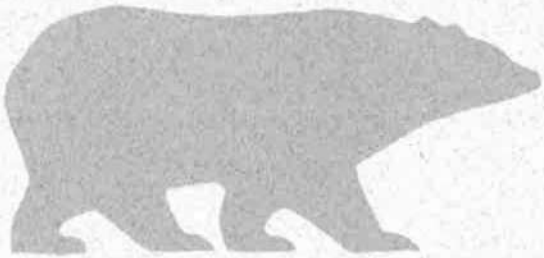
APPENDIX F

Preliminary Geotechnical Investigation



BRUIN GEOTECHNICAL SERVICES, INC.

SOIL AND MATERIAL CONSULTANTS

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PRELIMINARY
GEOTECHNICAL INVESTIGATION REPORT
FOR
ROYAL INVESTORS GROUP, LLC
AVANTI SOUTH PROJECT IN THE VICINITY OF
AVE. K-8 AND 70TH ST. WEST, LANCASTER
LOS ANGELES COUNTY, CALIFORNIA
APN 3204-008-045 & 047 AND 3204-001-195 & 184

Prepared by:
Bruin Geotechnical Services, Inc.
1817 East Avenue Q, Unit A1
Palmdale, California 93550

February 24, 2016

J.N. 14-23

BRUIN GSI

SOIL AND MATERIAL
TESTING AND INSPECTIONS

February 24, 2016 J.N. 14-23

Mr. Jim Powers
Royal Investors Group, LLC
1814 W. Cardiff Road
San Dimas, CA 91773

Subject: Preliminary Geotechnical Investigation Report; APN 3204-008-045 & 047, Avanti South, approximately 245 acres located at the southeast corner of 70th Street West & Avenue K-8, APN 3204-001-195 & 184, approximately 80 acres located at the northeast corner of 70th Street West and Avenue K-8 Lancaster, California

Dear Mr. Powers:

Presented herewith is the report of our Preliminary Geotechnical Investigation Report for the subject project. Our work was performed in accordance with the scope of work outlined in our original proposal dated December 1, 2015.

This report presents the results of our field investigation, laboratory testing and our engineering judgment, opinions, conclusions and recommendations pertaining to the proposed development.

It has been a pleasure to be of service to you on this project. Should you have any questions regarding the contents of this report, or should you require additional information, please contact the undersigned at (661) 273-9078.

Respectfully submitted,

BRUIN GEOTECHNICAL SERVICES, INC.

Dennis J. Sloan, P.E.

REGISTERED PROFESSIONAL ENGINEER
DENNIS J. SLOAN
No. 29704
Expires 03/31/17
CIVIL
STATE OF CALIFORNIA

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GEOTECHNICAL INVESTIGATION REPORT

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PRELIMINARY
GEOTECHNICAL INVESTIGATION REPORT
FOR PROPOSED MASTER PLANNED DEVELOPMENT
LOCATED AT
70TH STREET WEST AND AVENUE K-8
LANCASTER, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of our preliminary geotechnical investigation performed by Bruin Geotechnical Services, Inc. for the proposed development based on the conceptual site plan prepared by Kimley Horn, undated. Based on our review of the conceptual site plan, single-family residential units, apartment complex, senior living center, small commercial shopping centers, a school site, a fire station and parks are proposed.

The purpose of this investigation was to evaluate the subsurface soil conditions, to evaluate in-place characteristics, and to provide preliminary geotechnical recommendations relative to earthwork and grading, design parameters for construction of the proposed structure and improvements (utilities, etc.) associated with the proposed development.

The scope of the authorized investigation included the following tasks:

- performing a site reconnaissance,
- conducting field exploration
- laboratory testing program of selected samples
- performing engineering analyses of the data
- preparing this Preliminary Geotechnical Investigation Report.

This study also includes a review of published and unpublished literature and geotechnical maps with respect to active and potentially active faults located in proximity to the site which may have impact on the seismic design of the proposed structure.

2.0 SITE LOCATION AND DESCRIPTION

The subject parcel includes APN 3204-008-045 & 047 and APN 3204-001-195 & 184, with 245 acres located at the northeast corner of Avenue L and 70th Street West, extending to Avenue K-8 between 62nd Street West and 70th Street West and 80 acres located on the northwest corner of Avenue K-8 and 70th Street West, extending to Avenue K-4., extending from 70th Street West to 75th Street West, in the city of Lancaster, Los Angeles County, California. The subject site consists of approximately 325 acres. Access to the site is via 70th Street West and Avenue L, both of which are paved roads. At the time of our investigation, the subject site

was vacant of structures. Vegetation consisted of small annual grass and weeds. The surrounding properties were vacant at the time of our investigation except for a cemetery located at the southwest corner of Avenue K-8 and 70th Street West and a residential subdivision located at the northeast corner of 62nd Street West and Avenue K-8. The general location of the subject site is shown on Figure 1.

The site topography is relatively flat and level with a general slope down to the north/northeast with drainage by sheet flow at approximately two percent across the site. The elevation is approximately 2,449 feet above mean sea level at the southwest corner of the subject site.

3.0 PROPOSED GRADING AND CONSTRUCTION

A grading plan was not available for our review prior to our site investigation. However, we assume the proposed earthwork to consist of cuts and fills of 2-3 feet to achieve design grades for building pads and streets.

Although construction details are not available at the present time, it is expected that the structures will be a single- and two-story wood-framed buildings, and some masonry commercial structures. Conventional concrete continuous and isolated foundations and slab-on-grade floors are anticipated. No basements are anticipated. We anticipate loads of 2,000 plf for continuous foundations and 50 kips for isolated column foundations. Other improvements are anticipated to include concrete flatwork, sidewalks, driveways and street improvements with landscape and drainage devices. It is anticipated that the drainage will consist of sloped surfaces to drainage swales and curb & gutter as well as storm drain system to an approved area. Public sewer and water systems and installation of underground dry utilities lines are also anticipated.

4.0 GEOTECHNICAL INVESTIGATION

The geotechnical investigation included a field exploration program and a laboratory testing program. These programs were performed in accordance with our revised proposal for Preliminary Geotechnical Investigation Report dated December 1, 2015. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, surface water, groundwater or air, below or around the site. The field exploration and laboratory testing programs are described below.

4.1 Field Exploration Program

The field exploration program was initiated on January 21, 2016, under the technical supervision of our engineer. A total of twenty five (25) exploratory trenches were drilled using a CME 75 truck-mounted drilling rig with 8" hollow

VICINITY MAP
(Not to Scale)

Avanti South Project
Ave K-8 & 70th Street West,
Lancaster CA

Royal Investors Group, LLC

Bruin GSI
1817 E. Ave. Q., Unit A-1
Palmdale, CA 93550
661.273.9078

Job No. 14-23

FIGURE 1

stem auger. The borings were advanced to depths of thirty (30) feet below ground surface (bgs). The approximate location of the borings is shown on Figure 2.

Logs of subsurface conditions encountered in the borings were prepared in the field by a representative of Bruin GSI. Soil samples were obtained at various depth intervals, consisting of relatively undisturbed brass ring samples (Modified California split-spoon sampler) driven by a 140 pound hammer falling 30 inches. Bulk samples were also collected at various depths from 0 to 5 feet below existing ground surface. The soil samples were returned to the laboratory for analysis and testing. Final boring logs were prepared from the field logs and are presented in Appendix A.

4.2 Laboratory Testing

Selected samples collected during trenching activities were tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence at the site.

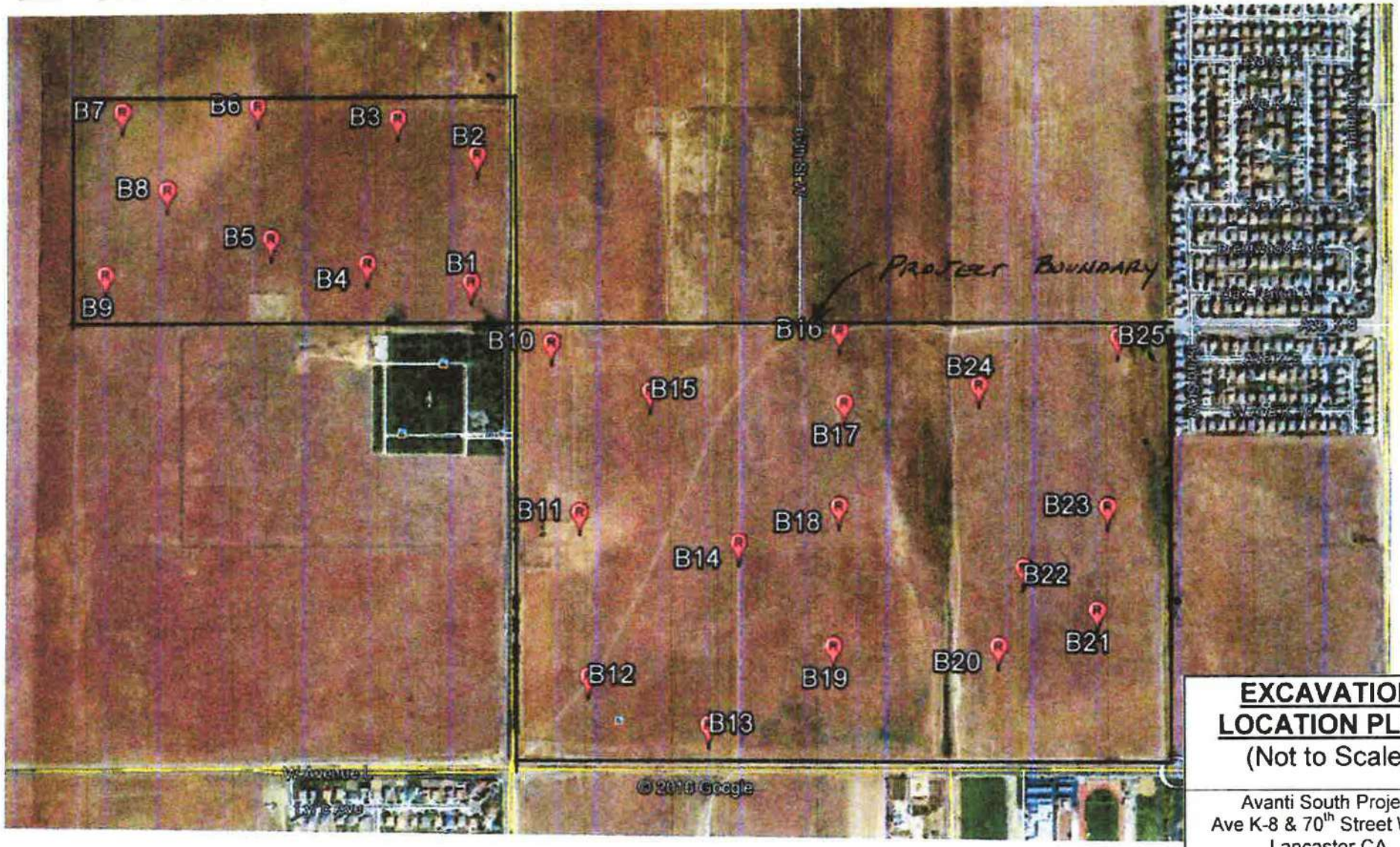
The samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture and density determination
- Consolidation potential
- Shear strength
- Expansion index
- Chemical analyses, including pH, resistivity, soluble sulfates and soluble chlorides

The following classification tests were performed:

• Identification of soils	ASTM D 2488
• Expansion Index	ASTM D 4829
• Maximum density – Optimum moisture	ASTM D 1557
• Material Finer than the No. 200 Sieve	ASTM D 1140
• Sand Equivalent Value	ASTM D 2419

Tabular and graphic test results are presented in Appendix B.



EXCAVATION LOCATION PLAN

(Not to Scale)

Avanti South Project
Ave K-8 & 70th Street West,
Lancaster CA

Royal Investors Group, LLC

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Job No. 14-23

FIGURE 2

5.0 CONCLUSIONS

The following conclusions for the site are based on the results of the field exploration and laboratory testing programs and represent professional opinions.

5.1 Site and Subsurface Conditions

Native materials were encountered within all of our exploratory borings. The native materials were noted to be dry to moist and loose to dense. The soil strata encountered consisted of silty sands (SM) with localized interbedded layers of integrated #4-3" gravel. Some of the soil samples were cemented. For more detailed descriptions of the subsurface materials refer to the trench logs in Appendix A.

5.2 Groundwater Conditions

Groundwater was not encountered in any of our exploratory trenches, at least to the maximum depth explored (15 feet bgs). Bruin GSI reviewed available reports and electronic data bases to assess historic water level conditions in the vicinity of the proposed site. Sources reviewed included the historically highest groundwater contours prepared by County of Los Angeles, Department of Public Works, Water Resources Division electronic database, historically highest groundwater levels in the immediate site vicinity indicate that groundwater level at the site are over 100 feet bgs. Based on this information, groundwater is not a design factor for this project.

5.3 Soil Engineering Properties

Physical tests were performed on the relatively undisturbed samples to characterize the engineering properties of the native soils. Moisture content and dry unit weight determinations were performed on the sample to evaluate the in-situ unit weights of the different materials. Moisture content and dry unit weights of the surficial soils ranged from about 2-13 percent with an average of 4-7 percent and about 104 pounds per cubic foot (pcf) to 127 pcf. The expansion index tests indicate that the surficial soils are within the "very low" expansion category. Moisture content and dry unit weight results are shown on the boring logs in Appendix A. Sieve analyses were performed on selected samples to evaluate the percent fines of different lithologic layers. Consolidation test results reveal the upper three to five (3-5) feet of soil has a moderate tendency to hydroconsolidate.

6.0 SEISMIC HAZARDS

The project site is locate in a seismically active are typical of Southern California and likely to be subjected to a strong ground shaking due to earthquakes on nearby faults.

The San Andreas Fault zone is the largest active fault rift zone, which is several miles wide, and passes through the Antelope Valley, extending from the Gulf of Mexico through the western portion of the State of California to a point at Cape Mendocino in northern California. The San Andreas Fault is predicted to have an event every 100-200 years based on geologic records. The San Andreas Fault has had two major eruptions in the last 150 years: 1) in the Southern California area in 1857, and 2) in San Francisco in 1906. In each event, approximately 320 kilometers of surface rupture has taken place, as well as a horizontal displacement of approximately 9 meters. Additional faulting has occurred adjacent to the San Andreas Fault causing numerous events of various magnitudes throughout the length of the San Andreas Fault.

The project site is located in an area in which active seismic occurrences are recorded on a yearly basis. Seismic studies conducted show a major break along the San Andreas Fault could be responsible for an event of approximately 8.4 on the Richter scale. A seismic event of this magnitude could cause bedrock accelerations as large as 0.5g. Events of this magnitude are anticipated to occur approximately every 150 years. The last occurrence of this magnitude was in 1857.

No known active faults have been mapped across the subject site. The potential hazards due to active fault ground rupture are considered minimal. According to current publications by the State of California, the project site is not located within the Alquist-Priolo special studies zone.

6.1 IBC Design Parameters

The following coefficients have been estimated in accordance with the The following coefficients have been estimated in accordance with the requirements of the 2012 IBC, utilizing the USGS U.S. Seismic Design Maps Application Version 3.1.0. The following values are provided, based on the approximate latitude and longitude of the southwest corner of the subject site at Avenue L and 70th Street west:

Latitude	34.6602°
Longitude	118.2538°

Spectral Response Acceleration - S_{DS}	1.278g	0.2(sec)
Spectral Response Acceleration - S_{D1}	0.914g	1.0(sec)

Mapped Spectral Acceleration - S_S	1.918g	0.2(sec)
Mapped Spectral Acceleration - S_1	0.914g	1.0(sec)

Site Classification (2013 CBC, further defined in ASCE7-10, Chapter 20) = D

The actual method of seismic design should be determined by the Structural Engineer.

Refer to Appendix C for the Design Maps Summary Report provided by the USGS website.

6.2 Liquefaction Potential

Liquefaction is a seismic phenomenon in which loose, saturated, granular (non-cohesive) soils react as a fluid when subject to high-intensity ground shaking. Research and historical data indicate loose to medium dense granular soils with a specific range of grain size distribution, saturated by a relatively shallow groundwater table are most susceptible to liquefaction.

The effects of liquefaction on level ground include settlement, sand boils and bearing capacity failures below structures.

