REVISED GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MENTAL HEALTH PARKING STRUCTURE
VA CENTRAL CALIFORNIA HEALTH CARE SYSTEM
2615 EAST CLINTON AVENUE
FRESNO, CALIFORNIA

PROJECT NO. 012-10078
JULY 29, 2011

Prepared for:

MR. ERIC FRAMPTON
FCE, INC.
895 WEST ASHLAN AVENUE, SUITE 102
CLOVIS, CALIFORNIA 93612

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
215 W. DAKOTA AVENUE
CLOVIS, CALIFORNIA 93612
(559) 348-2200

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

July 29, 2011

Project No. 012-10078

Mr. Eric Frampton
FCE, Inc.
895 West Ashlan Avenue, Suite 102
Clovis, California 93612

RE: Revised Geotechnical Engineering Investigation
Proposed Mental Health Parking Structure
VA Central California Health Care System
2615 East Clinton Avenue
Fresno, California

Dear Mr. Frampton:

In accordance with your request, we have completed a Revised Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

Krazan & ASSOCIATES, INC.

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Krazan & ASSOCIATES, INC.

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July 29, 2011 Project No. 012-10078

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FRESNO, CALIFORNIA

INTRODUCTION

This report presents the results of our Revised Geotechnical Engineering Investigation for the proposed Mental Health Parking Structure, to be located at the VA California Health Care Facility in Fresno, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, and pavement design.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A also contains a description of the laboratory-testing phase of this study, along with the laboratory test results. Appendices B and C contain guides to earthwork and pavement specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 7 borings to depths ranging from approximately 20 to 50 feet for evaluation of the subsurface conditions at the project site.

- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structures are unavailable. On a preliminary basis, it is understood that the planned development will include the construction of a new parking structure with a footprint area of approximately 45,000 square feet. The proposed structure is anticipated to be two- or four-stories in height. The anticipated foundation loads will be either on the order of 400 or 800 kips for interior columns and either 210 or 420 kips for exterior columns. Modifications to on-site paved areas and landscaping are also planned for the development of the project.

In the event, these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The site is roughly rectangular in shape and encompasses approximately 1.5 acres. The site is located at the southeast corner of Fresno Street and Harvard Avenue within the northwest portion of the VA Central California Health Care Facility in Fresno, California. The hospital facility has a street address of 2615 East Clinton Avenue. The hospital building is located east of the site. A parking lot is located south of the site. The remainder of the site is predominately surrounded by residential and commercial developments.

Presently, the site is utilized as a parking lot and contains several landscape planters occupied by bushes and trees. The majority of the site is covered with asphaltic concrete pavement. An existing administration building is located in the northern portion of the site. Buried utility lines such as sewer, gas, storm water, electrical, and landscape irrigation lines are located throughout the site. The site is relatively level with no major changes in grade. However, a subfloor entrance to the emergency facility is just east of the site. The subfloor entrance is approximately 8 to 10 feet below existing grade.

GEOLOGIC SETTING

The San Joaquin Valley, which includes the Fresno area, is a topographic and structural basin that is bounded on the east by the Sierra Nevada Mountains and on the west by the Coast Ranges. The Sierra Nevada, a fault block dipping gently southwestward, is made up of igneous and metamorphic rocks of pre-Tertiary age that comprise the basement complex beneath the Valley. The Coast Ranges contain folded and faulted sedimentary rocks of Mesozoic and Cenozoic age, which are similar to those rocks that underlie the Valley at depth and non-conformably overlie the basement complex; gently dipping to nearly horizontal sedimentary rocks of Tertiary and Quaternary age overlie the older rocks. These younger rocks are mostly of continental origin and in the Fresno area, they were derived from the Sierra Nevada.

The Coast Ranges evolved as a result of folding, faulting, and accretion of diverse geologic terrains. They are composed chiefly of sedimentary and metamorphic rocks that are sharply deformed into complex structures. They are broken by numerous faults, the San Andreas Fault being the most notable structural feature.

Both the Sierra Nevada and Coast Range are geologically young mountain ranges and possess active and potentially active fault zones. Major active faults and fault zones occur at some distance to the east, west, and south of the Fresno area. The Owens Valley Fault Zone bounds the eastern edge of the Sierra Nevada block and contains both active and potentially active faults.

Portions of the Ortigalita, Calaveras, Hayward, and Rinconada Faults, which are to the west, are considered potentially active. The San Andreas Fault is possibly the best known fault and is located about 60 to 70 miles to the west.

There are no active fault traces in the project vicinity. Accordingly, the project area is not within an Earth Quake Fault Zone (Special Studies Zone) and will not require a special site investigation by an Engineering Geologist.

Fresno residents could feel the affects of a large seismic event on one of the nearby active or potentially active fault zones. Fresno has experienced groundshaking from earthquakes in the historical past. According to the Five County Seismic Safety Element, groundshaking of VII intensity (Modified Mercali Scale) was felt in Fresno from the 1872 Owens Valley Earthquake. This is the largest known earthquake event affecting the Fresno area.

Secondary hazards from earthquakes include rupture, seiche, landslides, liquefaction, and subsidence. Since there are no known faults within the immediate area, ground rupture from surface faulting should not be a potential problem. Seiche and landslides are not hazards in the area either. Liquefaction potential (sudden loss of shear strength in a saturated, cohesionless soil) should be low since groundwater occurs below 60 feet. Lastly, deep subsidence problems may be low to moderate according to the conclusions of the Five County Seismic Safety Element. However, there are no known occurrences of structural or architectural damage due to deep subsidence in the Fresno area.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 7 borings to depths ranging from approximately 20 to 50 feet below existing site grade, using a truck-mounted drill rig. The approximate boring locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, expansion potential, atterberg limits, R-value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils for buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the majority of the site is covered by a pavement section consisting of approximately 2 to 2½ inches of asphaltic concrete underlain by 8 to 9 inches of aggregate base. Areas not covered by pavement consisted of approximately 6 to 12 inches of very loose silty sand and sandy silt soils.

Below the pavement section and loose surface soils, approximately 1 to 2 feet of fill material was encountered. The fill material predominately consisted of silty sand soil. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigation. Preliminary tests on the fill material suggest that the fill soils have varying strength characteristics ranging from loosely placed to compacted.

Below the loose surface soils, pavement section, and fill material, approximately 3 to 5 feet of loose to very dense silty sand was encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 11 to 67 blows per foot. Dry densities ranged from 107 to 122 pcf. Representative soil samples consolidated approximately 1½ to 2½ percent under a 2 ksf load when saturated. A representative soil samples had an angle of internal friction ranging from 31 to 33 degrees.

Below approximately 6 to 7 feet, layers of medium dense to very dense silty sand, sandy silt, or sand were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 26 blows per foot to greater than 50 blows per 6 inches. These soils had greater strength characteristics than the upper soils and extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the boring logs in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was not encountered within a depth of 50 feet below site grade during the field investigation. Review of groundwater elevation data prepared by the State of California Department of Water Resources dating from 1945 to 2003 indicates that the depth to free groundwater in the vicinity of the site ranged from 15 to 131 feet below site grade.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the fill material and existing development, appear to be conducive to the development of the project. Approximately 1 to 2 feet of fill material was encountered within the borings drilled throughout the site. The fill soils predominately consisted of silty sand and sandy silt soil. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted. Fill soils which have not been properly compacted and certified should be excavated and recompacted. The fill material should be moisture-conditioned to a minimum of 2 percent above optimum moisture-content and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional removal will be required.

