	0.21	5.00	0.00	0.02	0.02
43.85	2.16	0.21	5.00	0.00	0.02	0.02
43.90	2.16	0.21	5.00	0.00	0.02	0.02
43.95	2.16	0.21	5.00	0.00	0.02	0.02
44.00	2.16	0.21	5.00	0.00	0.02	0.02
44.05	2.16	0.21	5.00	0.00	0.02	0.02
44.10	2.16	0.21	5.00	0.00	0.02	0.02
44.15	2.16	0.21	5.00	0.00	0.02	0.02
44.20	2.16	0.21	5.00	0.00	0.02	0.02
44.25	2.16	0.21	5.00	0.00	0.02	0.02
44.30	2.16	0.21	5.00	0.00	0.02	0.02
44.35	2.16	0.21	5.00	0.00	0.02	0.02
44.40	2.16	0.21	5.00	0.00	0.02	0.02
44.45	2.16	0.21	5.00	0.00	0.02	0.02
44.50	2.16	0.21	5.00	0.00	0.02	0.02
44.55	2.16	0.21	5.00	0.00	0.02	0.02
44.60	2.16	0.21	5.00	0.00	0.02	0.02
44.65	2.15	0.21	5.00	0.00	0.02	0.02
44.70	2.15	0.21	5.00	0.00	0.02	0.02
44.75	2.15	0.21	5.00	0.00	0.02	0.02
44.80	2.15	0.21	5.00	0.00	0.02	0.02
44.85	2.15	0.21	5.00	0.00	0.02	0.02
44.90	2.15	0.21	5.00	0.00	0.02	0.02
44.95	2.15	0.21	5.00	0.00	0.02	0.02
45.00	2.15	0.21	5.00	0.00	0.02	0.02
45.05	2.15	0.21	5.00	0.00	0.02	0.02
45.10	2.15	0.21	5.00	0.00	0.02	0.02
45.15	2.15	0.21	5.00	0.00	0.02	0.02
45.20	2.15	0.21	5.00	0.00	0.02	0.02
45.25	2.15	0.21	5.00	0.00	0.02	0.02
45.30	2.15	0.21	5.00	0.00	0.02	0.02
45.35	2.15	0.21	5.00	0.00	0.02	0.02
45.40	2.15	0.21	5.00	0.00	0.02	0.02
45.45	2.15	0.21	5.00	0.00	0.02	0.02
45.50	2.15	0.21	5.00	0.00	0.02	0.02
45.55	2.15	0.21	5.00	0.00	0.02	0.02
45.60	2.14	0.21	5.00	0.00	0.02	0.02
45.65	2.14	0.21	5.00	0.00	0.02	0.02
45.70	2.14	0.21	5.00	0.00	0.02	0.02
45.75	2.14	0.21	5.00	0.00	0.02	0.02
45.80	2.14	0.21	5.00	0.00	0.02	0.02
45.85	2.14	0.21	5.00	0.00	0.02	0.02
45.90	2.14	0.21	5.00	0.00	0.02	0.02
45.95	2.14	0.21	5.00	0.00	0.02	0.02
46.00	2.14	0.21	5.00	0.00	0.02	0.02
46.05	2.14	0.21	5.00	0.00	0.02	0.02
46.10	2.14	0.21	5.00	0.00	0.02	0.02
46.15	2.14	0.21	5.00	0.00	0.02	0.02
46.20	2.14	0.21	5.00	0.00	0.02	0.02
46.25	2.14	0.21	5.00	0.00	0.02	0.02
46.30	2.14	0.21	5.00	0.00	0.01	0.01
46.35	2.14	0.21	5.00	0.00	0.01	0.01
46.40	2.14	0.21	5.00	0.00	0.01	0.01
46.45	2.14	0.21	5.00	0.00	0.01	0.01
46.50	2.13	0.21	5.00	0.00	0.01	0.01
46.55	2.13	0.21	5.00	0.00	0.01	0.01
46.60	2.13	0.21	5.00	0.00	0.01	0.01