In view of the relatively firm silty sand encountered in the trenches, relative densities, and depth to groundwater (over 100 feet), our preliminary liquefaction analysis indicates the potential for on-site liquefaction or seismically induced dynamic settlement is not probable.

6.2.1 Other Liquefaction Associated Hazards

Potential hazards associated with liquefaction include lateral spreading and slow slides, foundation bearing failure, and ground surface settlement. Considering the upper 50 feet of the native soils are not likely to liquefy, these hazards are not considered to be design factors for this project.

6.3 Differential Soil Settlement

Differential soil settlement occurs when supporting soils are not uniform in density or classification and seismic shaking causes one type of soil to settle more than the other. When unaccounted for in design, such settlement can result in damage to structures, pavement and subsurface utilities. Based on the subsurface data obtained during the investigation, the on-site soils are relatively uniform, consisting of predominantly medium dense soils that should not be prone to differential settlement under earthquake loading conditions.

Recompaction of the upper site soils is intended to remedy the potential for surficial differential settlement due to structures supported on non-uniform thickness of compacted fill.

Settlement of structures founded on compacted fill will be relatively small, less than 1". Differential settlement is anticipated to be on the order of ½" in a thirty foot span. Most settlement should take place during construction.

7.0 111 STATEMENT

Subsequent to compliance with the recommendations provided in this report and based on the site reconnaissance, subsurface exploration, and laboratory analysis, it is our opinion the proposed structure will be safe from hazards associated with faulting, landslides, slippage, and settlement. The proposed development will not adversely impact the existing geologic stability of adjacent sites.

8.0 EFFECT OF PROPOSED GRADING ON ADJACENT PROPERTIES

It is our opinion that the proposed grading and construction will not adversely affect the stability of adjoining properties provided that grading and construction are performed in compliance with the recommendations presented herein.

9.0 GEOTECHNICAL RECOMMENDATIONS

Based upon the results of our investigation, the proposed development is considered feasible from a geotechnical standpoint provided the recommendations presented herein are incorporated into the design and construction.

Once the structures are in design and building loads are determined, Bruin GSI shall be contacted and allowed to review the recommendations provided and revise as necessary for the specific building plans.

In addition, If variations of changed conditions are encountered during construction, Bruin GSI should be contacted to evaluate their effects on these recommendations. The following geotechnical engineering recommendations for the proposed development are based on observations from the field investigation program and the laboratory test results and our experience with sites of similar conditions.

The local Department of Building and Safety should be contacted prior to start of construction to assure the project is properly permitted and inspected during construction. Any grading performed at the site shall be incompliance with the

recommendations provided in this report, the local building code and the Earthwork and Grading Specifications for Rough Grading presented in Appendix D.

Field observations and testing during rough-grading operations should be provided by the Bruin GSI so a decision can be formed regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the project geotechnical specifications. **Any work related to grading performed without the full knowledge of, and under the supervision of the Geotechnical Consultant, may render the recommendations of this report invalid.**

9.1 Earthwork

Prior to any grading, the site should be cleared and grubbed. All vegetation, trash and debris shall be removed from the area to be graded and should not be incorporated into engineered fill.

Any depressions resulting from removals during grubbing process (trees etc.) shall be observed by the Geotechnical Consultant. Depressions requiring backfill within structural areas will require placement of engineered fill, observed and tested by the Geotechnical Consultant.

9.2 Remedial Grading for Building Pads

Subsequent to clearing and grubbing, the existing native soils shall be excavated to a depth of sixty (60) inches below existing grade or finish grade, whichever is lower. The excavation shall extend a minimum of five (5) feet beyond the limits of the proposed foundations. The bottom of the excavation shall be a level plane.

The Geotechnical Consultant shall inspect the resulting surfaces prior to scarification and fill placement. A minimum of twenty four (24) inches of compacted fill is required beneath the proposed foundations.

Subsequent to approval of the resulting surface by the Geotechnical Consultant, the resulting soil surface shall be scarified an additional six (6) inches, properly moisture conditioned or aerated to near optimum moisture content, and mechanically compacted with heavy compaction equipment to 90% relative compaction as determined by ASTM D 1557 test method. **Compaction shall be verified by testing.**

9.3 Remedial Grading for Flexible Pavement and Exterior Flatwork

Subsequent to clearing and grubbing the site, the existing native soils shall be excavated to a depth of twelve (12) inches below existing grade or finish grade, whichever is lower. The excavation shall extend a minimum of three

(3) feet beyond the limits of the proposed pavement and flatwork. The Geotechnical Consultant shall inspect the resulting surfaces prior to fill placement.

Subsequent to approval of the resulting surface by the Geotechnical Consultant, the resulting soil surface shall be scarified an additional twelve (12) inches, properly moisture conditioned or aerated to near optimum moisture content, and mechanically compacted with heavy compaction equipment to **90% relative compaction** as determined by ASTM D 1557 test method. Compaction shall be verified by testing.

9.4 Fill Placement and Compaction Requirements

Native soils may be used as engineered fill. Materials for engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain rocks greater than 6 inches in maximum dimension.

All native soil fill should be placed in 8-inch-thick maximum lifts measured loose, moisture conditioned or air dried as necessary to achieve near optimum moisture condition, and then compacted in place to a maximum relative compaction of 90 percent as determined in accordance with Test Method ASTM D 1557.

All import soil fill (meeting the requirements of Section 9.6) should be placed in 8-inch-thick maximum lifts measured loose, moisture conditioned or air dried as necessary to near optimum moisture condition, and then compacted in place to a maximum relative compaction of 90 percent as determined in accordance with Test Method ASTM D 1557.

A representative of the project consultant should be present on-site during grading operations to verify proper placement and compaction of all fill, as well as to verify compliance with the other geotechnical recommendations presented herein.

9.5 Fill Slope Construction and Stability

Provided all material is properly compacted as recommended, fill slopes may be constructed at a 2:1 (horizontal to vertical) gradient or flatter. Permanent cut slopes may be constructed at 2:1 or flatter. Fill slopes constructed as recommended at a slope ratio not exceeding 2:1 (horizontal:vertical), are expected to be both grossly and surficially stable and are expected to remain so under normal conditions.

Proper drainage should be planned so water is not allowed to flow over the tops of slopes. The slopes should be planted as soon as possible to minimize erosion and maintenance.

If slopes are planned steeper than 2:1, the Geotechnical Consultant shall be notified for slope stability determinations.

9.6 Imported Soils

If imported soils are required to complete the planned grading, these soils shall be free of organic matter and deleterious substances, meeting the following criteria:

- 100% passing a 2-inch sieve
- 60% to 100% passing the #4 sieve
- no more than 20% passing a #200 sieve
- expansion index less than 20
- liquid limit less than 35
- plasticity index less than 12

Prospective import soils should be observed, tested and pre-approved by this firm prior to importing the soils to the site. Final approval of the import soil will be given once the material is on site either in place or adequate quantities to finish the grading.

9.7 Native Soil Shrinkage

A shrinkage factor of fifteen to twenty (15-20) percent may be utilized for earthwork quantity calculations. This estimate is based on the limited data collected from the subsurface exploration and laboratory test data with an average degree of compaction of 92 percent and may vary depending on contractor methods.

During compaction, an additional 0.1-foot subsidence of the underlying soil is estimated. Losses from site clearing and grubbing operations mat effect quantity calculations and should be taken into account. Actual shrinkage of the soil may vary.

We recommend monitoring the rough grading excavations by survey with comparison to grading contractor earthwork yardage estimates to determine a closer estimate of actual shrinkage so adjustments (if necessary) may be made during grading.

9.8 Grading Observations and Testing

The grading of the site shall be observed and tested by the Geotechnical Consultant to verify compliance with the recommendations. Any grading performed without full knowledge of the Geotechnical Consultant may render the recommendations of this report invalid.

10.0 POST-GRADING AND DESIGN CONSIDERATIONS

10.1 Pad Drainage

A surface drainage system consisting of a combination of sloped concrete flatwork, swales and sheet flow gradients in landscape areas, and roof gutters and downspouts should be designed for the site. The roof gutters and downspouts should also be tied directly into the proposed area drain system. Drainage from structures should be designed at minimum 2% gradient to approved areas. The purpose of this drainage system will be to reduce water infiltration into the subgrade soils and to direct surface waters away from building foundations, walls and slope areas.

Concrete flatwork surfaces and paved sloped surfaces should be inclined at a minimum gradient of 1 percent away from the building foundations and similar structures. A minimum 12-inch-high berm should be maintained along the top of the descending slope to prevent any water from flowing over the slope.

The owner is advised that all irrigation and drainage devices should be properly maintained throughout the lifetime of the development.

10.2 Foundation Design Recommendations

The proposed structure shall be constructed on a conventional concrete foundation system. Provided the recommendations in this report are incorporated into site development, foundation for load bearing walls and interior columns may be designed as follows:

10.2.1 Allowable Bearing Capacity

Continuous (strip or wall) foundations for the proposed structure may be proportioned for the following values:

Design Values: An allowable "net" bearing capacity of 1,500 p.s.f. can be utilized for dead and sustained live loads. This value includes a minimum safety factor of three, and may be increased by 1/3 for total loads, including seismic forces.

Continuous foundations for single- and two-story structures should be embedded a minimum of 15 and 18 inches, respectively, below the lowest adjacent soil grade and a minimum of 12 inches in width. Actual depth, width, and reinforcement requirements for continuous foundations will be dependent on applicable sections of the governing building code and requirements of the structural engineer.

The allowable bearing capacity for continuous foundations may be increased by 200 psf for each additional six inches of foundation depth and 200 psf for each additional one foot of foundation width. The allowable bearing capacity should not exceed 2,100 p.s.f. for continuous foundations to keep estimated settlements within allowable limits.

Isolated pad (column) foundations for the proposed single-story structure may be proportioned for the following values:

Design Values: An allowable "net" bearing capacity of 1,800 p.s.f. can be utilized for dead and sustained live loads. This value includes a minimum safety factor of three, and may be increased by 1/3 for total loads, including seismic forces.

Isolated pad foundations for single- and two-story structures should be embedded a minimum of 18 and 24 inches, respectively, below the lowest adjacent soil grade and be a minimum of 24 inches square. Actual depth, width, and reinforcement requirements for isolated pad foundations will be dependent on applicable sections of the governing building code, and requirements of the structural engineer.

The allowable bearing capacity for isolated pad foundations may be increased by 200 psf for each additional six inches of foundation depth and 200 psf for each additional one foot foundation width. The allowable bearing capacity should not exceed 2,100 p.s.f. for isolated pad foundations to keep estimated settlements within allowable limits.

10.2.2 Lateral Load Resistance

Lateral load resistance for the spread footings will be developed by passive soil pressure against sides of footings below grade and by friction acting at the base of the concrete footings bearing on compacted fill. An allowable passive pressure of 275 psf per foot of depth may be used for design purposes. An allowable coefficient of friction 0.30 may be used for dead and sustained live load forces to compute the frictional resistance of the footings constructed directly on compacted fill. Safety factors of 2.0 and 1.5 have been incorporated in development of allowable passive and frictional resistance values, respectively. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

10.2.3 Footing Reinforcement

Reinforcement for footings should be designed by the structural engineer based on the anticipated loading conditions and expansion

index of the supporting soil. Preliminary expansion index for the native soil is categorized as "very low" as determined by ASTM D 4829. Footings should be reinforced with a minimum of two No. 4 bars, one top and one bottom.

Based on the preliminary chemical analysis performed on a sample of the native soil, foundation concrete shall consist of type II cement with a minimum compressive strength of 2,500 psi as indicated in the ACI 318 Table 4.3.1. A higher compressive strength may be required by the structural engineer. Additional soil chemical analysis during grading is recommended.

10.2.4 Footing Observations

All footing trenches should be observed by a representative of the project geotechnical consultant to verify that they have been excavated into competent soils prior to placement of forms, reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, sloughed or moisture-softened soils and/or any construction debris should be removed prior to placing of concrete. **Excavated soils derived from footing and/or utility trenches should not be placed in building slab-on-grade areas or exterior concrete flatwork areas unless the soils are compacted to at least 90 percent of maximum dry density.**

10.2.5 Foundation Setbacks

Footings of structures (including retaining walls) located above a slope having a total height of 10 feet or less should have a minimum setback of 5 feet, measured from the outside edge of the footing bottom along a horizontal line to the face of the slope. For footings above slopes having a total height greater than 10 feet, the setback should be, at minimum, equal to one third of the total height of the slope but need not exceed 40 feet. Refer to the IBC Table 1805.3.1.

10.3 RETAINING WALLS AND WALLS BELOW GRADE

The project may include shallow retaining walls or walls below grade supporting soil materials. These walls are anticipated to be shallow (i.e., approximately 8 feet or less in height). Design lateral earth pressures, backfill criteria, and drainage recommendations for walls below grade are presented.

10.3.1 Lateral Earth Pressures

*	Driving Earth Pressure*	Resisting Earth Pressure*
Well-drained soil	40	275**
Well-drained soil (2:1 backfill)	63	
At-rest (restrained wall)	60^	

*Equivalent fluid pressure (PSF) per foot of soil height

^For design purposes, a wall is considered restrained if it prevented from movement greater than 0.002H (H= height of wall in feet) at the top of the wall.

**The upper one foot of soil should be subtracted from the depth Z, unless confined by pavement or slab. This is an ultimate value.

Note: The pressures recommended above are based on the assumption that the backfill will be compacted to 90% relative compaction.

Friction acting along the base of the foundation may provide resistance to lateral loading. The coefficient of friction is estimated to be 0.30 for native soils compacted to 90% relative compaction, and may be used with dead loads. This value may be increase by 1/3 for total loads, including seismic forces. Frictional and passive resistance may be combined without reduction.

The above values are for retaining walls that have been supplied with a proper subdrain system. All walls should be designed to support any adjacent structural surcharge loads imposed by other nearby walls or footings in addition to the above recommended active and at-rest earth pressures.

10.3.2 Wall Backfill

Backfill behind shallow retaining walls or walls below grade should consist of non-expansive granular materials. Wall backfill should not contain organic material, rubble, debris, and rocks or cemented fragments larger than 3 inches in greatest dimension. In the case

where no shoring was used, the granular backfill should extend outward from the base of the wall to ground surface at a 1:1 (horizontal:vertical) slope.

Backfill should be placed in lifts not exceeding 8 inches in thickness measured loose, moisture conditioned to above optimum moisture content, and mechanically compacted with hand-operated equipment to minimum 90 percent of the maximum dry density as determined by ASTM D 1557. Walls below grade that are not free to deflect should be properly braced prior to placement and compaction of backfill.

10.3.3 Drainage and Waterproofing

Walls designed for drained earth pressures shall have adequate drainage provided behind the walls. Subdrains at the base of the walls shall be incorporated into design. Wall backdrains shall be designed by a registered Civil Engineer

11.0 CORROSION AND CHEMICAL ATTACK

Soluble sulfate, pH, resistivity and chloride concentration test results are presented in Appendix B. The Resistivity (CTM 643) test results on a bulk soil sample from the site indicated that on-site soils are not corrosive when in contact with ferrous material (9,000 and 12,000 ohm-cm).

Corrosion test results also indicate that the surficial soils at the site have negligible sulfate attack potential (45 and 33 ppm) on concrete, according to the ACI 318 Table 4.3.1. Type II cement should be used in all concrete that may be in contact with the on-site soils. The minimum concrete compressive strength should be determined by the structural engineer.

Chemical test results performed on bulk soil samples obtained during the field investigation are presented in Appendix C.

Additional soil samples should be obtained during grading to verify soil chemistry.

12.0 UTILITY TRENCH BACKFILL

The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for "Excavations, Trenches, and Earthwork." Trenches or excavations greater than five (5) feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

Soil backfill around foundations or behind walls below grade should be placed in lifts not exceeding eight (8) inches measured loose, moisture conditioned to near optimum moisture content and mechanically compacted to 90% relative compaction as determined by ASTM D 1557 test method. No flooding or jetting will be allowed.

Trench backfill shall be moisture conditioned to near optimum moisture content, placed in lifts not exceeding eight (8) inches measured loose, and mechanically compacted to 90% relative compaction as determined by ASTM D 1557 test method. **No flooding or jetting will be allowed**

Backfill of public utilities within road right-of-ways or on the subject site should be placed in strict conformance with the requirements of the governing agency.