In order to reduce the potential for differential settlement and provide uniform support for the planned structures, it is recommended that following stripping, fill certification or removal operations, and demolition activities, the upper 24 inches of exposed subgrade within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that proposed structural elements be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. The excavation should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement, Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional removal will be required.

Presently, the site is occupied by a parking lot. Several structures are located in the northern portion of the site. In addition, several structures are located along the edges of the site. Concrete and asphaltic concrete pavements cover the majority of the site. In addition buried structures, such as utility lines are located throughout the site. Demolition activities should include proper removal of any buried structures encountered during construction. Any buried structures or utilities encountered during construction should be properly removed and/or relocated. It is suspected that demolition activities of the existing pavement and related structures will disturb the upper soils. Following demolition activities, the exposed subgrade should be cleaned to firm native ground. The resulting excavation should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

It is recommended that the portion of the structure within 12 feet of the existing basement be supported on drilled caissons to reduce the potential of surcharge loading to the existing structure. The caissons should extend below the footing elevation of the existing basement structure. If the structure will be within 12 feet of the basement, our office should be contacted for supplemental recommendations.

As an alternative, the proposed structure may be supported on geopiers. Preliminary information provided by Geopier indicates they recommend 30-inch diameter piers extending to a minimum depth of 10 to 15 feet below the bottom of the footing elevations. The spacing on the piers would be 3½ to 4 feet on center. This design will need to be confirmed by Geopier prior to using this system.

Several trees and bushes were located throughout the site. If not utilized for the proposed development, tree and bush removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be cleansed to firm ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing an allowable bearing pressure of 3,500 psf for dead-plus-live loads. As an alternative, the allowable bearing pressure for a shallow foundation system may be increased to 4,000 psf for dead-plus-live loads provided the structure footings are supported by 3 feet of Engineered Fill. As an alternative, the allowable bearing pressure for a shallow foundation system may be increased to 4,500 psf for dead-plus-live loads provided the structure footings are supported by 4 feet of Engineered Fill. Provided the foundations are supported on 8 feet of Class II aggregate base compacted to a minimum of 95 percent of maximum density, the footing can be designed for an allowable bearing pressure of 8500 psf for dead plus live loads. Footings should have a minimum embedment of 18 inches.

Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Some structures in the Fresno area that are founded on hardpan have experienced standing water for extended periods of time in crawl spaces below wooden floors or within sunken floor slab areas. The sources of the water were natural precipitation and landscape irrigation, and consequently, wood floor and sunken floor slab construction in hardpan soils are discouraged.

Soil Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs in soils such as sand in which the strength is purely friction. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic event.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Groundwater depth;
2) Soil type;
3) Relative density;
4) Initial confining pressure;
5) Intensity and duration of groundshaking.

The soils encountered within a depth of 50 feet on the project site predominately consist of loose to very dense silty sands, sandy silts, and sands. Groundwater was not encountered within the soil borings advanced during subsurface exploration. Available groundwater data, as well as our experience in the area, indicates that groundwater depth has been as shallow as 15 feet within the project site vicinity.

The potential for soil liquefaction during a seismic event was evaluated using the LIQUEFYPRO computer program (Version 5) developed by CivilTech Software. For the analysis, a maximum earthquake magnitude of 6.5 was used. A peak horizontal ground surface acceleration of 0.19g was considered conservative and appropriate for the liquefaction analysis (SDs/2.5). A groundwater depth of 15 feet was used for the analysis. The computer analysis indicates that soils above a depth of 15 feet are non-liquefiable due to the absence of groundwater. The soils below a depth of 15 feet are considered to be non-liquefiable with a factor of safety of 2.35 to 5.0. The analysis also indicates that the total and differential seismic induced settlement is not anticipated to exceed ½ inch and ¼ inch, respectively. Therefore, it is not anticipated that liquefaction will have a significant affect on the proposed development. Accordingly, the liquefaction potential at the site is considered very low and measures to mitigate liquefaction potential are not necessary.

Due to the relatively low levels of expected groundshaking at the site, the limited thickness of the native soil deposits, the density of these deposits (107 pcf to 127 pcf), the moderate to high penetration resistance of the native soils (N = 11 to 100+), and the recommendation that all loose fill within proposed building areas be excavated and recompacted, liquefaction is not considered a viable geologic hazard at the subject site.

Seismic Settlement

One of the most common phenomena during seismic shaking accompanying any earthquake is the induced settlement of loose unconsolidated soils. Based on the nature of the subsurface materials, the plan to excavate and recompact the upper soils and any loose fill soils within the proposed building areas and the relatively low to moderate seismicity of the region, we would not expect seismic settlement to represent a significant geologic hazard to the site provided that the recommendations of our referenced Revised Geotechnical Engineering Investigation are followed.

One of the most common phenomena during seismic shaking accompanying any earthquake is the induced settlement of loose unconsolidated soils. Based on the nature of the subsurface materials, and the relatively low to moderate seismicity of the region, we would not expect seismic settlement or lateral spread to represent a significant geologic hazard to the site.

The estimated seismic settlement was determined at the site using the settlement analysis method by Tokimatsu, Seed, and Bolton (1987). The results of the settlement analysis are included as follows:

Location	Seismic Settlement (inches)				
	Saturated Settlement	**Unsaturated Settlement**	**Total Settlement**	**Range of Differential Settlement**	**Design for Differential Settlement**
B1	0.00	0.01	0.01	0.003 to 0.004	1 Inch in 100 Feet

The above settlement values were determined at specific boring locations. The Consolidated Settlement (under static load of specific structures) and Differential Settlement (per specified length in building area) are indicated in the Foundations section of this report.

The native soils within the project site are not conducive to hydrocollapse due to the relatively medium dense soil conditions, low void-ratio, and moderate to high penetration resistance measured. Any loose fill material at the site could be vulnerable to hydrocollapse. However, the proposed structure is planned to be supported on engineered fill. Therefore the structure will not be vulnerable to hydrocollapse. In addition, this hazard can be mitigated by following the design and construction recommendations of current and future Revised Geotechnical Engineering Investigations (over-excavation and rework of any loose soils and/or uncertified fill materials).

The emergency entrance and basement are located approximately 50 feet east of the proposed parking structure. The walls are constructed with reinforced concrete with sidewalls sloping vertical. The structure planned for development will be located greater than 50 feet away from the retaining wall. The potential for lateral spreading was evaluated using the "Revised Multilinear Regression Equations for Predication of Lateral Spread Displacement" by Youd, Hansen, Corbett and Bartlett (2002). Based on a lack of shallow liquefiable soils within the subject site, the distance of proposed structures from the existing retaining wall and a lack of saturated cohesionless sediments with $(N1)_{60}$ less than 15, the site is not likely subject to lateral spreading hazards.

Site Preparation

General site clearing should include removal of vegetation; asphalt; debris; existing utilities; structures including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Approximately 1 to 2 feet of fill material was encountered within the borings drilled throughout the site. The fill soils predominately consisted of silty sand and sandy silt. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. Preliminary testing on the fill material indicates that the fill soils ranged from loosely placed to compacted. Therefore, it is recommended that the fill soils be excavated and stockpiled so that the native soils can be properly prepared. The fill material should be moisture-conditioned to a minimum of 2 percent above optimum moisture-content and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional removal will be required.