			Archibald	and	7th.sum	
46.65	2.13	0.21	5.00	0.00	0.01	0.01
46.70	2.13	0.21	5.00	0.00	0.01	0.01
46.75	2.13	0.21	5.00	0.00	0.01	0.01
46.80	2.13	0.21	5.00	0.00	0.01	0.01
46.85	2.13	0.21	5.00	0.00	0.01	0.01
46.90	2.13	0.21	5.00	0.00	0.01	0.01
46.95	2.13	0.21	5.00	0.00	0.01	0.01
47.00	2.13	0.21	5.00	0.00	0.01	0.01
47.05	2.13	0.21	5.00	0.00	0.01	0.01
47.10	2.13	0.21	5.00	0.00	0.01	0.01
47.15	2.13	0.21	5.00	0.00	0.01	0.01
47.20	2.13	0.21	5.00	0.00	0.01	0.01
47.25	2.13	0.21	5.00	0.00	0.01	0.01
47.30	2.13	0.21	5.00	0.00	0.01	0.01
47.35	2.13	0.21	5.00	0.00	0.01	0.01
47.40	2.13	0.20	5.00	0.00	0.01	0.01
47.45	2.12	0.20	5.00	0.00	0.01	0.01
47.50	2.12	0.20	5.00	0.00	0.01	0.01
47.55	2.12	0.20	5.00	0.00	0.01	0.01
47.60	2.12	0.20	5.00	0.00	0.01	0.01
47.65	2.12	0.20	5.00	0.00	0.01	0.01
47.70	2.12	0.20	5.00	0.00	0.01	0.01
47.75	2.12	0.20	5.00	0.00	0.01	0.01
47.80	2.12	0.20	5.00	0.00	0.01	0.01
47.85	2.12	0.20	5.00	0.00	0.01	0.01
47.90	2.12	0.20	5.00	0.00	0.01	0.01
47.95	2.12	0.20	5.00	0.00	0.01	0.01
48.00	2.12	0.20	5.00	0.00	0.01	0.01
48.05	2.12	0.20	5.00	0.00	0.01	0.01
48.10	2.12	0.20	5.00	0.00	0.01	0.01
48.15	2.12	0.20	5.00	0.00	0.01	0.01
48.20	2.12	0.20	5.00	0.00	0.01	0.01
48.25	2.12	0.20	5.00	0.00	0.01	0.01
48.30	2.12	0.20	5.00	0.00	0.01	0.01
48.35	2.12	0.20	5.00	0.00	0.01	0.01
48.40	2.11	0.20	5.00	0.00	0.01	0.01
48.45	2.11	0.20	5.00	0.00	0.01	0.01
48.50	2.11	0.20	5.00	0.00	0.01	0.01
48.55	2.11	0.20	5.00	0.00	0.01	0.01
48.60	2.11	0.20	5.00	0.00	0.01	0.01
48.65	2.11	0.20	5.00	0.00	0.01	0.01
48.70	2.11	0.20	5.00	0.00	0.01	0.01
48.75	2.11	0.20	5.00	0.00	0.01	0.01
48.80	2.11	0.20	5.00	0.00	0.01	0.01
48.85	2.11	0.20	5.00	0.00	0.01	0.01
48.90	2.11	0.20	5.00	0.00	0.01	0.01
48.95	2.11	0.20	5.00	0.00	0.01	0.01
49.00	2.11	0.20	5.00	0.00	0.01	0.01
49.05	2.11	0.20	5.00	0.00	0.01	0.01
49.10	2.11	0.20	5.00	0.00	0.01	0.01
49.15	2.11	0.20	5.00	0.00	0.01	0.01
49.20	2.11	0.20	5.00	0.00	0.01	0.01
49.25	2.11	0.20	5.00	0.00	0.01	0.01
49.30	2.11	0.20	5.00	0.00	0.01	0.01
49.35	2.11	0.20	5.00	0.00	0.01	0.01
49.40	2.10	0.20	5.00	0.00	0.01	0.01
49.45	2.10	0.20	5.00	0.00	0.01	0.01
49.50	2.10	0.20	5.00	0.00	0.01	0.01
49.55	2.10	0.20	5.00	0.00	0.00	0.00
49.60	2.10	0.20	5.00	0.00	0.00	0.00
49.65	2.10	0.20	5.00	0.00	0.00	0.00
49.70	2.10	0.20	5.00	0.00	0.00	0.00
49.75	2.10	0.20	5.00	0.00	0.00	0.00

Archibald and 7th.sum						
49.80	2.10	0.20	5.00	0.00	0.00	0.00
49.85	2.10	0.20	5.00	0.00	0.00	0.00
49.90	2.10	0.20	5.00	0.00	0.00	0.00
49.95	2.10	0.20	5.00	0.00	0.00	0.00
50.00	2.10	0.20	5.00	0.00	0.00	0.00
50.05	2.10	0.20	5.00	0.00	0.00	0.00
50.10	2.10	0.20	5.00	0.00	0.00	0.00
50.15	2.10	0.20	5.00	0.00	0.00	0.00
50.20	2.10	0.20	5.00	0.00	0.00	0.00
50.25	2.10	0.20	5.00	0.00	0.00	0.00
50.30	2.10	0.20	5.00	0.00	0.00	0.00
50.35	2.10	0.20	5.00	0.00	0.00	0.00
50.40	2.09	0.20	5.00	0.00	0.00	0.00
50.45	2.09	0.20	5.00	0.00	0.00	0.00
50.50	2.09	0.20	5.00	0.00	0.00	0.00
50.55	2.09	0.20	5.00	0.00	0.00	0.00
50.60	2.09	0.20	5.00	0.00	0.00	0.00
50.65	2.09	0.20	5.00	0.00	0.00	0.00
50.70	2.09	0.20	5.00	0.00	0.00	0.00
50.75	2.09	0.20	5.00	0.00	0.00	0.00
50.80	2.09	0.20	5.00	0.00	0.00	0.00
50.85	2.09	0.20	5.00	0.00	0.00	0.00
50.90	2.09	0.20	5.00	0.00	0.00	0.00
50.95	2.09	0.20	5.00	0.00	0.00	0.00
51.00	2.09	0.20	5.00	0.00	0.00	0.00

\* F.S.<1, Liquefaction Potential Zone  
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units                      Depth = ft, Stress or Pressure = tsf (atm), Unit Weight =  
pcf, Settlement = in.

CRRm	Cyclic resistance ratio from soils
CSRfs	Cyclic stress ratio induced by a given earthquake (with user
request factor of safety)	
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRfs
S_sat	Settlement from saturated sands
S_dry	Settlement from dry sands
S_all	Total settlement from saturated and dry sands
NoLiq	No-Liquefy Soils