For purposes of this section of the report, "bedding" is defined as material placed in a trench up to one (1) foot above a utility pipe, and "backfill" is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand proposed for use as bedding should be tested in our laboratory to verify its suitability and measure its compaction characteristics. **Sand bedding should be compacted by mechanical means to achieve at least 90% relative compaction based on ASTM D 1557.**

Backfill operations should be observed and tested by the Geotechnical Consultant to monitor compliance with these recommendations.

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 approximately 8 inches in thickness measured loose, watered 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 probe and test the backfills to verify adequate compaction.

Where utility trenches enter the footprint of the building, they should be backfilled through their entire depths with on-site fill materials, sand-cement slurry, or concrete rather than with any sand or gravel shading. This "Plug" of less- or non-permeable materials will mitigate the potential for water to migrate though the backfilled trenches from outside of the building to the areas beneath the foundations and floor slabs.

13.0 INTERIOR CONCRETE SLAB-ON-GRADE

13.1 Moisture Barrier

Slab-on-grade to receive flooring (carpet, tile etc.) shall be underlain by a 10 mil. vapor barrier. The vapor barrier shall be lapped a minimum of five feet

and all laps shall be sealed. Two (2) inches of clean sand shall be placed over the vapor barrier for protection and to aid in curing the concrete. The sand shall be moistened prior to concrete placement.

13.2 Thickness and Joint Spacing

Concrete slab-on-grade should be at least 4 inches thick and provided with construction joints or expansion joints every 8 feet or less. The slab-on-grade should have a minimum compressive strength of 2,500 psi at 28 days.

13.3 Reinforcement

Reinforcement should be provided with No. 3 bars spaced 24 inches on centers, both ways. The reinforcement should be positioned near the middle of the slabs by means of concrete chairs or brick.

13.4 Subgrade Preparation

As further measure to minimize cracking of concrete flatwork, the subgrade soils below concrete flatwork areas should first be compacted to a minimum relative compaction of **90 percent** and then thoroughly moistened to achieve a moisture content that is near optimum moisture content. Pre-wetting of the soils will promote uniform curing of the concrete and minimize the development of shrinkage cracks. **A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soils, and the depth or moisture penetration prior to pouring concrete.**

14.0 NON-STRUCTURAL EXTERIOR CONCRETE FLATWORK

14.1 Thickness and Joint Spacing

To reduce the potential of unsightly cracking, concrete sidewalks, patio-type slabs should be at least 4 inches thick and provided with construction joints or expansion joints every 8 feet or less. The slab-on-grade should have a minimum compressive strength of 2,000 psi at 28 days.

14.2 Reinforcement

Consideration should be given to reinforcing all concrete patio-type slabs and sidewalks greater than 5 feet in width with No. 3 bars spaced 24 inches on centers, both ways, or 6x6-10/10 welded wire mesh. The reinforcement should be positioned near the middle of the slabs by means of concrete chairs or brick.

14.3 Subgrade Preparation

As further measure to minimize cracking of concrete flatwork, the subgrade soils below concrete flatwork areas should first be compacted to a minimum relative compaction of **90 percent** and then thoroughly moistened to achieve a moisture content that is near optimum moisture content. Pre-wetting of the soils will promote uniform curing of the concrete and minimize the development of shrinkage cracks. **A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soils, and the depth or moisture penetration prior to pouring concrete.**

15.0 PRELIMINARY FLEXIBLE PAVEMENT DESIGN

Asphalt concrete pavements shall be designed per the Caltrans Highway Design Manual based on R-Value and Traffic Index.

An assumed R-value of the native soil of 40 was utilized for the preliminary structural pavement section. On-site and any imported soils should be tested during grading for R-Value determination during grading.

For pavement design, the preliminary flexible pavement layer thickness is as follows:

RECOMMENDED ASPHALT PAVEMENT SECTION LAYER THICKNESS

Pavement Material	Recommended Thickness (TI = 5.0) Interior Streets (R/W=60')
Asphalt Concrete	4"
Class II Aggregate Base	4"
Compacted Subgrade Soils	24"

Pavement Material	Recommended Thickness (TI = 6.0) Interior Streets (R/W=64')
Asphalt Concrete	4"
Class II Aggregate Base	6"
Compacted Subgrade Soils	24"

Pavement Material	Recommended Thickness (TI = 8.0) Minor Arterial (R/W=80')
Asphalt Concrete	4"
Class II Aggregate Base	9"
Compacted Subgrade Soils	24"

Asphalt concrete should conform to Sections 203 and 302 of the latest edition of the Standard Specifications for Public Works Construction ("Greenbook").

Class II aggregate base should conform to Section 26 of the Caltrans Standard Specifications, latest edition. The aggregate base should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557.

Additional soil samples of the finish subgrade soils shall be obtained during grading for R-value testing and pavement section calculations to verify street structural sections and submitted to the governing agency for review.

16.0 CONSTRUCTION CONSIDERATIONS

Based on our field exploration program, earthwork can be performed with conventional construction equipment.

16.1 Temporary Dewatering

Groundwater was not encountered in any of our trenches to the maximum depth of our explorations. Based on the anticipated excavation depths, the need for temporary dewatering is considered low.

16.2 Construction Slopes

Excavations during construction should be conducted so that slope failure and excessive ground movement will not occur. The short-term stability of excavation depends on may factors, including slope angle, engineering characteristics of the subsoils, height of the excavation and length of time the excavation remains unsupported and exposed to equipment vibrations, rainfall and desiccation.

Where spacing permits, and providing that adjacent facilities are adequately supported, open excavations may be considered. In general, unsupported slopes for temporary construction excavations should not be expected to

stand at an inclination steeper than 1:1 (horizontal:vertical). The temporary excavation side walls may be cut vertically to a height of 3 feet and then laid back at a 1:1 slope ratio above a height of 3 feet.

Surcharge loads should be kept away from the top of temporary excavations a horizontal distance equal to at least one-half the depth of excavation. Surface drainage should be controlled along the top of temporary excavations to preclude wetting of the soils and erosion of the excavation faces. Even with the implementation of the above recommendations, sloughing of the surface of the temporary excavations may still occur, and workmen should be adequately protected from such sloughing.

If site conditions do not provide sufficient space for sloped excavations at the project site, slot cutting techniques in a repeating "ABC" sequence may be required. First, all the slots designated as "A" should be excavated, backfilled and recompacted. The procedure should continue with the "B" slots and end with the "C" slots. The width of each slot should not exceed 5 feet. If any evidence of potential instability is observed, revised recommendations such as narrower slot cuts may be necessary. All slot excavation and backfilling procedures should be performed under the observation and testing of a qualified geotechnical engineer.

16.3 Temporary Shoring

If shoring is considered, Bruin GSI should be notified in order to provide appropriate design parameters.

17.0 ADDITIONAL SERVICES

Final project plans and specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. This report is based on the assumption that an adequate testing and inspection program along with client consultation will be performed during final design and construction phases to verify compliance with the recommendations of this report.

Retaining Bruin GSI as the geotechnical consultant to provide additional services from preliminary design through project completion will assure continuity of services.

Additional services include:

- Consultation during design stages of the project.
- Review, stamp and signature of the grading and building plans.
- Observation and testing during rough grading, fine grading and trench backfill as well as placement of engineered fill.
- Consultation as required during construction.

Cost estimates can be prepared if requested. Please contact our office.

18.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is based on the conceptual development plans provided to our office. If structure design changes or structure locations changes occur, the conclusion and recommendations in this report may not be considered valid unless the changes are reviewed and the conclusions of this report are modified or approved by the Geotechnical Consultant.

The subsurface conditions and characteristics described herein have been projected from individual borings or test pits placed across the subject property. Actual variations in the subsurface conditions and characteristics may occur.

If conditions encountered during construction differ from those described in this report, this office should be notified so as to consider the necessity for modifications. No responsibility for construction compliance with the design concepts, specifications, or recommendations is assumed unless on-site construction review is performed during the course of construction, which pertains to the specific recommendations contained herein.

It is recommended that Bruin GSI be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design specifications. If Bruin GSI is not accorded the privilege of making this recommended review, Bruin GSI can assume no responsibility for misinterpretation of the recommendations contained in this report.

This report has been prepared in accordance with generally accepted practice and standards in this community at this time. No warranties, either expressed or implied, are made as to the professional advice provided under the terms of the agreement and included in this report. This report has been prepared for the exclusive use of Royal Investors Group LLC. and their authorized agents. Unauthorized reproduction of any portion of this report without expressed written permission is prohibited.

If parties other than Bruin GSI are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

19.0 CLOSURE

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretations of the limited data obtained from our field and laboratory programs; (2) based upon an interpolation of soil conditions between and beyond the borings; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during the grading, infrastructure installation and building phases of site development.

APPENDIX A

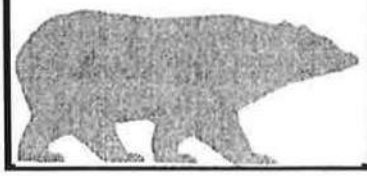
Exacavtion Logs and Classification Key

Boring Log: B1

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 30' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6678	**Longitude:** 118.2548

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown very silty fine to medium sand moist, med. dense		24-27	110.6	6.3
5'		SM	Yellowish brown silty fine to medium sand moist		14-30	DIST.	4.0
		SM	Strong brown sitly fine to medium sand w/ occ. coarse sand (cemented) moist, very dense		34-50	124.5	6.6
10'		SM	Moderate brown silty fine to coarse sand occ # 4-1/2" gravel moist, med. dense		25-40	123.2	6.8
15'		SM	Strong brown very silty fine to medium sand w/ clay binder moist, very dense		30-43	127.4	7.9
20'		SM	Yellowish brown silty fine to medium sand w/coarse sand moist, med. dense		19-17	115.9	11.4
25'		SM	Moderate brown slightly silty fine to coarse sand w/ occ # 4 gravel slightly moist, med. dense		19-35	113.1	7.2
30'		SM/SP	Moderate brown slightly silty fine to medium sand occ coarse sand w/#4 gravel (slightly cemented) moist, med. dense		45-50/4"	114.4	5.3

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test Boring terminated @ 30' bgs
Dist= Disturbed No ground water No caving



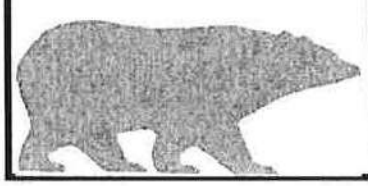
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B2

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6699	**Longitude:** 118.2547

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Moderate brown silty fine to medium sand w/ coarse sand moist, med. dense		28-50		4.5
		SM	Strong brown silty fine to medium sand occ. coarse sand (slightly cemented) moist, med. dense		11-12-11		4.3
10'		SM	Moderate brown silty fine to medium sand moist, med. dense		9-11-14		6.2
15'		SM	Moderate brow silty fine to medium sand moist, med. dense		5-10-12		5.9
20'			Boring terminated @ 15' bgs No groundwater No caving All samples = SPT				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



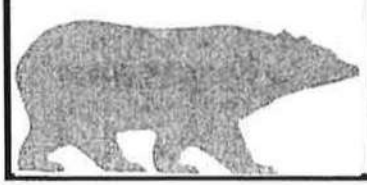
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B3

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6705	**Longitude:** 118.2563

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown silty fine to medium sand w/ coarse sand (slightly cemented) moist, med. dense		15-28-40		5.9
5'		SM	Moderate brown silty fine to medium sand occ. coarse sand		22-25-26		4.1
		SM	Moderate brown silty fine to medium sand w/ coarse sand w/ caliche (cemented) moist, med. densee		21-29-23		5.4
10'		SM	Moderate brown silty fine to medium sand w/ coarse sand & caliche (cemented) moist, med. densee		10-14-40		6.9
15'			Boring terminated @ 10' bgs No groundwater No caving All samples = SPT				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



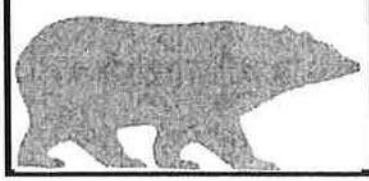
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B4

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6681	**Longitude:** 118.2569

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown silty fine to medium sand w/occ. coarse sand moist, med.dense		17-27	110.4	4.5
5'		SM	Yellowish brown silty fine to coarse sand (cemented) moist, med.dense		37-50/4"	109.3	4.4
		SM	Strong brown silty fine to coarse sand w/occ. # 4 gravel & clay binder moist, dense		33-50/5"	128.0	6.6
10'		SM	Yellowish brown silty fine to coarse sand w/occ. # 4 gravel moist, med.dense		15-30	117.0	6.2
15'		SM	Strong brown silty fine to medium sand w/occ. coarse sand moist, med. dense		20-37	126.7	8.8
20'			Boring terminated @15' bgs No groundwater No caving				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



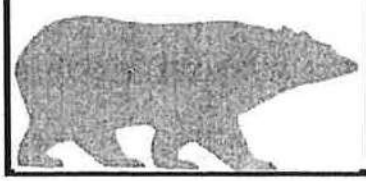
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B5

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 20' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6685	**Longitude:** 118.2588

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown silty fine to medium sand w/occ. coarse sand moist, med. dense		10-11-14		4.0
5'		SM	Moderate brown silty fine to medium sand w/ coarse sand (slightly cemented) moist, med. dense		16-20-24		4.4
10'		SM	Yellowish brown silty fine to medium sand (slightly cemented) moist, med. dense		14-18-16		4.8
15'		SM	Yellowish brown silty fine to medium sand w/occ. coarse sand & clay binder moist, med. dense		8-16-18		6.8
20'		SM/ML	Yellowish brown very silty fine to medium sand w/coarse sand moist, med. dense		6-7-8		20.9
25'			Boring terminated @20 ' bgs No groundwater No caving All samples = SPT				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



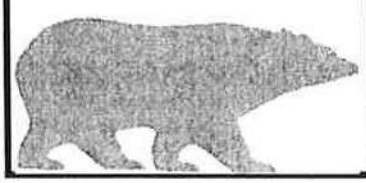
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B6

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 9' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6707	**Longitude:** 118.2591

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Moderate brown silty fine to medium sand w/ coarse sand moist, med. dense		10.13	102.3	4.4
10'		SM	Yellowish brown silty fine to coarse sand (cemented) moist, med. dense		20-27	110.4	6.0
15'		SM	Yellowish brown silty fine to coarse sand (cemented) moist, med. dense Boring terminated @ 9' bgs No groundwater No caving		18/20	112.3	7.5
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



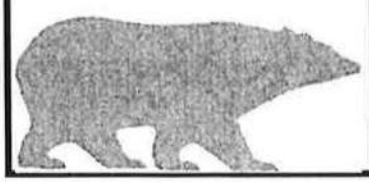
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B7

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6706	**Longitude:** 118.2618

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown slightly silty fine to medium sand moist, med. dense		7-12-17		3.6
5'		SM	Yellowish brown silty fine to coarse sand (slightly cemented) slightly moist, med. dense		17-18-15		2.9
		SM	Yellowish brown silty fine to coarse sand (slightly cemented) moist, med. dense		7-15-15		3.4
10'		ML	Yellowish brown fine to medium sandy silt w/ coarse sad, occ. #4 gravel moist, firm		6-8-8		4.8
15'		ML	Pale brown clayey silt w/ fine to medium sand very moist, firm		4-7-8		14.6
20'			Boring terminated @ 15' bgs No groundwater No caving All samples = SPT				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



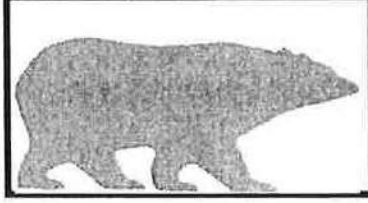
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B8

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6693	**Longitude:** 118.2609

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown slightly silty fine to medium sand w/ coarse sand moist, med. dense		6-12	106.2	4.0
5'		SM	Moderate brown silty fine to medium sand & coarse sand (cemented) moist, dense		35-50/4"	115.6	4.2
10'		SM	Light brown silty fine sand w/ medium sand & oc.c coarse sand (slightly cemented) moist, med. dense		21-31	104.8	5.0
15'			Boring terminated @ 10' bgs No groundwater No caving				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