Existing structures are located within the project site and vicinity. In addition, the majority of the site is covered with pavement. Demolition activities should include proper removal of any buried structures. Any surface or buried structures including utilities encountered during construction should be properly removed and/or relocated. The resulting excavations should be cleaned to firm native ground and backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Excavations, depressions, or soft and pliant areas extending below planned finish subgrade level should be cleaned to firm undisturbed soil, and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

Several trees and bushes are located within the project site. If not utilized for the proposed development, tree and bush removal operations should include roots greater than 1 inch in diameter. The resulting excavation should be cleansed to firm ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Following stripping, tree and bush removal, fill certification or removal operations, and demolition activities, the exposed subgrade in exterior flatwork and pavement areas should be excavated to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Limits of recompaction should extend 2 feet beyond the edge of pavements or sidewalks. Prior to backfilling, the exposed subgrade should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

In order to reduce the potential for differential settlement and provide uniform support for the planned structures, it is recommended that following stripping, fill certification or removal operations, and demolition activities, the upper 24 inches of the exposed subgrade within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that proposed structural elements be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. The excavation should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to fill placement, Krazan & Associates, Inc. should inspect the bottom of the excavation to verify no additional removal will be required.

If a higher bearing pressure is utilized, the proposed structure foundation should be supported by 3 feet of Engineered Fill. (Please refer to Alternative II Foundation's section of this report.) Therefore, if the footings are 18 inches deep, the total depth of recompaction within the proposed footing area and 3 feet beyond should be 4½ feet.

Alternatively, the proposed foundations may be designed utilizing an allowable bearing capacity of 8500 psf for dead plus live loads, provided they are supported on 8 feet of Class 2 aggregate base compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557. Limits of the aggregate base should extend 5 feet beyond the footings in each direction.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The upper on-site native soils and fill material predominately consist of silty sand, sandy silt, and sand. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics and debris.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill material should be predominately non-expansive granular material with a plasticity index less than 10 and a UBC Expansion Index less than 15. Imported Fill should be free from rocks and clods greater than 4 inches in diameter. All Imported Fill material should be submitted to the Soils Engineer for approval at least 48 hours prior to delivery at the site.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned as necessary, and compacted to achieve at least 90 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1803 of the 2007 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 2 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. The utility trench backfill placed in pavement areas should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations - Conventional

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on a minimum of 2 feet of Engineered Fill. Spread and continuous footings supported on a minimum of 2 feet of Engineered Fill can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,625 psf
Dead-Plus-Live Load	3,500 psf
Total Load, including wind or seismic loads	4,650 psf

As an alternative, a higher bearing pressure may be used, provided the proposed structures are supported by 3 feet of Engineered Fill. Spread and continuous footings supported by a minimum of 3 feet of Engineered Fill can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	3,000 psf
Dead-Plus-Live Load	4,000 psf
Total Load, including wind or seismic loads	5,325 psf

As an alternative, a higher bearing pressure may be used, provided the proposed structures are supported by 4 feet of Engineered Fill. Spread and continuous footings supported by a minimum of 4 feet of Engineered Fill can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	3,375 psf
Dead-Plus-Live Load	4,500 psf
Total Load, including wind or seismic loads	6,000 psf

As an additional alternative, a higher bearing pressure may be used, provided the proposed structures are supported by 8 feet of Class II aggregate base compacted to a minimum of 95 percent of maximum density. Spread and continuous footings supported by a minimum of 8 feet of Engineered Fill can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	6,400 psf
Dead-Plus-Live Load	8,500 psf
Total Load, including wind or seismic loads	11,300 psf

The footings should have a minimum embedment depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load.

The total settlement is not expected to exceed 1 inch. Differential settlement should be less than ½ inch. Most of the movement is expected to occur during construction as the loads are applied. However, additional post-construction movement may occur if the foundation soils are flooded or saturated.

The footing excavation should not be allowed to dry out at any time prior to pouring concrete. It is recommended that footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.4 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an equivalent fluid passive pressure of 350 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Floor Slabs and Exterior Flatwork

In areas where moisture-sensitive floor coverings will be included, concrete slab-on-grade floor should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practice. The water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean, gravel of ¾-inch maximum size. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted. It is recommended the parking structure slabs be supported by a minimum of 6 inches of compacted class 2 aggregate base.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 31 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 52 pounds per square foot per foot per depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Seismic Parameters – 2007 CBC

The site class, per Table 1613.5.2 of the 2007 California Building Code, is based upon the site soil conditions. It is our opinion that a Site Class D is appropriate for building design at this site. For seismic design of the structures, in accordance with the seismic provisions of the 2007 CBC, we recommend the following parameters:

Seismic Item	VALUE	CBC REFERENCE
Site Class	D	Table 1613.5.2
Site Coefficient F_a	1.394	Table 1613.5.3 (1)
S_S	0.507	Figure 1613.5 (3)
S_{MS}	0.707	Section 1613.5.3
S_{DS}	0.472	Section 1613.5.4
Site Coefficient Fv	1.954	Table 1613.5.3 (2)
S_1	0.223	Figure 1613.5 (4)
S_{M1}	0.435	Section 1613.5.3
S_{D1}	0.290	Section 1613.5.4

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and UBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected from these soil samples were less than 150 ppm and are below the maximum allowable values established by HUD/FHA and UBC. Therefore, no special design requirements are necessary to compensate for sulfate reactivity with the cement.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Revised Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

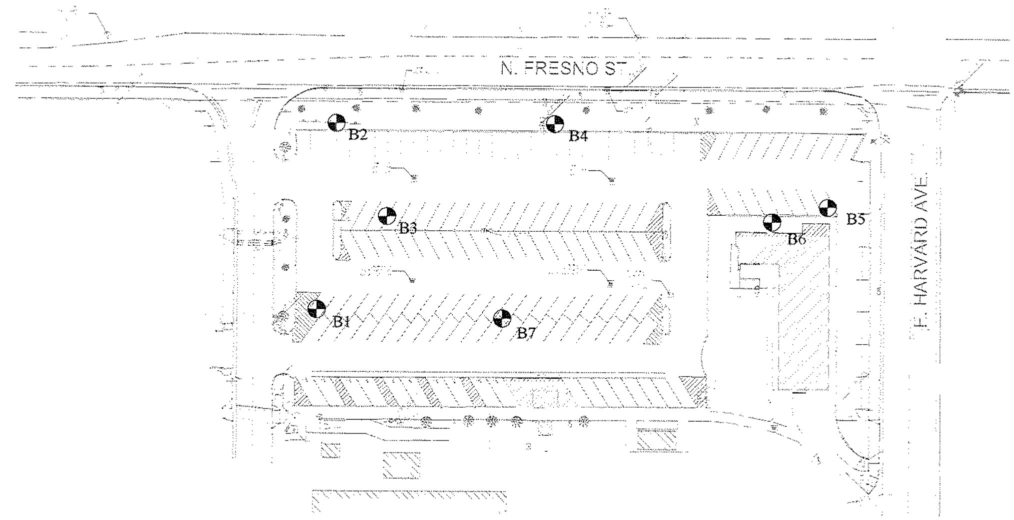
The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