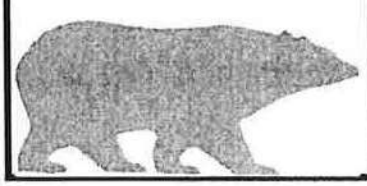
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B 9

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6679	**Longitude:** 118.2621

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brow silty fine to medium sand w/ coarse sand moist, med. dense		8-11-12		4.6
5'		SM	Moderate brown silty fine to coarse sand w/ occ # 4 gravel moist, med. dense		9-12-16		4.2
		SM	Moderate brown slightly silty fine to coarse sand w/ #4 gravel occ 1" gravel moist, med. dense		6-8-8		5.7
10'		SM	Moderate brown slightly silty fine to coarse sand w/ #4 gravel occ 1" gravel moist, med. dense		7-8-9		8.3
15'		SM	Yellowish brown silty fine to medium sand occ coarse sand, clay binder moist, med. dense		6-12-12		9.2
20'			Boring terminated @ 15' bgs No groundwater No caving All samples = SPT				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



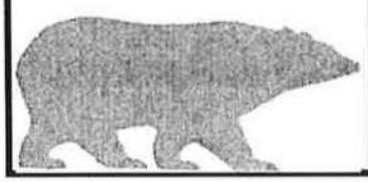
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B10

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 20' bgs
Drive Weight: 140 #	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	Date: 1-21-16
Latitude: 34.6668	**Longitude:** 118.2532

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Yellowish brown silty fine sand w/ medium to coarse sand (cemented) moist, dense		5-50/5"	121.7	5.8
10'		SM	Moderate brown silty fine to medim sand w/ coarse sand (cemented) moist, dense		27-44	125.6	6.4
15'		SM	Reddish brown silty fine to medium sand w/ clay binder very moist, dense		24-50/5"	120.9	13.1
20'		SM	Yellowish brown silty fine to coarse sand w/ # 4 gravel & clay binder moist, dense		10-17	119.5	9.5
25'			Boring terminated @ 20' bgs No groundwater No caving				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



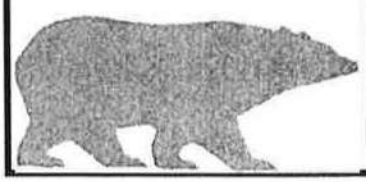
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B11

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10'
Drive Weight 140#	**Logged By:** DBM
Hole Diamete 8" **Drop:** 30"	**Date:** 1/21/16
Latitude: 34.6640	**Longitude:** 118.2526

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown silty fine to medium sand with coarse sand slightly moist, med. Dense		5-7-8		3.4
5'		SM	Moderate brown very silty fine sand with medium sand (slightly cemented) moist, med.dense		5-7-11		5.8
		SM	Yellowish brown very silty fine to medium sand with coarse sand 1/2" gravel (cemented) moist, med. dense		8-12-9		6.6
10'		SM	Yellowish brown silty fine to coarse sand with #4gravel and clay binder moist, med. dense		12-22-40		7.5
15'			Boring terminated @ 10 ' bgs No groundwater No caving All samples = SPT				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



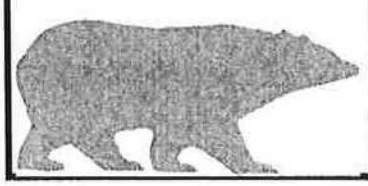
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B12

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6613	**Longitude:** 118.2524

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown slightly silty fine sand with medium sand moist, med. dense		4-6-13		4.8
5'		SM	Strong brown slightly silty fine sand with medium sand moist, med. dense		16-14-13		
		SM	Yellowish brown silty fine to medium sand with coarse sand occ #4 gravel (cemented) moist, med. dense		10-20-35		5.0
10'		SM	Light brown very silty fine to medium sand (cemented) moist, dense		20-30-44		4.0
15'		SM	Strong brown silty fine to medium sand with occ. coarse sand moist, med. dense		7-7-7		7.5
20'			Boring terminated @ 15 ' bgs No groundwater No caving				
25'			All samples = SPT				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



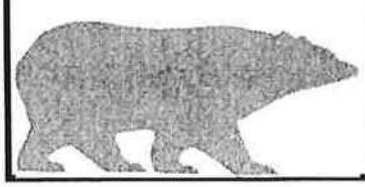
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B13

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 20' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.660 S	**Longitude:** 118.2500

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown silty fine to medium sand with coarse sand (slightly cemented) moist, med. dense		20/37	Dist.	5.2
5'		SM/SP	Moderate brown slightly silty medium to coarse sand with fine sand (cemented) moist, dense		40/50	120.6	7.0
10'		SM	Yellowish brown very silty fine to medium sand with coarse sand and occ. #4 - 3" gravel very moist, dense		50/5"	114.6	9.8
15'		SM	Moderate brown very silty fine to medium sand with coarse sand moist, dense		12/18	121.6	9.2
20'		SM	Moderate brown fine sand with medium to coarse sand moist, dense		10/15	118.4	8.1
25'							
30'			Boring terminated @ 20 ' bgs No groundwater No caving				

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



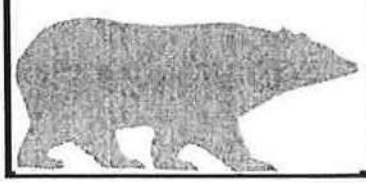
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B14

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 9' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6635	**Longitude:** 118.2494

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Moderate brown silty fine to medium sand with coarse sand (cemented) slightly moist, med. dense		12/10	107.2	3.8
10'		SM	Moderate brown silty fine to moist sand with coarse sand (cemented) moist, med. dense		25/25	112.3	5.6
		SM	Yellowish brown slightly silty fine to medium sand w/coarse sand moist, med. dense		17/17	113.4	7.2
15'			Boring terminated @ 9 ' bgs No groundwater No caving				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



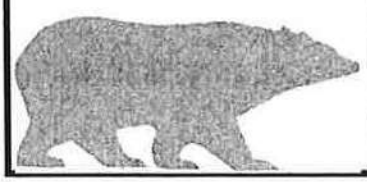
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B15

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6660	**Longitude:** 118.2512

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Moderate brown silty fine to medium sand with coarse sand moist, med. dense		8/15/22		5.3
10'		SM	Moderate brown silty fine to medium sand with coarse sand and occ. #4 gravel moist, med. dense		16/25/24		4.2
15'		SM	Moderate brown silty fine to medium sand with coarse sand and occ. #4 - 3" gravel moist, med. dense		12/15/16		9.2
		SM	Moderate brown silty fine to medium sand with coarse sand (cemented) moist, med. dense		11/12/11		8.3
20'			Boring terminated @ 15 ' bgs No groundwater No caving				
25'			All samples = SPT				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



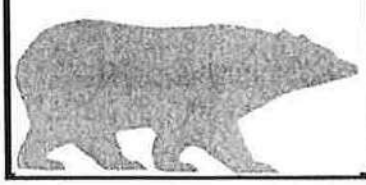
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B16

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6670	**Longitude:** 118.2474

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Dark yellowish brown silty fine to medium sand with coarse sand moist, med. dense		13-17	105.2	6.0
5'		SM	Dark brown sity fine to medium sand with coarse sand moist, med. dense		12-18	109.2	6.3
		SM	Moderate brown slightly silty fine to medium sand with coarse sand (cemented) moist, med. dense		20/50	110.4	12.9
10'		SM	Moderate brown very silty fine to medium sand with coarse sand very moist, med. dense		12-13	113.9	18.2
15'			Boring terminated @ 10 ' bgs No groundwater No caving				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



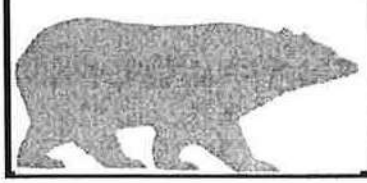
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B17

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 32.6658	**Longitude:** 118.2473

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
5'		SM	Strong brown silty fine to medium sand with coarse sand,(cemented) moist, med. dense		20/37	110.1	4.6
10'		SM	Yellowish brown slightly silty fine to medium sand with coarse sand, (cemented) moist, dense		37/50/4"	Dist.	5.4
		SM	Strong brown slightly silty fine to medium sand with coarse sand (cemented) moist, dense		35/50/4"	128.6	9.2
15'		SM	Strong brown silty fine to medium sand with coarse sand & clay binder moist, med. dense		21/25	N/R	13.3
20'		SM	Strong brown silty fine to medium sand with coarse sand & clay binder moist, med. dense Boring terminated @ 15 ' bgs No groundwater No caving				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test N/R= No Recovery
Dist= Disturbed



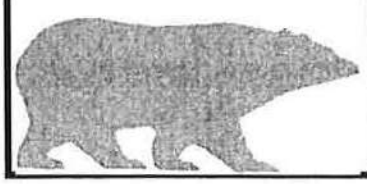
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B18

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 20' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6641	**Longitude:** 118.2474

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Dark brown silty fine to medium sand with coarse sand moist, med. dense		7/9	104.2	3.2
5'		SP/SM	Yellowish brown slightly silty fine to medium sand w/coarse sand and occ. #4 gravel moist, med. dense		9/9	110.4	5.2
		SM	Yellowish brown silty fine to medium sand with coarse sand and occ. #4 gravel moist, dense		28/50 5"	121.4	5.3
10'		SM	Strong brown silty fine to medium sand with coarse sand (cemented) moist, dense		20/17	119.6	3.7
15'		SM	Moderate brown silty fine to medium sand with coarse sand moist, med. dense		15/15	114.6	4.3
20'		SM	Moderate brown silty fine to medium sand w/coarse sand & clay binder moist, med. dense		12/12	116.7	4.9
25'			Boring terminated @ 20' bgs No groundwater No caving				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



BRUIN GEOTECHNICAL SERVICES INC.

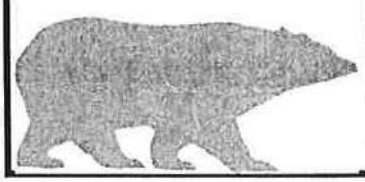
Boring Log: B19

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenuer K-8	**Total Depth:** 30' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6618	**Longitude:** 118.2475

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Light brown silty fine to medium sand with coarse sand				
5'		SM	Dark brown silty fine to medium sand with coarse sand moist, med. dense		10/15	110.1	7.1
10'		SM	Yellowish brown silty fine to medium sand with coarse sand and occ. #4 gravel (cemented) moist, dense		35/50 4"	118.7	6.8
15'		SM	Dark yellowish brown silty fine to medium sand with coarse sand and occ. #4 gravel moist, med. dense		8/10	112.6	7.2
20'		SM	Light brown slightly silty fine to coarse sand with occ. #4 gravel moist, med. dense		12/16	113.8	9.9
25'							
30'		SM	Yellowish brown silty fine to medium sand with coarse sand		19/25/16		6.2

Notes: CSS= Cal. Split Spoon; SPT= Standard Penetration Test; Dist= Disturbed; N/A= Not Analyzed

Boring terminated @ 30 ' bgs
No groundwater
No caving



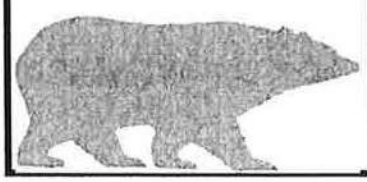
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B20

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6618	**Longitude:** 118.2442

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown slight silty fine to medium sand with coarse sand, (cemented) slightly moist, med. dense		6/10/10		3.5
5'		SM	Moderate brown slight silty fine to medium sand with coarse sand, (cemented) moist, med. dense		6/8/8		4.2
		SM	Moderate brown slightly silty fine to medium sand with coarse sand, (cemented) moist, med. dense		20/21/18		4.6
10'		SM	Dark yellowish brown very silty fine to medium sand with coarse sand moist, dense		12/18/50 5"		7.6
15'			Boring terminated @ 10 ' bgs No groundwater No caving All samples = SPT				
20'							
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



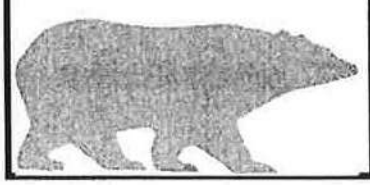
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B21

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6624	**Longitude:** 118.2422

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Yellowish brown silty medium to coarse sand with fine sand moist, med. dense		17/25	115.2	4.4
5'		SM	Yellowish brown silty fine to medium sand with coarse sand (cemented) moist, med. dense		26/46	111.4	5.2
		SM	Yellowish brown silty fine to medium sand with coarse sand (cemented) moist, med. dense		50 6"	112.3	12.6
10'		SM	Yellowish brown silty fine to medium sand with coarse sand (cemented) moist, dense		24/36	124.9	8.7
15'		SM	Yellowish brown silty fine to medium sand with coarse sand med.dense		21/40	122.7	7.3
20'			Boring terminated @ 15 ' bgs No groundwater No caving				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



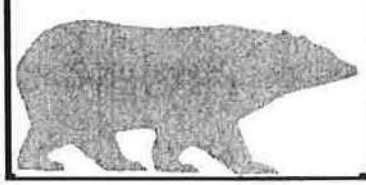
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B22

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6631	**Longitude:** 118.2437

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Dark brown silty fine to medium with coarse sand moist, med. dense		11/2	104.1	4.1%
5'		SM	Dark brown silty fine to medium with coarse sand occ #4 gravel (slightly cemented) moist, med. dense		10/10	108.6	4.0
10'		SM	Moderate brown very silty fine to med. sand with coarse sand, (cemented) very moist, med. dense		21/28	113.4	12.6
15'		SM	Moderate brown very silty fine to medium sand with coarse sand clay		17/17	112.7	13.5
20'			binder (slighty cemente very moist, med. dense Boring terminated @ 15 ' bgs No groundwater No caving				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



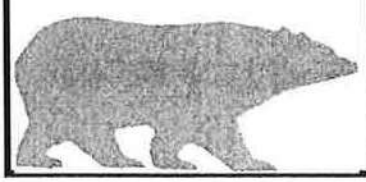
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B23

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6641	**Longitude:** 118.2420

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Moderate brown silty fine.sand with coarse sand moist, med. dense		8/16/28		4.6
5'		SM	Moderate brown silty fine to coarse sand with #4 gravel (cemented) moist, dense		28/34/38		9.3
		SM	Strong brown fine to medium sand, occ. coarse sand moist, med. dense		8/9/10		8.4
10'		SM	Strong brown silty fine to medium sand with coarse sand moist, slightly dense		4/5/6		7.3
15'		SM	Strong brown silty fine to medium sand with coarse sand moist, slightly dense		4/5/6		7.3
20'			Boring terminated @ 15' bgs No groundwater No caving				
25'			All samples = SPT				
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



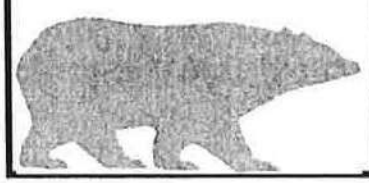
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B24

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 15' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6661	**Longitude:** 118.2446

Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Dark yellowish brown silty fine to medium sand with coarse sand and occ #4 (cemented) moist, med.dense		12/19	105.2	4.2
5'		SM	Dark yellowish brown silty fine to medium sand with coarse sand (cemented) moist, med.dense		27/34	109.7	5.3
		SM	Yellowish brown very silty fine to medium sand with coarse sand and clay binder (cemented) very moist, med.dense		15/20	110.9	17.4
10'		SM	Yellowish brown silty fine-med. sand with coarse sand (cemented) moist, med.dense		35/45	112.4	8.7
15'		SM	Dark yellowish brown silty fine sand with medium coarse sand moist, med.dense		27/39	116.3	9.9
20'			Boring terminated @ 15' bgs No groundwater No caving				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



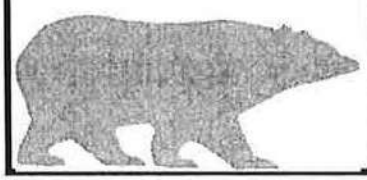
BRUIN GEOTECHNICAL SERVICES INC.

Boring Log: B25

Client: Royal LLC	**Project No:** 14-23
Project: Avanti South	**Drill Type:** CME 75 Drill Rig
Location: 70th Street West & Avenue K-8	**Total Depth:** 10' bgs
Drive Weight: 140#	**Logged By:** DBM
Hole Diameter: 8" **Drop:** 30"	**Date:** 1-21-16
Latitude: 34.6669	**Longitude:** 118.2418

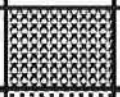
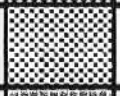
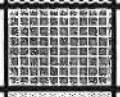
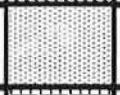
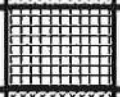
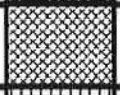
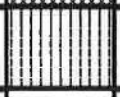
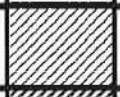
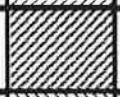
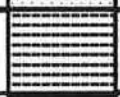
Depth	Sample	USCS	SOIL DESCRIPTIONS	Graphic Symbol	Blow Counts	Dry Density	Moisture %
		SM	Strong brown silty fine sand with coarse sand (cemented) moist, med. dense		10/15/15		6.6
5'		SM	Strong brown silty fine sand with coarse sand (cemented) moist, med. dense		14/24/20		4.7
		SM	Yellowish brown slightly silty fine to medium sand with coarse sand moist, loose		3/4/3		7.1
10'		SP	Dark yellowish brown medium to coarse sand with fine sand moist, loose		1/2/1		6.6
15'			Boring terminated @ 10' bgs No groundwater No caving				
20'			All samples = SPT				
25'							
30'							

Notes: CSS= Cal. Split Spoon N/A= Not Analyzed
SPT= Standard Penetration Test
Dist= Disturbed



BRUIN GEOTECHNICAL SERVICES INC.

SOIL CLASSIFICATION KEY

Major Divisions					Typical Names
Coarse Grained Soils 50% or more larger than #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 gravels, gravel-sand mixtures
			GP		Poorly graded gravels, gravel-sand mixtures
		Gravel 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 50% or more smaller than #200 sieve	**Silts and Clays** Liquid limit less than 50		ML		Inorganic silts, rock flour, clayey silts
			CL		Inorganic clays of low to medium plasticity, sandy clays, silty clays
			OL		Organic clays and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH		Inorganic silts, micaceous or diatomaceous fine sandy/silty soils, elastic silts
			CH		Inorganic clays with high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt		Peat and other highly organic soils
Sample Locations/Designations					In-situ sample/ Cal. Split Spoon or SPT
					Bulk sample

CLASSIFICATION SYSTEM BASED ON UNIFIED SOIL CLASSIFICATION SYSTEM

APPENDIX B

Laboratory Test Data

SUMMARY OF LABORATORY TEST RESULTS

SIEVE ANALYSIS

Percent passing individual sieves

Sample I.D.	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200
B1@4			100	98	93	64	40	28
B1@10			100	99	93	66	46	33
B1@20		100	99	98	89	49	27	20
B2@6			100	99	97	75	52	39
B3@2			100	99	96	69	49	37
B4@4		100	99	99	93	64	42	31
B4@10		100	99	92	83	44	20	13
B5@15		100	99	97	88	56	34	24
B6@3	100	99	99	97	92	59	36	24
B6@9			100	98	93	64	41	29
B7@10		100	98	96	89	58	36	66
B8@1		100	99	98	92	61	36	23
B8@10			100	98	91	60	37	26
B9@5		100	99	96	89	54	30	20
B9@15			100	99	98	76	52	36
B10@10			100	99	89	59	40	29
B10@20	100	99	99	97	90	67	41	31
B11@3		100	99	93	91	68	49	36
B11@8	100	99	97	94	85	60	40	28
B12@6			100	99	95	73	50	36
B12@15		100	99	97	89	76	43	29
B13@5			100	99	91	61	43	34
B13@20			100	99	96	63	39	30
B15@4			100	99	92	66	45	32
B15@12		100	99	98	91	56	37	31
B17@3	100	99	99	99	95	72	44	30
B17@9			100	99	96	73	47	32
B18@8			100	99	93	68	42	30
B19@5			100	99	93	65	43	32

B20@7			100	91	95	70	45	33
B21@3			100	99	92	65	44	34
B22@4	100	99	99	97	91	58	32	22
B23@2			100	99	96	69	43	28
B24@5			100	99	97	78	57	41
B25@4			100	99	97	77	53	42

EXPANSION INDEX

Sample Description	Expansion Index	Expansion Classification*	Sample I.D.
Moderate brown silty fine to medium sand w/ coarse sand (SM)	0	Non-expansive	B8@ 0-5'

*ASTM D 4829

Sample Description	Expansion Index	Expansion Classification*	Sample I.D.
Dark yellowish brown silty fine to medium sand w/ coarse sand, occ. # 4 gravel (SM)	0	Non-expansive	B11@ 0-5'

*ASTM D 4829

Sample Description	Expansion Index	Expansion Classification*	Sample I.D.
Yellowish brown coarse sand fine to medium sand w/silts (SM)	0	Non-expansive	B18@ 0-5'

*ASTM D 4829

MAXIMUM DENSITY / OPTIMUM MOISTURE DETERMINATION

Soil Description	Maximum Density	Optimum Moisture	Sample I.D.
Moderate brown silty fine to medium sand w/ coarse sand (SM)	132.9 pcf	10%	B8@ 0-5'

ASTM D 1557

Soil Description	Maximum Density	Optimum Moisture	Sample I.D.
Dark yellowish brown silty fine to medium sand w/ coarse sand, occ. # 4 gravel (SM)	128.9 pcf	9.2%	B11@ 0-5'

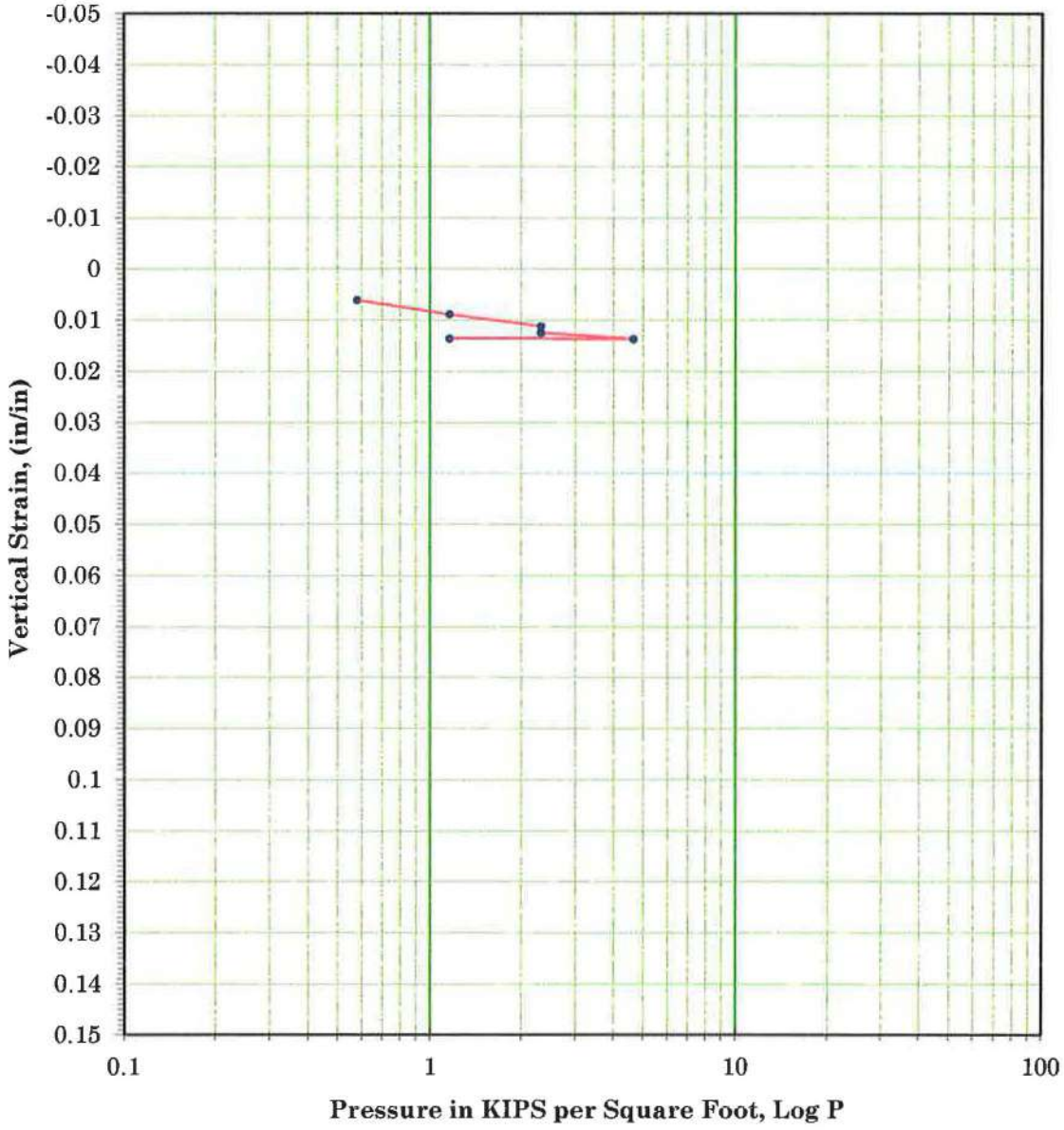
ASTM D 1557

Soil Description	Maximum Density	Optimum Moisture	Sample I.D.
Yellowish brown coarse sand fine to medium sand w/silts (SM)	124.0 pcf	9.2%	B18@ 0-5'

ASTM D 1557

SAND EQUIVALENT

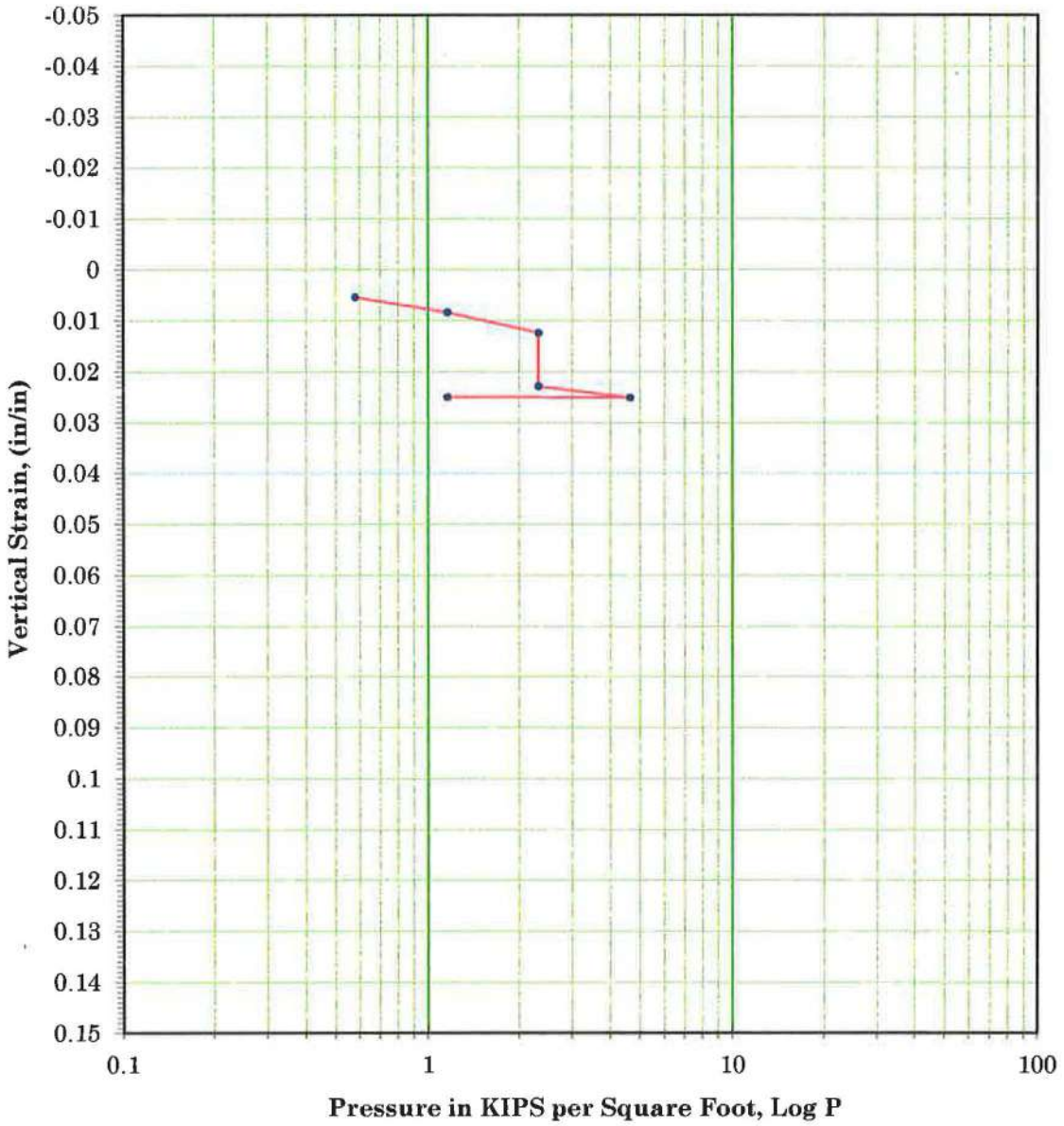
Sample I.D.	Sand Equivalent
B1@4	38
B1@30	65
B3@10	22
B4@6	25
B7@15	22
B10@5	22
B10@4	32
B14@3	33
B15@8	30
B18@20	60
B21@7	52



Sample Location: B1 @ 7'
Material: Silty Sand (SM)
Initial Dry Density: 124.5 PCF
Moisture Content: 6.6%
Percent Hydroconsolidation: 0.1%

* Test Method: ASTM D-2435

Consolidation Test	
Royal LLC	
Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B4 @ 4'

Material: Silty Sand (SM)