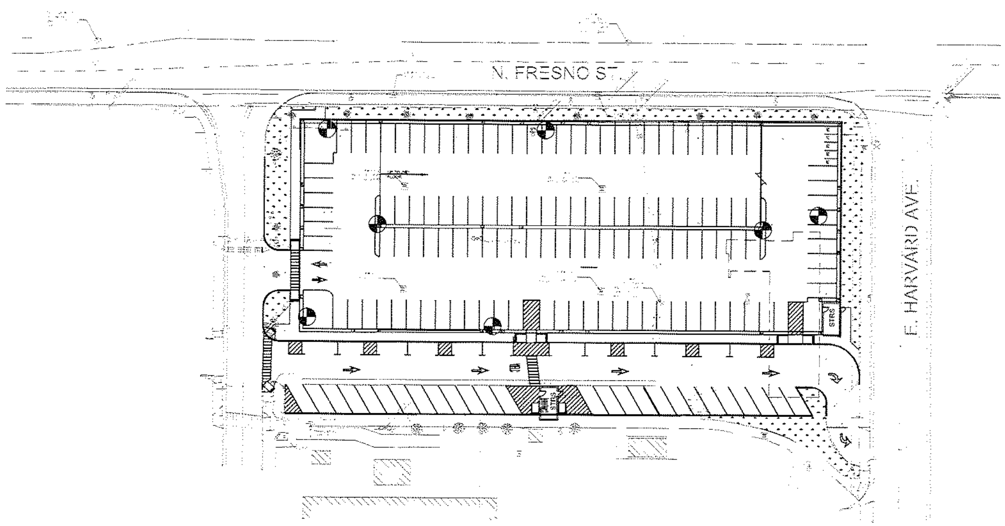
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Steve Nelson
Project Engineer

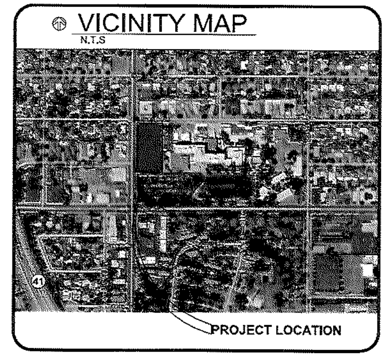
David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185



EXISTING SITE PLAN
SCALE 1"=30'



SITE PLAN
SCALE 1"=30'



VICINITY MAP
N.T.S

LEGEND
SITE PLAN: KEY NOTES

BOREHOLE LOCATIONS

Revisions	Date

CONSULTANTS:

ARCHITECT/ENGINEERS:
Frampton Consulting Engineers

Drawing Title: BOREHOLE LOCATIONS
Approved Project Director

Project Title: VA Central California Health Care Sys. Mental Health Parking Structure
Location: 2615 E. Clinton Avenue, Fresno, CA
Date: XX/XX/2010 | Checked: ECF | Drawn: AF

Project Number: 071010I
Building Number: –
Drawing Number: C-1
Dwg. X of XX

Office of Construction and Facilities Management
Department of Veterans Affairs

VA FORM 08-6231

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Seven 4½-inch exploratory borings were advanced. The boring locations are shown on the site plan.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. This test represents the resistance to driving a 2½-inch diameter core barrel. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with the central portion of the block shaded. All samples were returned to our Fresno laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. Expansion index and R-value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

Major Divisions	Symbol	Description
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
	Clean Gravels (Less than 5% fines)	
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
	Clean Sands (Less than 5% fines)	
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

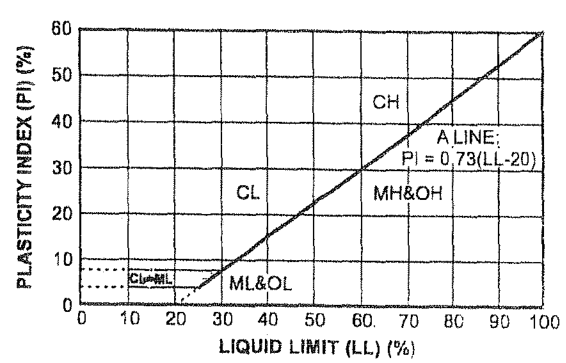
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	3 to 12 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Drill Hole B1

Project: Mental Health Parking Structure | **Project No:** 012-10078

Client: FCE, Inc. | **Figure No.:** A-1

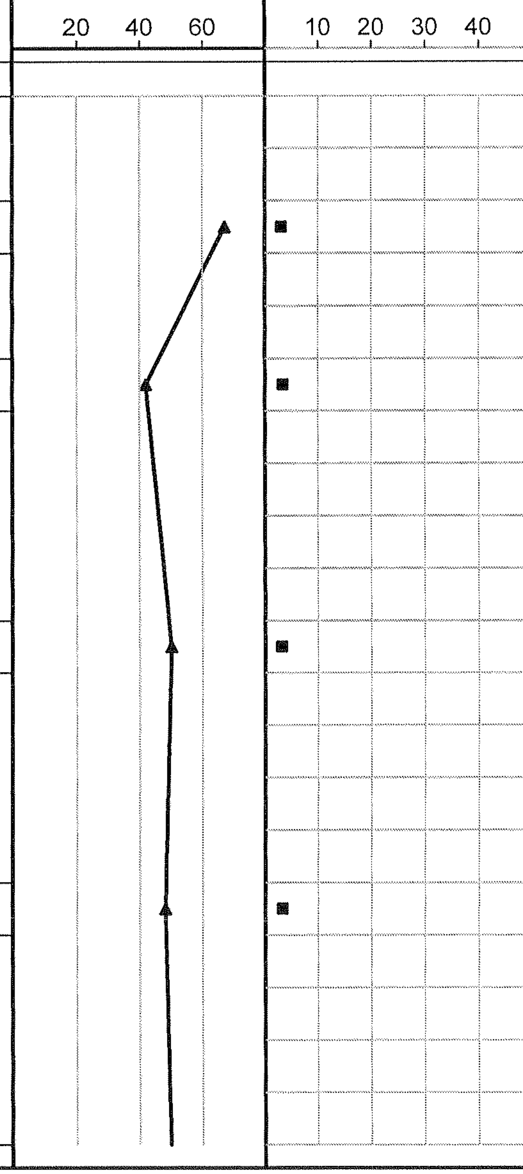
Location: 2615 East Clinton Avenue, Fresno, California | **Logged By:** Wayne Andrade

Depth to Water> | **Initial:** None | **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0		ASPHALTIC CONCRETE = 2½ Inches AGGREGATE BASE = 8 Inches				
2		***SILTY SAND (SM)*** FILL - Fine- to medium-grained; brown, damp, drills easily	122.0	3.1		67
4		***SILTY SAND (SM)*** Very dense, fine- to medium-grained; brown, damp, drills hard Dense and drills firmly below 4 feet				
6			116.4	3.4		42
8		Very dense and drills hard below 9 feet				
10			118.1	3.2		50+
12		Dense and drills firmly below 13 feet				
14			120.6	3.3		48
16						
18						
20						

Penetration Test blows/ft

Water Content (%)