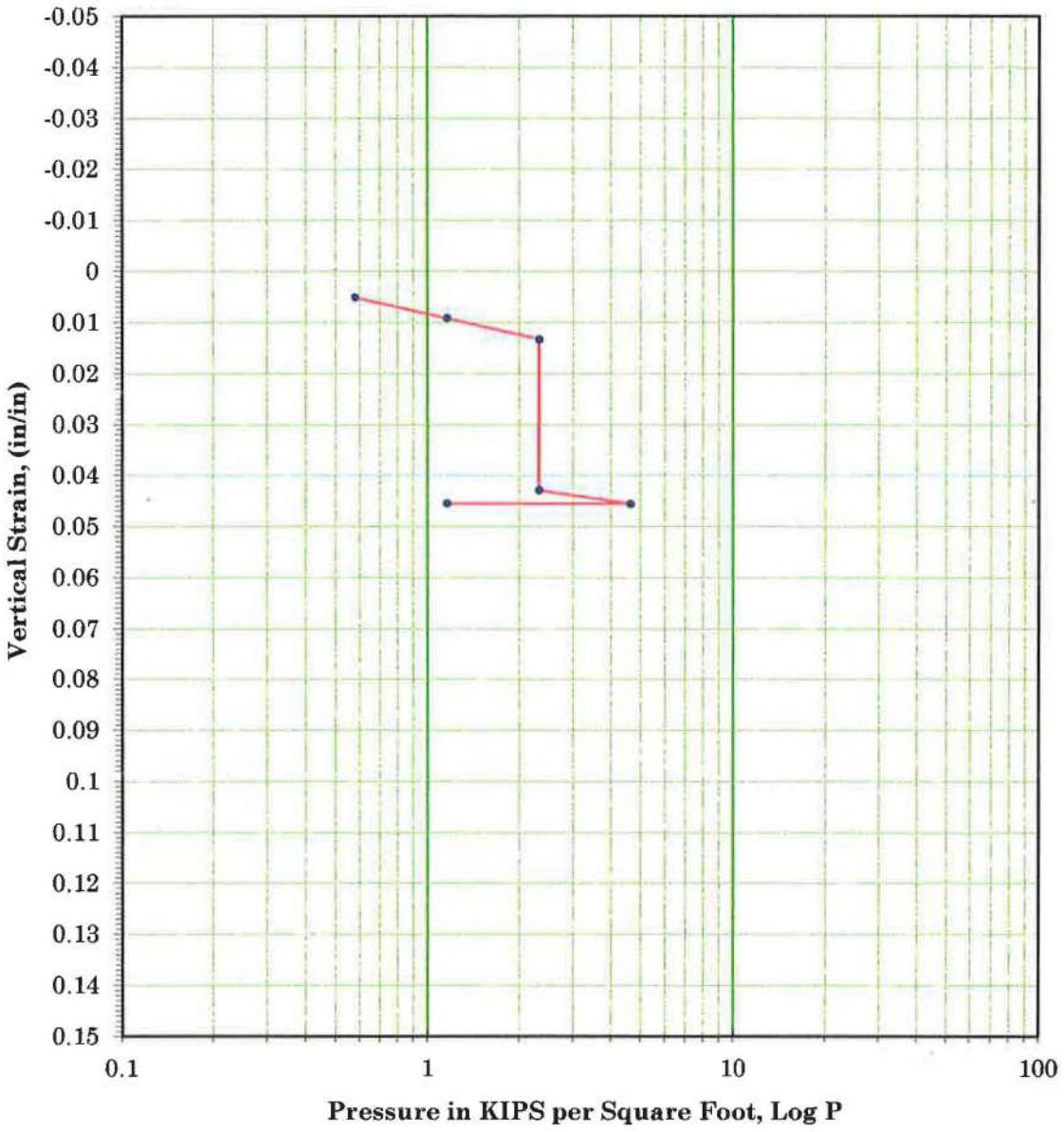
Initial Dry Density: 109.3 PCF

Moisture Content: 4.4%

Percent Hydroconsolidation: 1.1%

* Test Method: ASTM D-2435

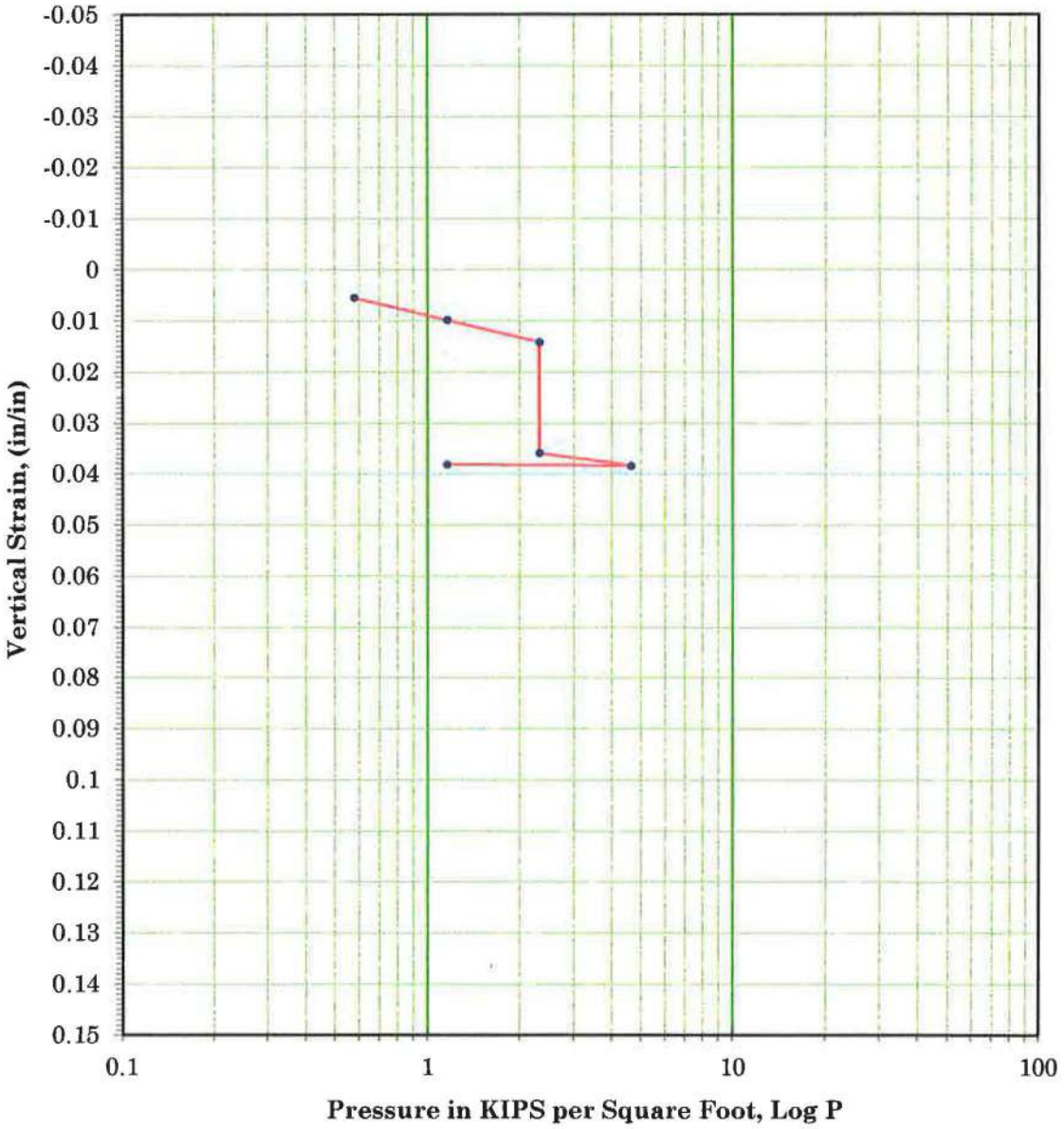
Consolidation Test	
Royal LLC	
Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B6 @ 3'
Material: Silty Sand (SM)
Initial Dry Density: 102.3 PCF
Moisture Content: 4.4%
Percent Hydroconsolidation: 3.0%

* Test Method: ASTM D-2435

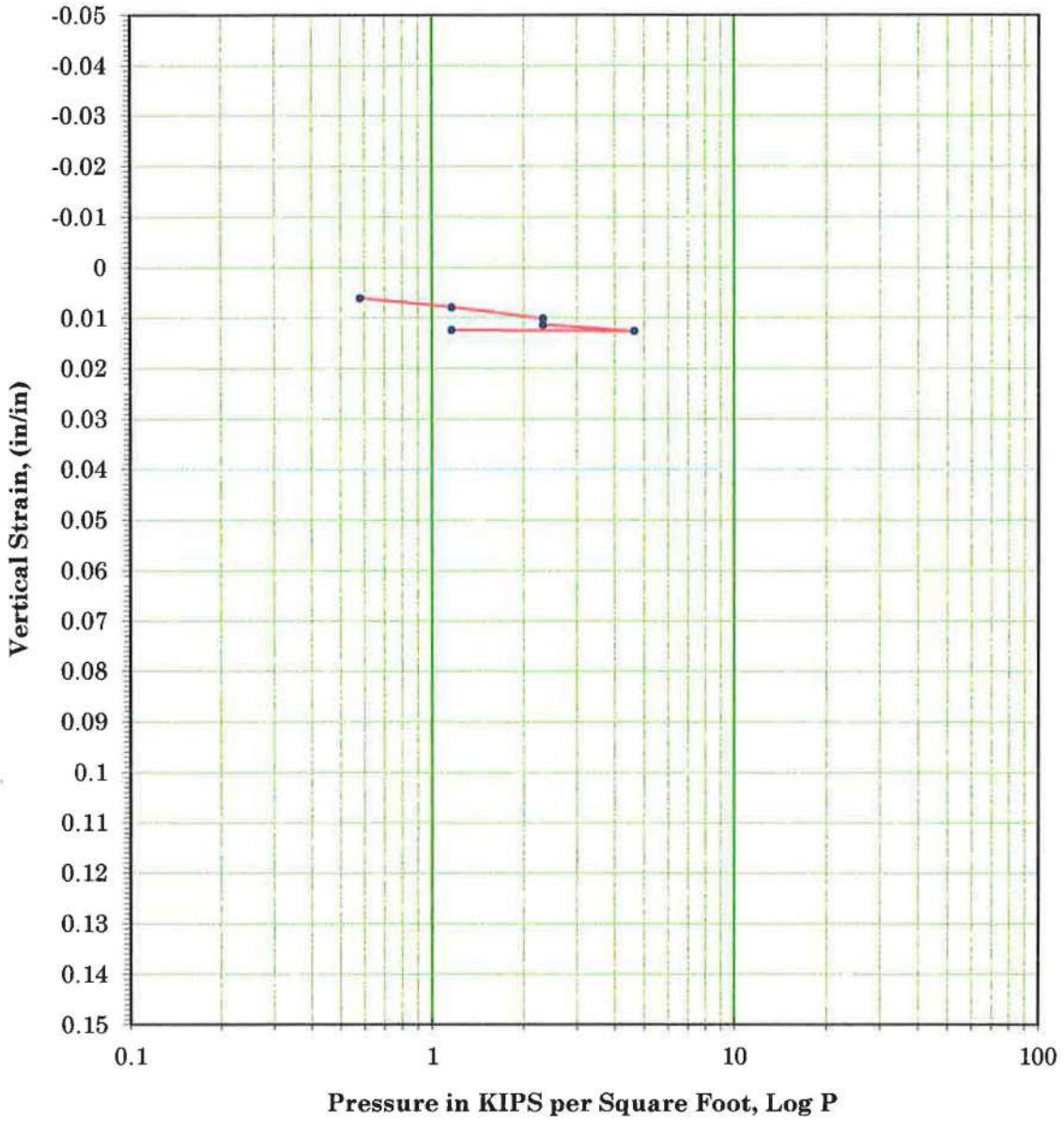
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B8 @ 1'
Material: Silty Sand (SM)
Initial Dry Density: 106.2 PCF
Moisture Content: 4.0%
Percent Hydroconsolidation: 2.2%

* Test Method: ASTM D-2435

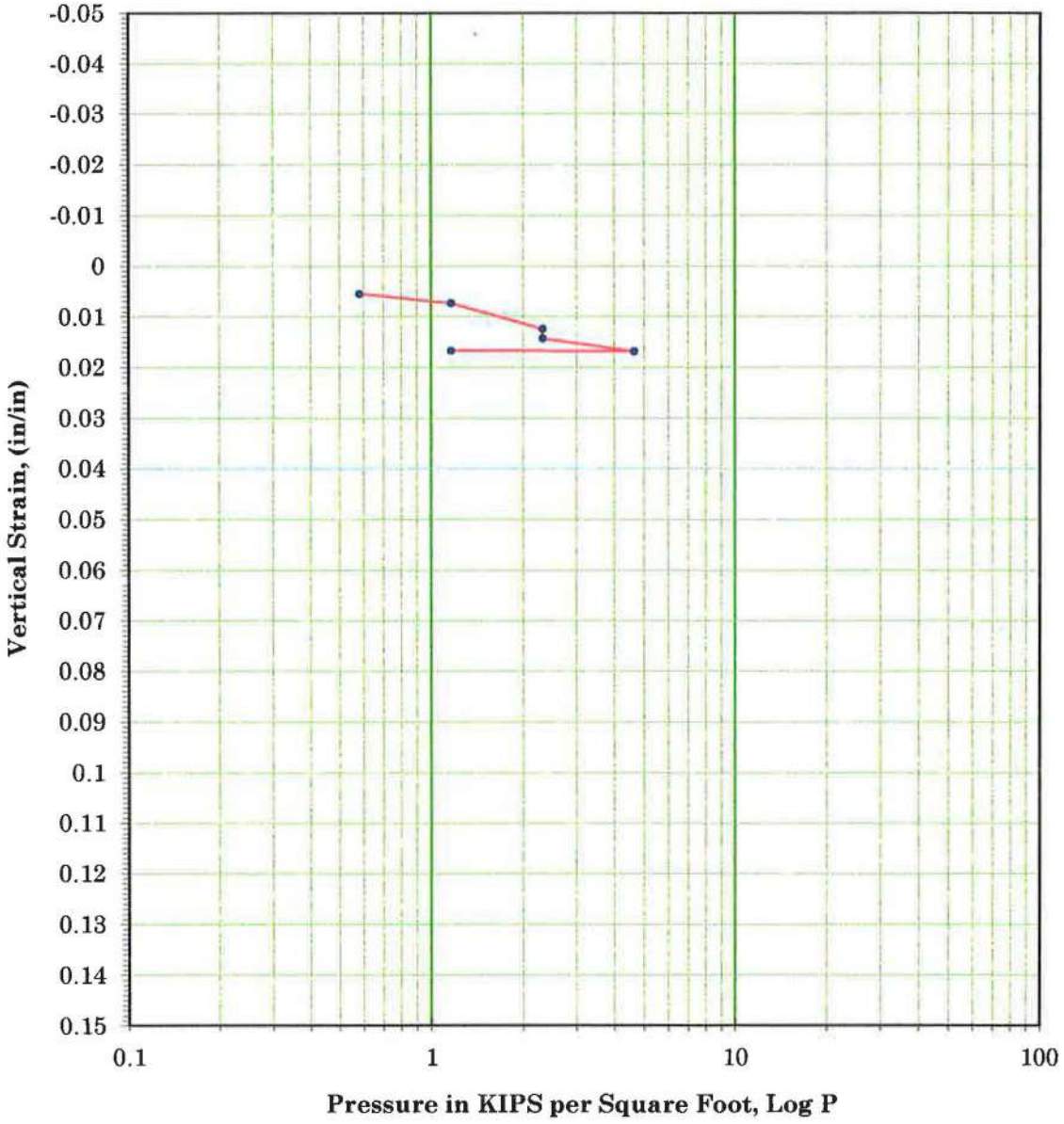
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B10 @ 10'
Material: Silty Sand (SM)
Initial Dry Density: 125.6 PCF
Moisture Content: 6.4%
Percent Hydroconsolidation: 0.1%

* Test Method: ASTM D-2435

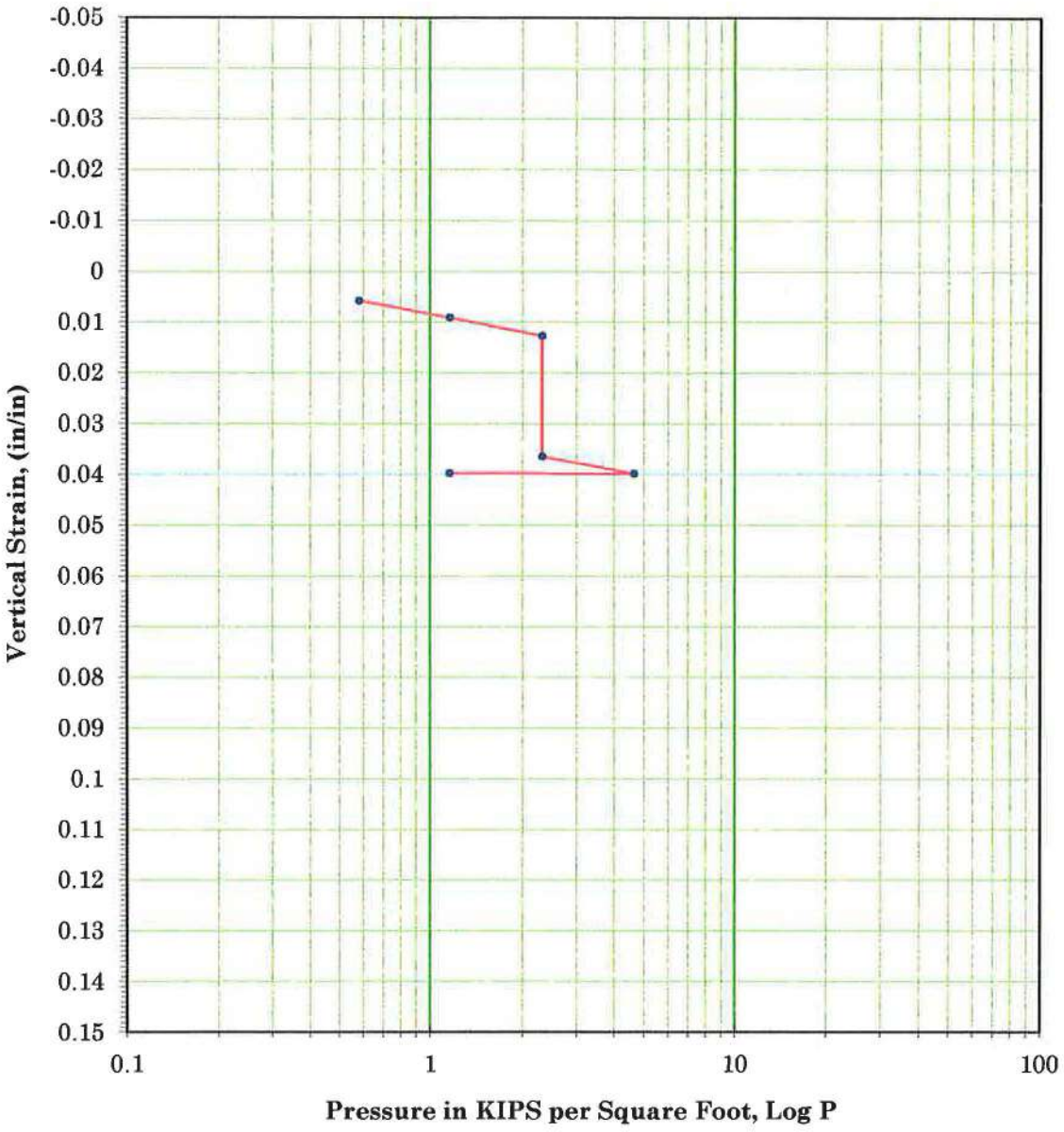
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B13 @ 10'
Material: Silty Sand (SM)
Initial Dry Density: 114.6 PCF
Moisture Content: 9.8%
Percent Hydroconsolidation: 0.2%