Drill Method: Solid Flight | **Drill Date:** 8-31-10

Drill Rig: CME 45 | **Krazan and Associates** | **Hole Size:** 4½ Inches

Driller: Chris Wyneken | **Elevation:** 50 Feet

Log of Drill Hole B1

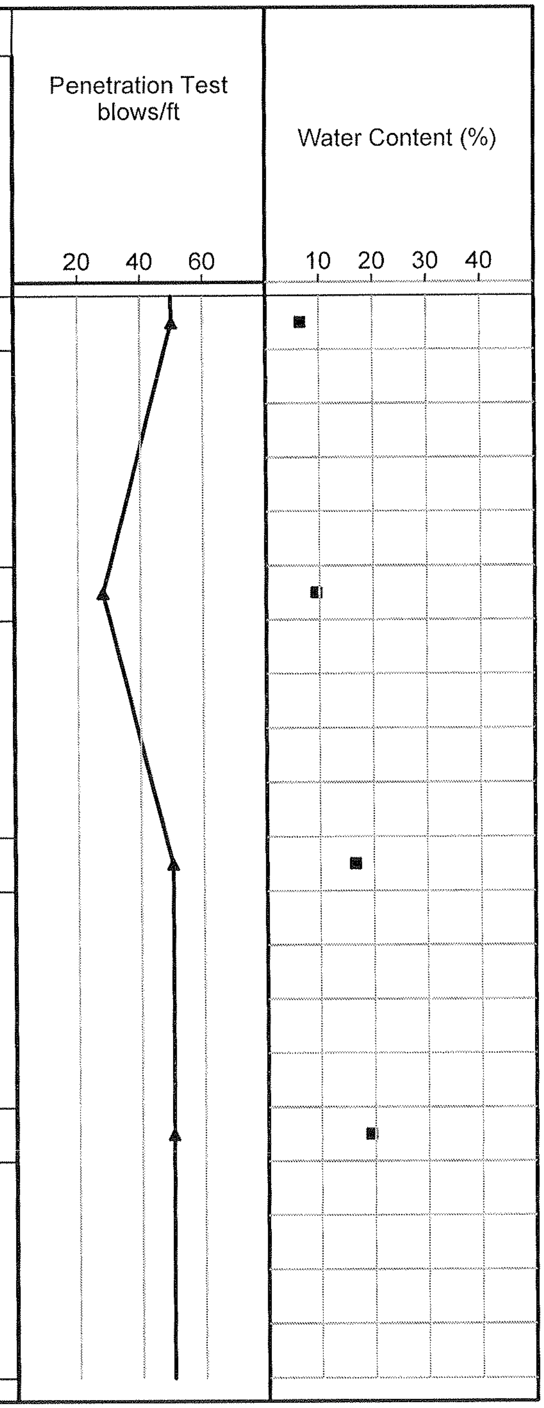
Project: Mental Health Parking Structure
Project No: 012-10078

Client: FCE, Inc.
Figure No.: A-1

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
21			117.3	6.6		50+
22						
23		***SANDY SILT (ML)*** Medium dense, fine-grained; light olive-brown, damp, drills hard				
24						
25			112.0	9.5		28
26						
28		Very dense and drills hard below 28 feet				
30			111.2	16.6		50+
32						
34						
35			104.8	19.3		50+
36						
38						
40						



Drill Method: Solid Flight
Drill Date: 8-31-10

Drill Rig: CME 45
Krazan and Associates
Hole Size: 4½ Inches

Driller: Chris Wyneken
Elevation: 50 Feet

Log of Drill Hole B1

Project: Mental Health Parking Structure
Project No: 012-10078

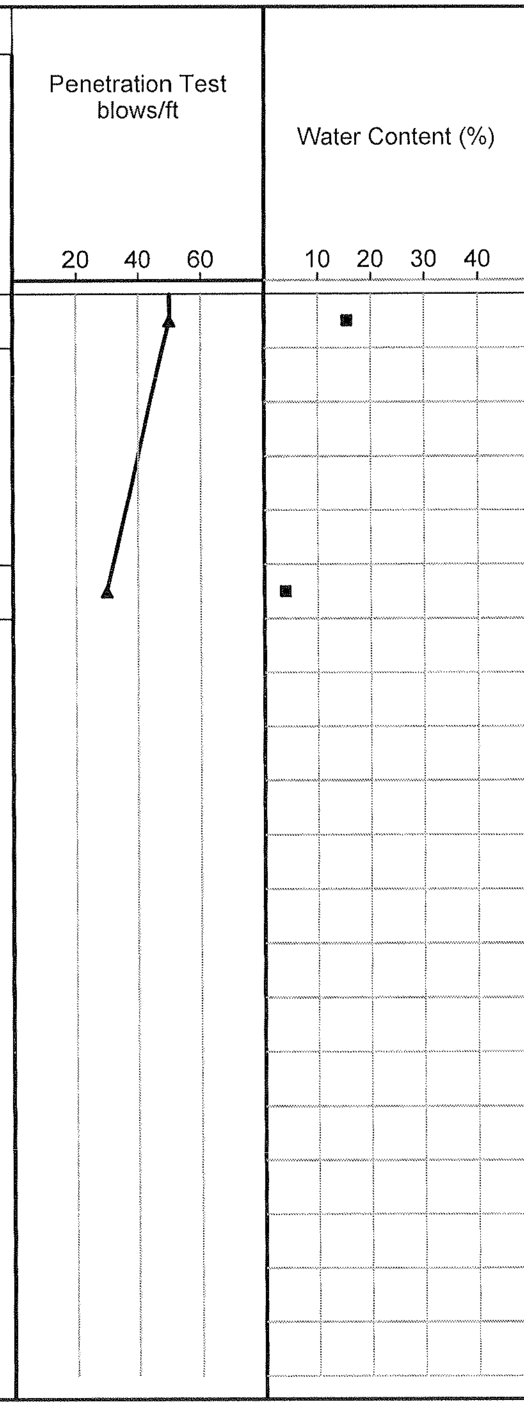
Client: FCE, Inc.
Figure No.: A-1

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
40–43			111.2	15.6		50+
43–50		***SILTY SAND (SM)*** Dense, fine-grained; light gray, damp, drills hard	97.7	4.1		30
50		End of Borehole				

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60



Drill Method: Solid Flight
Drill Date: 8-31-10

Drill Rig: CME 45
Krazan and Associates
Hole Size: 4½ Inches

Driller: Chris Wyneken
Elevation: 50 Feet

Log of Drill Hole B2

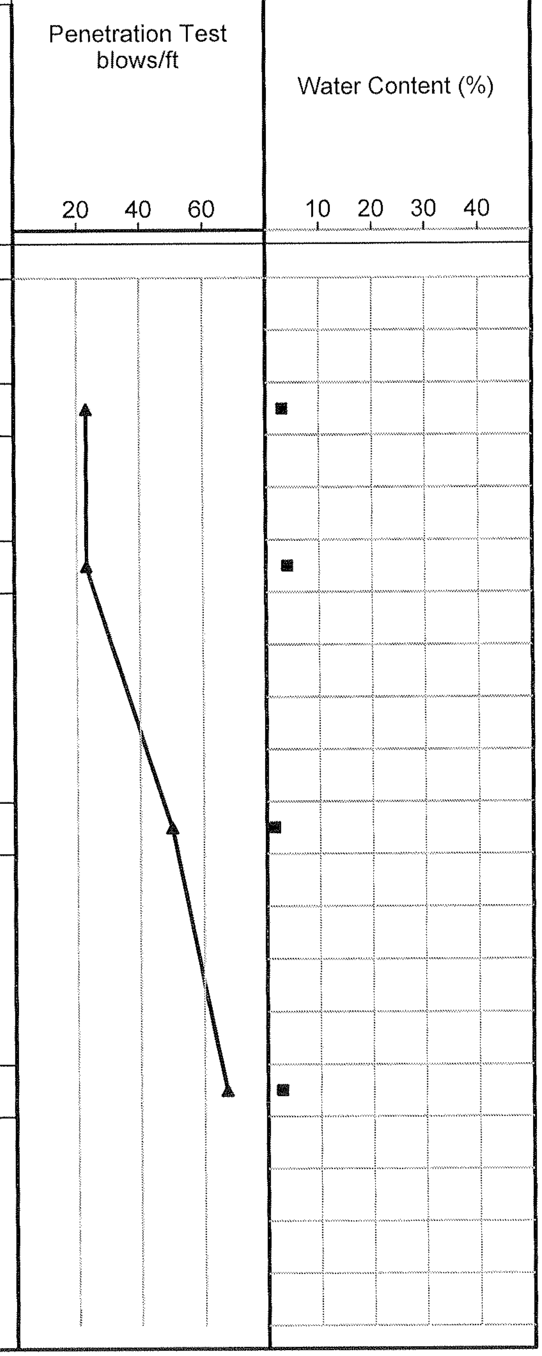
Project: Mental Health Parking Structure
Project No: 012-10078