* Test Method: ASTM D-2435

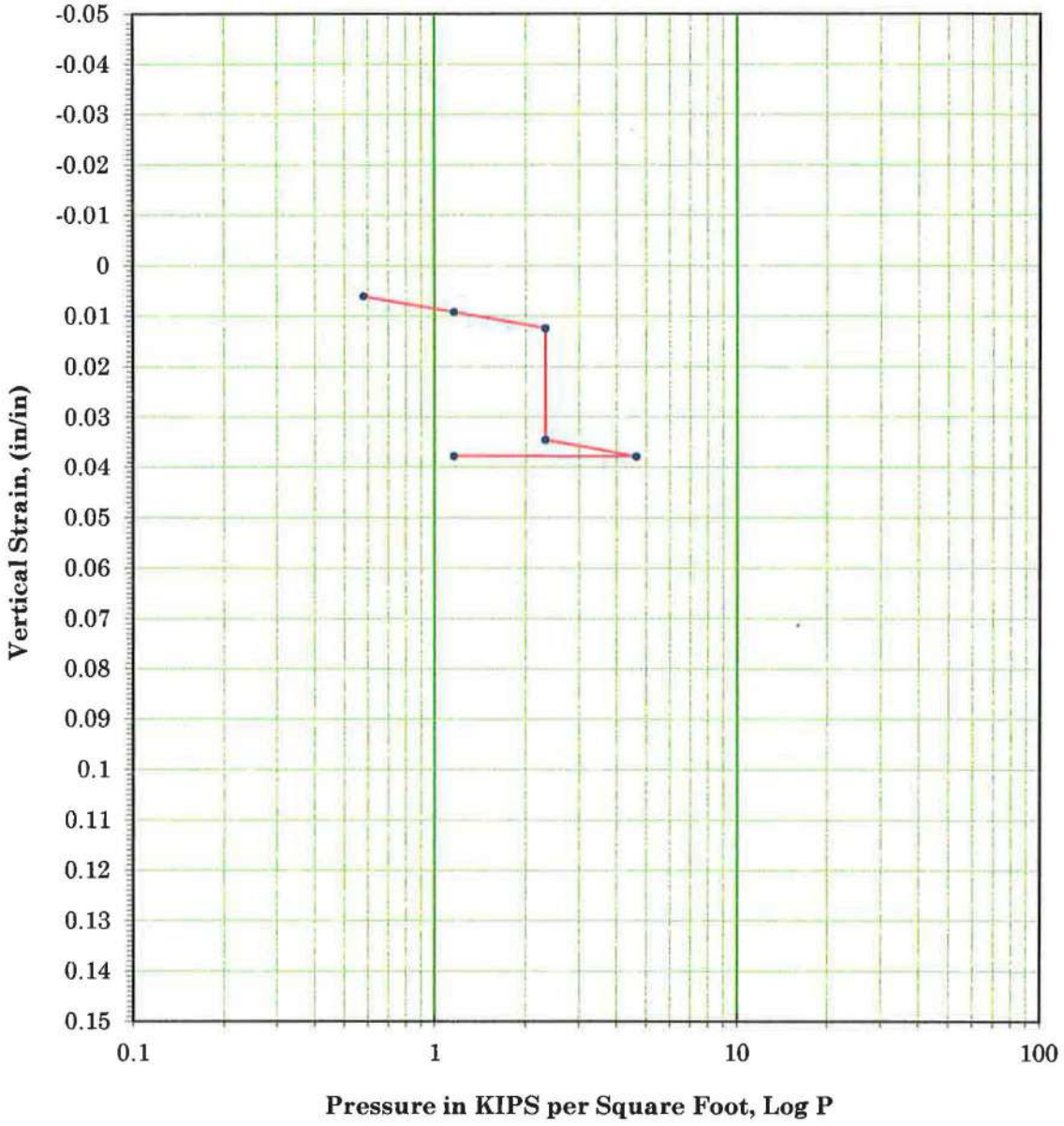
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B14 @ 3'
Material: Silty Sand (SM)
Initial Dry Density: 107.2 PCF
Moisture Content: 3.8%
Percent Hydroconsolidation: 2.4%

* Test Method: ASTM D-2435

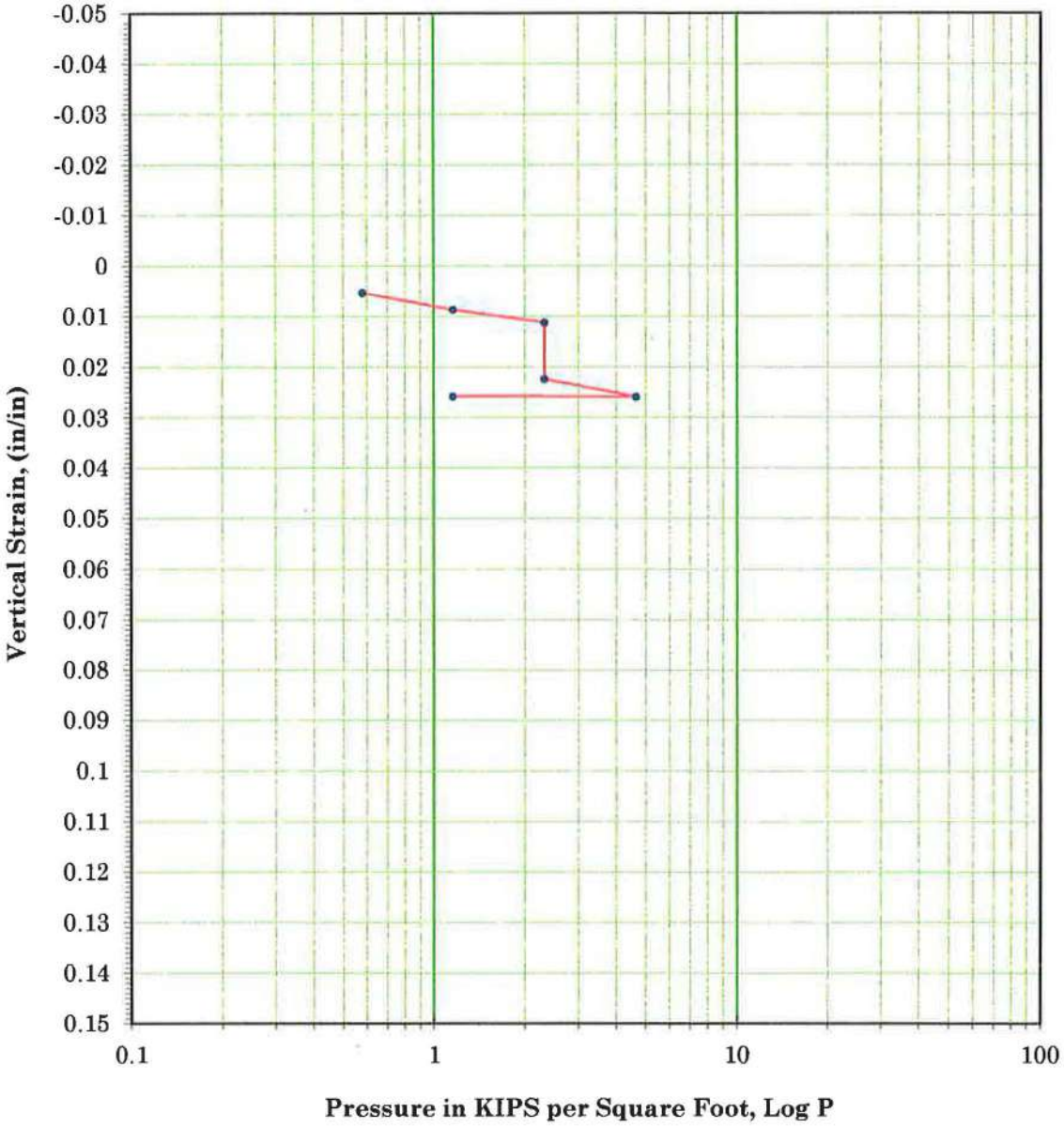
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B16 @ 2'
Material: Silty Sand (SM)
Initial Dry Density: 105.2 PCF
Moisture Content: 6.0%
Percent Hydroconsolidation: 2.2%

* Test Method: ASTM D-2435

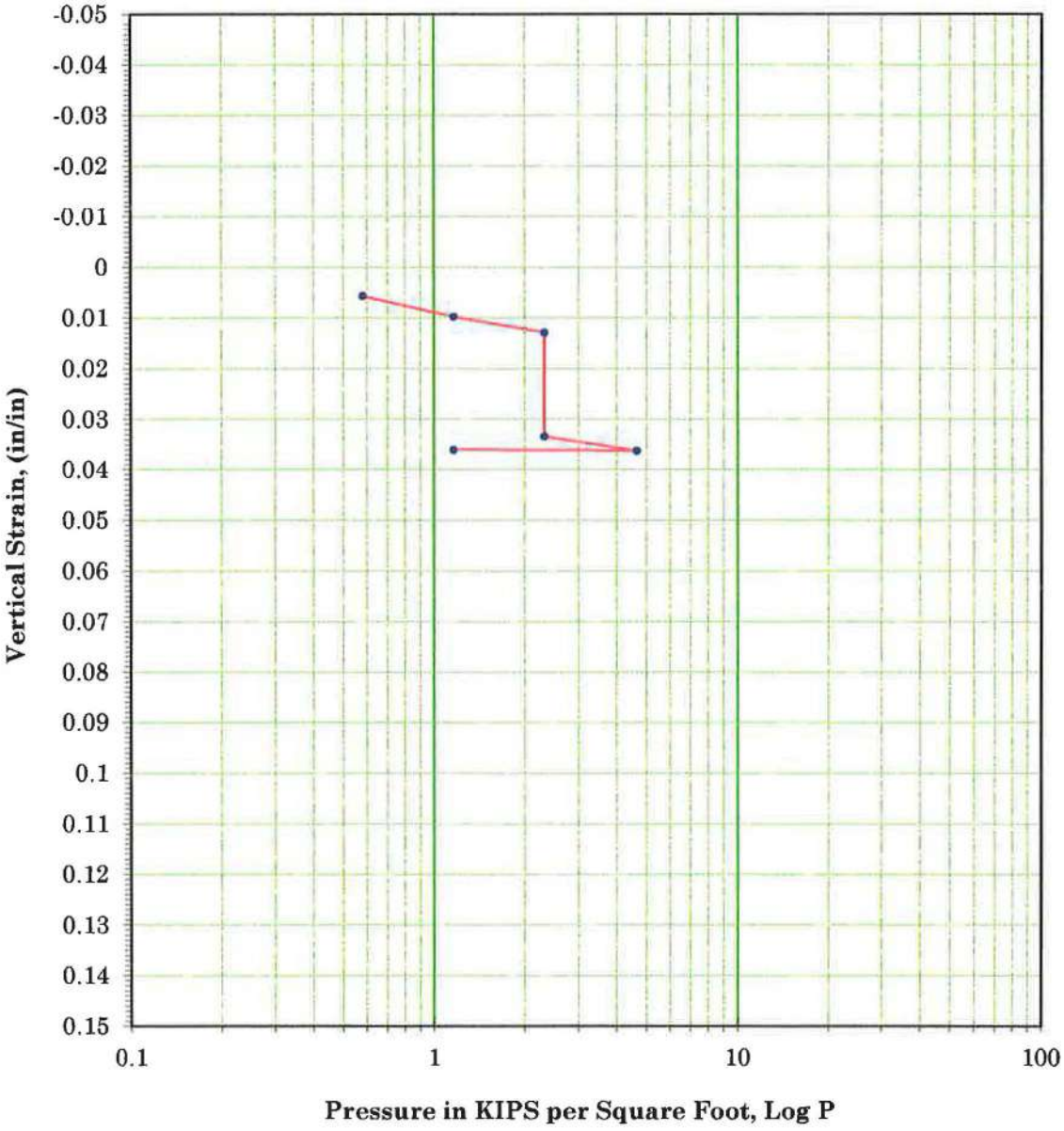
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B19 @ 5'
Material: Silty Sand (SM)
Initial Dry Density: 110.1 PCF
Moisture Content: 7.1%
Percent Hydroconsolidation: 1.1%

* Test Method: ASTM D-2435

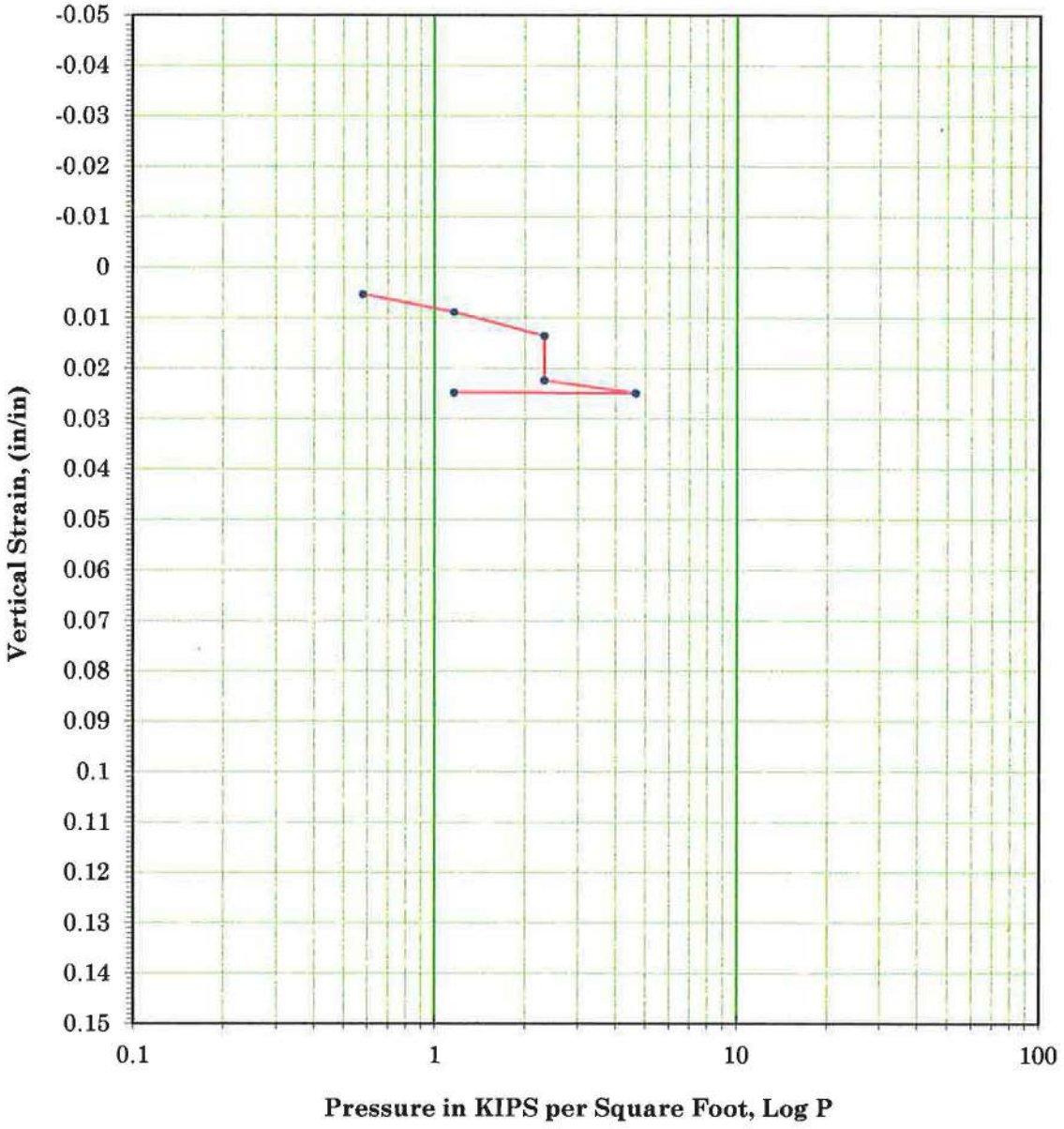
Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23