Client: FCE, Inc.
Figure No.: A-2

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
		ASPHALTIC CONCRETE = 2¼ Inches AGGREGATE BASE = 9 Inches				
		SILTY SAND (SM) FILL - Fine- to medium-grained; brown, damp, drills easily				
2			119.6	3.2		23
		SILTY SAND (SM) Medium dense, fine- to medium-grained; light brown, damp, drills hard				
4						
			107.8	4.1		23
6						
8		Very dense and drills hard below 8 feet				
		With trace SAND below 9 feet				
10			133.9	1.6		50+
12						
14			115.7	2.8		67
16						
18		With interbeds of SANDY SILT below 18 feet				
20						



Drill Method: Solid Flight
Drill Date: 8-31-10

Drill Rig: CME 45
Krazan and Associates
Hole Size: 4½ Inches

Driller: Chris Wyneken
Elevation: 20 Feet

Sheet: 1 of 1

Log of Drill Hole B3

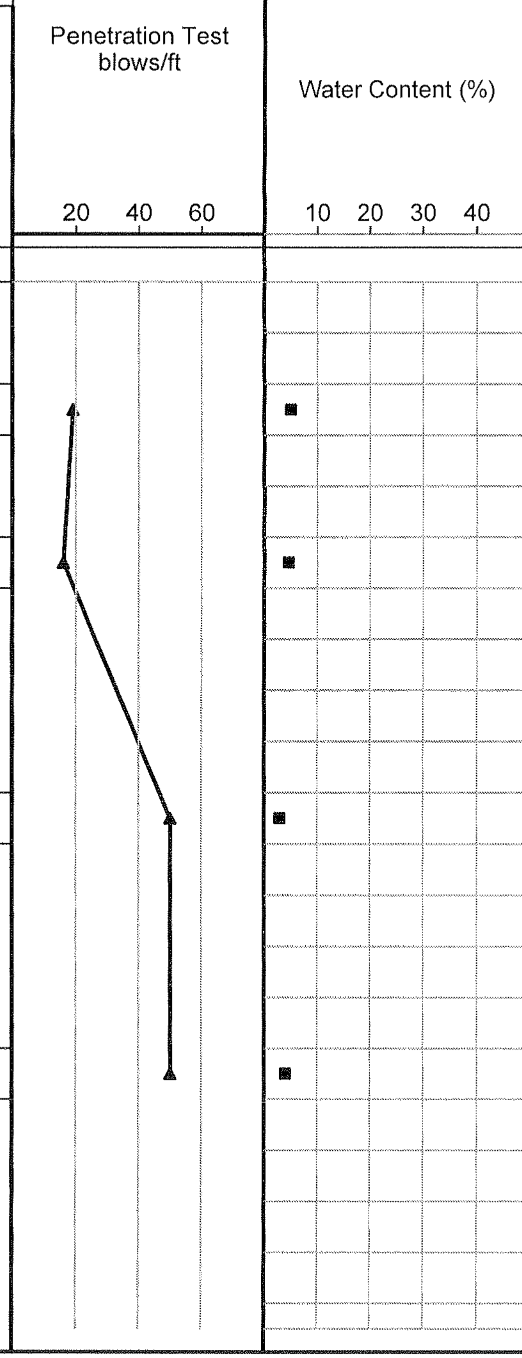
Project: Mental Health Parking Structure
Project No: 012-10078

Client: FCE, Inc.
Figure No.: A-3

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0–1	ASPHALTIC CONCRETE = 2 Inches AGGREGATE BASE = 9 Inches				
1–3	*SILTY SAND (SM)* FILL - Fine- to medium-grained; brown, damp, drills easily	115.1	5.0	■	19
3–15	*SILTY SAND (SM)* Medium dense, fine- to medium-grained; brown, damp, drills easily	119.7	4.6	■	16
	Very dense below 9 feet	119.5	3.0	■	50+
15–19	*SAND (SP)* Very dense, fine- to coarse-grained; light grayish-brown, damp, drills easily		4.0	■	50+
19–20.5	*SANDY SILT (ML)* Very dense, fine-grained; gray, damp, drills hard				
	End of Borehole				



Drill Method: Solid Flight
Drill Date: 8-31-10

Drill Rig: CME 45
Hole Size: 4½ Inches

Krazan and Associates

Driller: Chris Wyneken
Elevation: 20 Feet

Sheet: 1 of 1

Log of Drill Hole B4

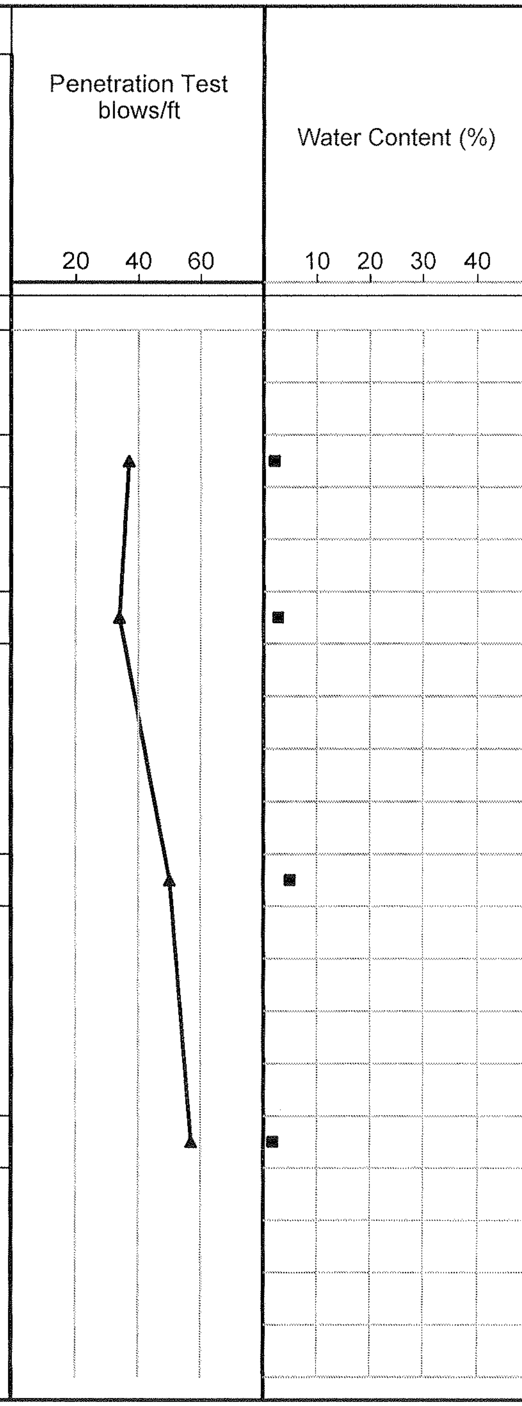
Project: Mental Health Parking Structure
Project No: 012-10078

Client: FCE, Inc.
Figure No.: A-4

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0–0.8	ASPHALTIC CONCRETE = 2 Inches AGGREGATE BASE = 8 Inches				
0.8–2	***SILTY SAND (SM)*** FILL - Fine- to medium-grained; brown, damp, drills easily				
2.5		117.0	2.1		37
3	***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily				
5.5		119.0	2.8		34
9	Very dense and drills hard below 9 feet				
10.5		120.1	5.1		50+
13.5	***SAND (SP)*** Dense, fine- to coarse-grained with trace GRAVEL; light gray, damp, drills firmly				
15.5			1.8		57
20					