Sample Location: B22 @ 4'
Material: Silty Sand (SM)
Initial Dry Density: 108.6 PCF
Moisture Content: 4.0%
Percent Hydroconsolidation: 2.1%

* Test Method: ASTM D-2435

Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23

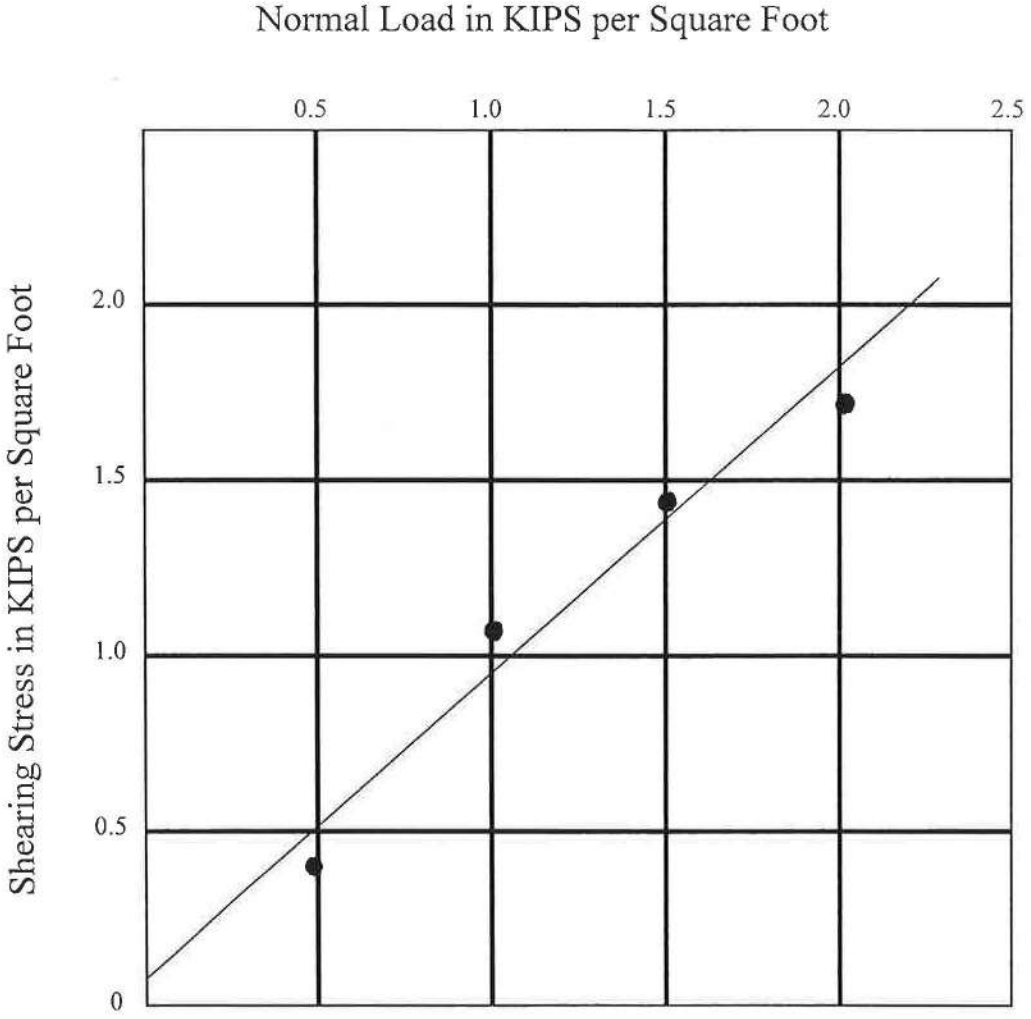


Sample Location: B24 @ 5'
Material: Silty Sand (SM)
Initial Dry Density: 109.7 PCF
Moisture Content: 5.3%
Percent Hydroconsolidation: 0.9%

* Test Method: ASTM D-2435

Consolidation Test	
Royal LLC Avanti South	
BGSI	
2/22/2016	14-23

Direct Shear Data



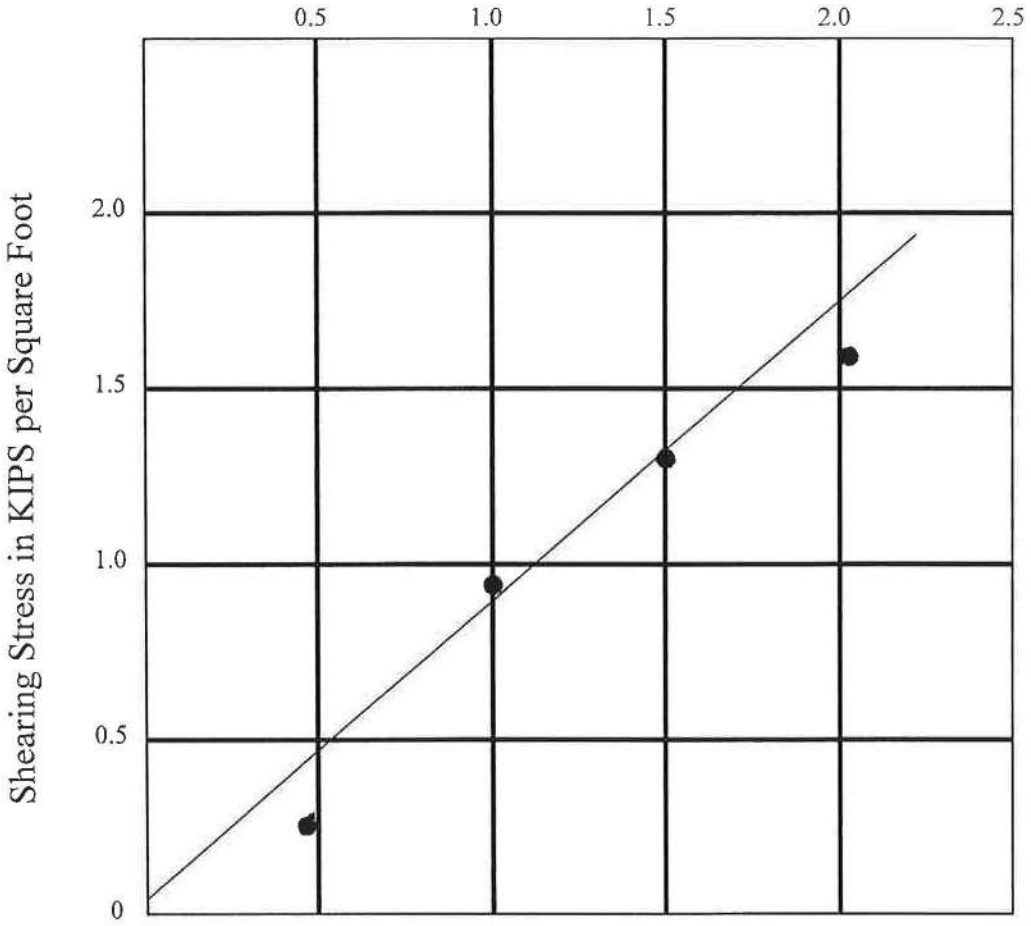
Sample	Symbol	Depth (feet)	Dry Density (PCF)	Angle of Friction (degrees)	Cohesion (PSF)
B8	●	0-5'	119.6*	40	60

*Remolded to 90% rel. comp. per ASTM D1557 test method

J.N 14-23

Direct Shear Data

Normal Load in KIPS per Square Foot



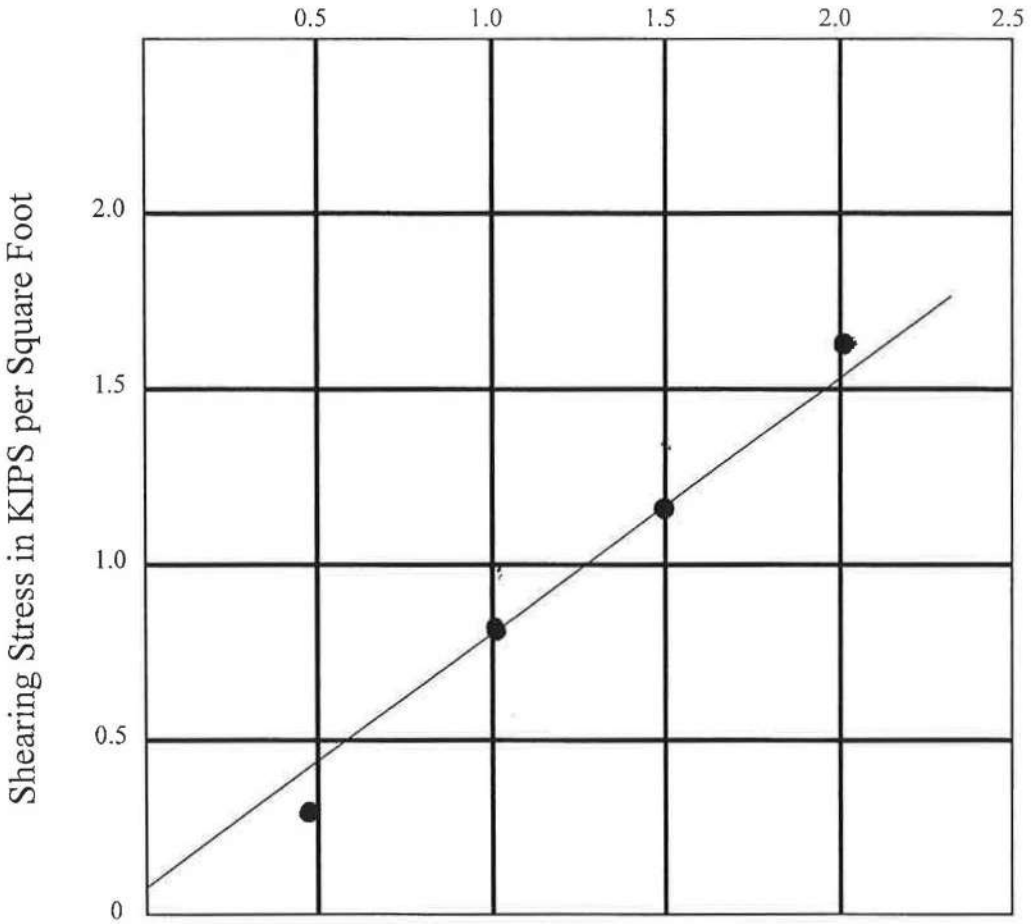
Sample	Symbol	Depth (feet)	Dry Density (PCF)	Angle of Friction (degrees)	Cohesion (PSF)
B11	●	0-5'	116.0*	40	20

*Remolded to 90% rel. comp. per ASTM D1557 test method

J.N 14-23

Direct Shear Data

Normal Load in KIPS per Square Foot



Sample	Symbol	Depth (feet)	Dry Density (PCF)	Angle of Friction (degrees)	Cohesion (PSF)
B18	●	0-5'	111.6	35	50

*Remolded to 90% rel. comp. per ASTM D1557 test method

J.N 14-23

LN: 14-23

ANAHEIM TEST LAB, INC

3008 ORANGE AVENUE
SANTA ANA, CALIFORNIA 92707
PHONE (714) 549-7267

BRUIN GEOTECHNICAL SERVICES, INC.
1817 E. AVE. Q, UNIT A-1
PALMDALE, CA 93550

DATE: 02/02/16

P.O. NO.: TRANSMITTAL

LAB NO.: B-9066 1-2

SPECIFICATION: CA-417/422/643

MATERIAL: SOIL

PROJECT# 14-23
Royal
70th Street W. & K-8
Quartz Hill, CA

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	pH	SOLUBLE SULFATES per CA. 417 ppm	SOLUBLE CHLORIDES per CA. 422 ppm	MIN. RESISTIVITY per CA. 643 ohm-cm
1) B-8@0-5'	8.2	45	111	9,000
2) B-18@0-5'	6.9	33	92	12,000

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

APPENDIX C

USGS Seismic Design Summary Report

USGS Design Maps Summary Report

User-Specified Input

Report Title Avanti South- Royal LLC
Mon March 14, 2016 20:24:06 UTC

Building Code Reference Document 2012 International Building Code
(which utilizes USGS hazard data available in 2008)

Site Coordinates 34.6602°N, 118.2538°W

Site Soil Classification Site Class D – "Stiff Soil"

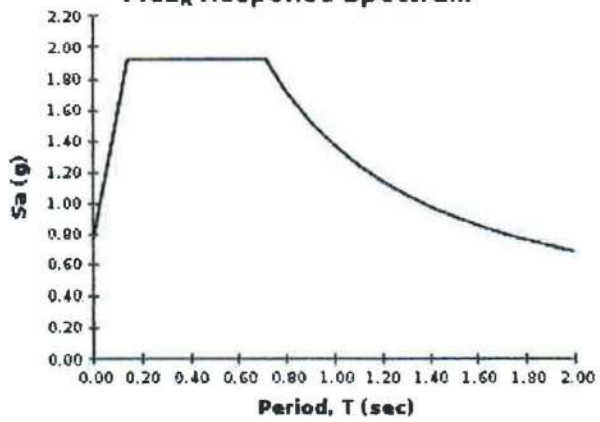
Risk Category I/II/III

USGS-Provided Output

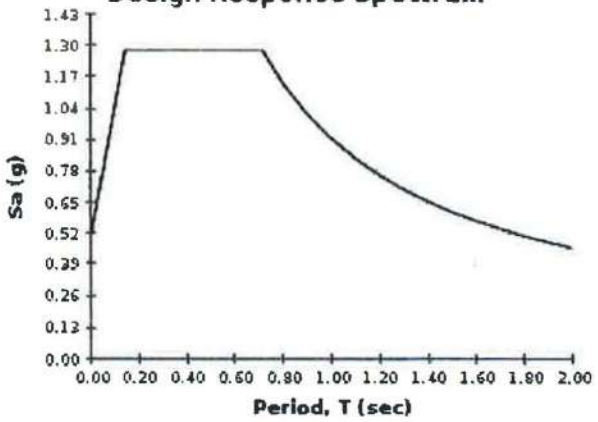
S_S =	1.918 g	S_{MS} =	1.918 g	S_{DS} =	1.278 g
S_1 =	0.914 g	S_{M1} =	1.371 g	S_{D1} =	0.914 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



APPENDIX D

Earthwork and Grading Specifications for Rough Grading

Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 **The Geotechnical Consultant of Record:** Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observations, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 **The Earthwork Contractor:** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of

grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultants, unsatisfactory conditions, such as unsuitable soil, improper moisture-condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in the specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 Preparation of Areas to be Filled

2.1 **Clearing and Grubbing:** Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 10 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminant dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

2.2 **Processing:** Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free from oversize material and the working surface is reasonably uniform, flat, and free from uneven features that would inhibit uniform compaction.

2.3 **Overexcavation:** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading pan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 **Benching:** Where fills are to be places on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter that 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 **Evaluation/Acceptance of Fill Areas:** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observes, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 **General:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 **Oversize:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 **Import:** If importing of fill material is required for grading, proposed import material shall meet the requirements of the geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so the suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 **Fill Layers:** Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates that grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain relatively uniform moisture content within 2% of optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 **Compaction of Fill Slopes:** In addition to normal compaction procedures specified above, compaction of slopes, shall be accomplished by backrolling of slopes with sheepfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 **Frequency of Compaction Testing:** Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 **Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less then 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical repot(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land survey/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well we over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding Material shall have a Sand Equivalent greater then 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.