Drill Method: Solid Flight
Drill Date: 8-31-10

Drill Rig: CME 45
Krazan and Associates
Hole Size: 4½ Inches

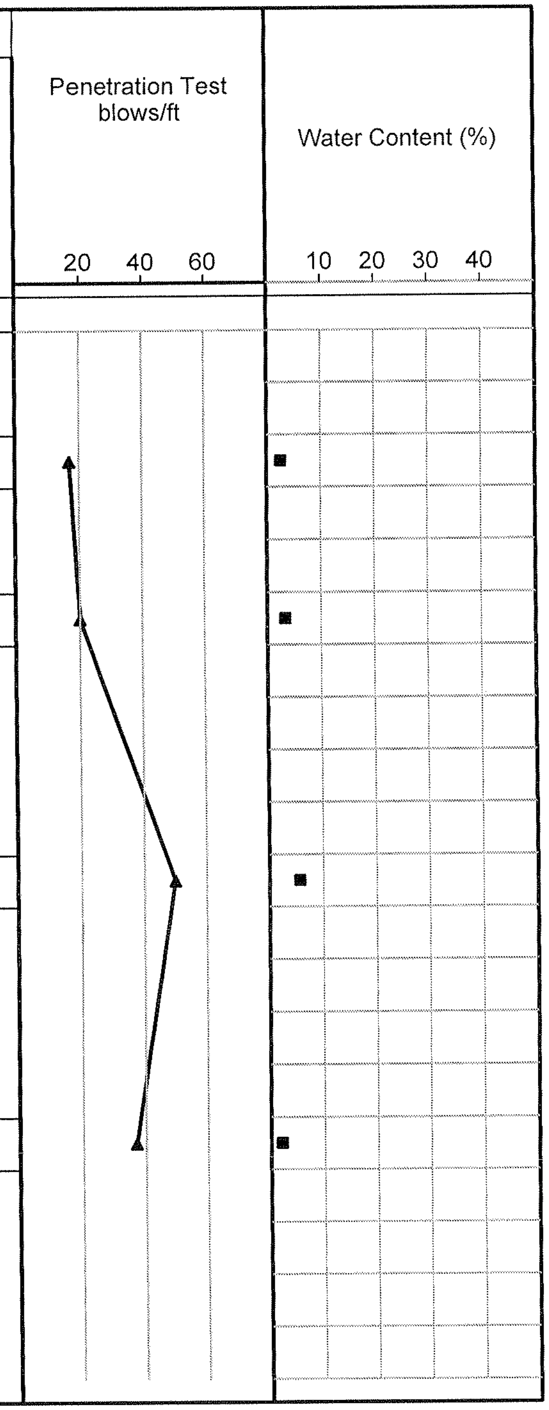
Driller: Chris Wyneken
Elevation: 20 Feet

Sheet: 1 of 1

Log of Drill Hole B5

Project: Mental Health Parking Structure		**Project No:** 012-10078	
Client: FCE, Inc.		**Figure No.:** A-5	
Location: 2615 East Clinton Avenue, Fresno, California		**Logged By:** Wayne Andrade	
Depth to Water>	**Initial:** None	**At Completion:** None	

Depth (ft)	Symbol	Description (SUBSURFACE PROFILE)	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0		ASPHALTIC CONCRETE = 2½ Inches AGGREGATE BASE = 8 Inches				
		SILTY SAND (SM) FILL - Fine- to medium-grained; light brown, damp, drills easily				
2			108.6	2.7		17
		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily				
4						
			113.6	3.4		20
6						
8						
		Very dense and drills hard below 9 feet				
10			114.4	5.7		50+
12						
		Medium dense below 13 feet				
14						
			116.5	2.1		37
16						
18		With interbeds of SANDY SILT below 18 feet				
20						



Drill Method: Solid Flight		**Drill Date:** 8-31-10	
Drill Rig: CME 45	**Krazan and Associates**	**Hole Size:** 4½ Inches	
Driller: Chris Wyneken		**Elevation:** 20 Feet	
		Sheet: 1 of 1	

Log of Drill Hole B6

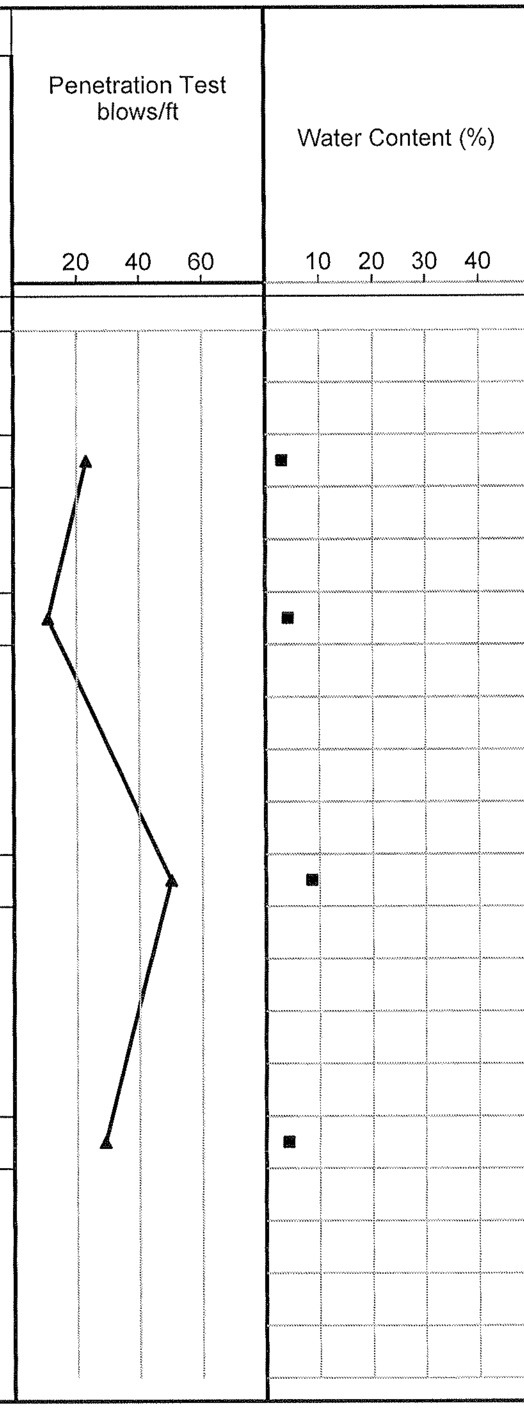
Project: Mental Health Parking Structure
Project No: 012-10078

Client: FCE, Inc.
Figure No.: A-6

Location: 2615 East Clinton Avenue, Fresno, California
Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE		SAMPLE			
Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0–0.9	ASPHALTIC CONCRETE = 2 Inches AGGREGATE BASE = 9 Inches				
0.9–2.8	***SILTY SAND (SM)*** FILL - Fine- to medium-grained; light brown, damp, drills easily	116.2	3.2	■	23
2.8–20	***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; light brown, damp, drills easily Loose below 4 feet	111.4	4.3	■	11
8	Very dense and drills hard below 8 feet	127.6	8.6	■	50+
14	Medium dense below 14 feet	119.9	4.3	■	29
20					



Drill Method: Solid Flight
Drill Rig: CME 45
Driller: Chris Wyneken

Krazan and Associates

Drill Date: 8-31-10
Hole Size: 4½ Inches
Elevation: 20 Feet
Sheet: 1 of 1

Log of Drill Hole B7

Project: Mental Health Parking Structure

Project No: 012-10078

Client: FCE, Inc.

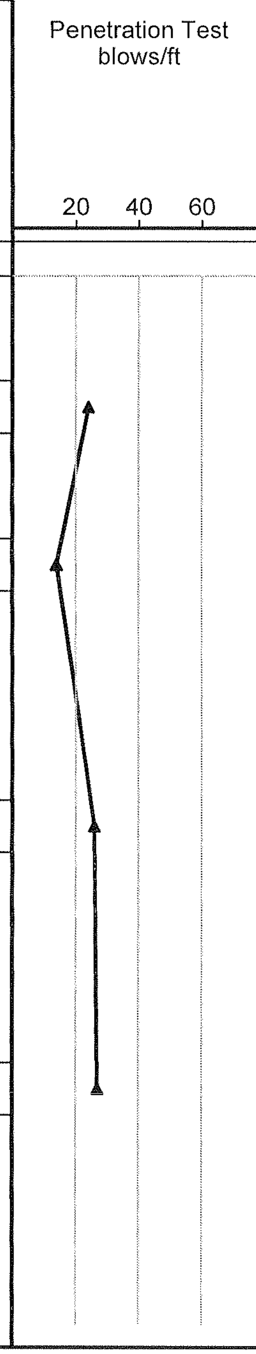
Figure No.: A-7

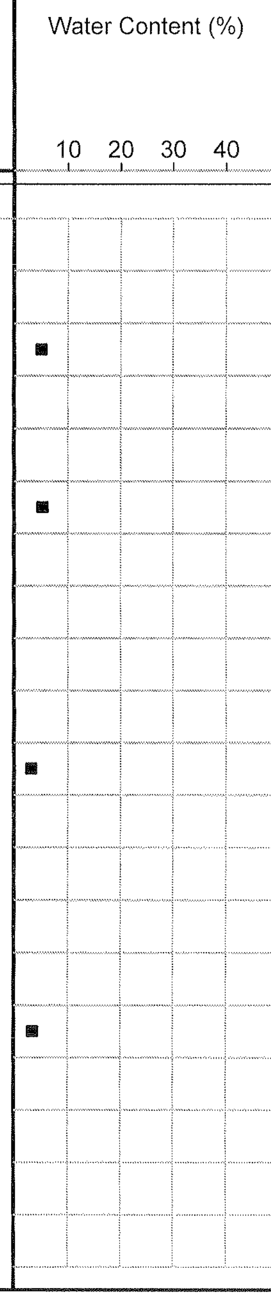
Location: 2615 East Clinton Avenue, Fresno, California

Logged By: Wayne Andrade

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0		ASPHALTIC CONCRETE = 2½ Inches AGGREGATE BASE = 10 Inches				
		SILTY SAND (SM) FILL - Fine- to medium-grained; brown, damp, drills easily				
2			122.9	5.2		24
		SILTY SAND (SM) Medium dense, fine- to medium-grained; light brown, damp, drills easily Loose below 4 feet				
4						
			114.5	5.4		14
6						
8		Medium dense below 9 feet				
10			119.2	3.3		26
12						
		SAND (SP) Medium dense, fine- to coarse-grained; light gray, damp, drills easily				
14						
			109.8	3.6		27
16						
18						
20						





Drill Method: Solid Flight

Drill Date: 8-31-10

Drill Rig: CME 45

Krazan and Associates

Hole Size: 4½ Inches

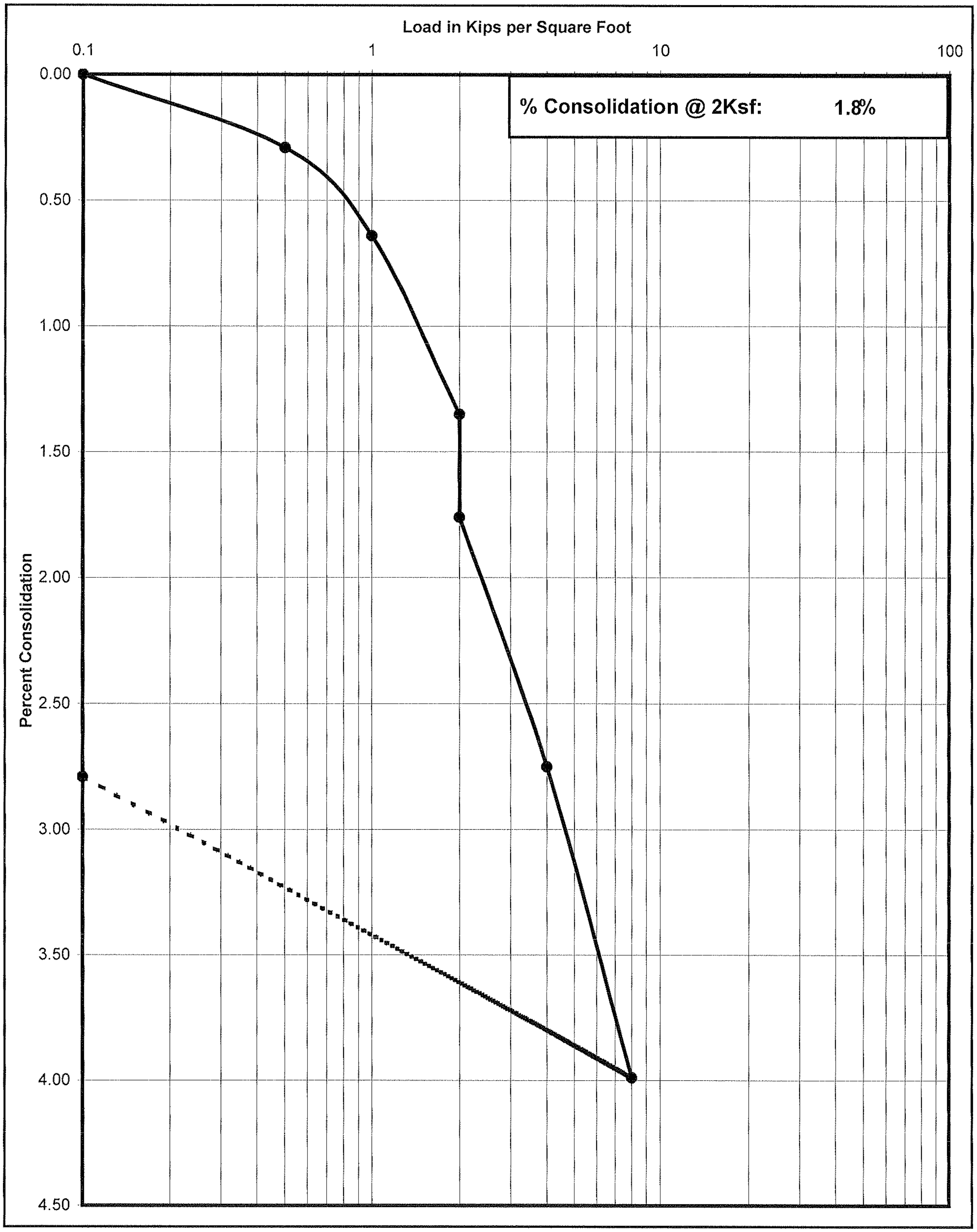
Driller: Chris Wyneken

Elevation: 20 Feet

Sheet: 1 of 1

Consolidation Test

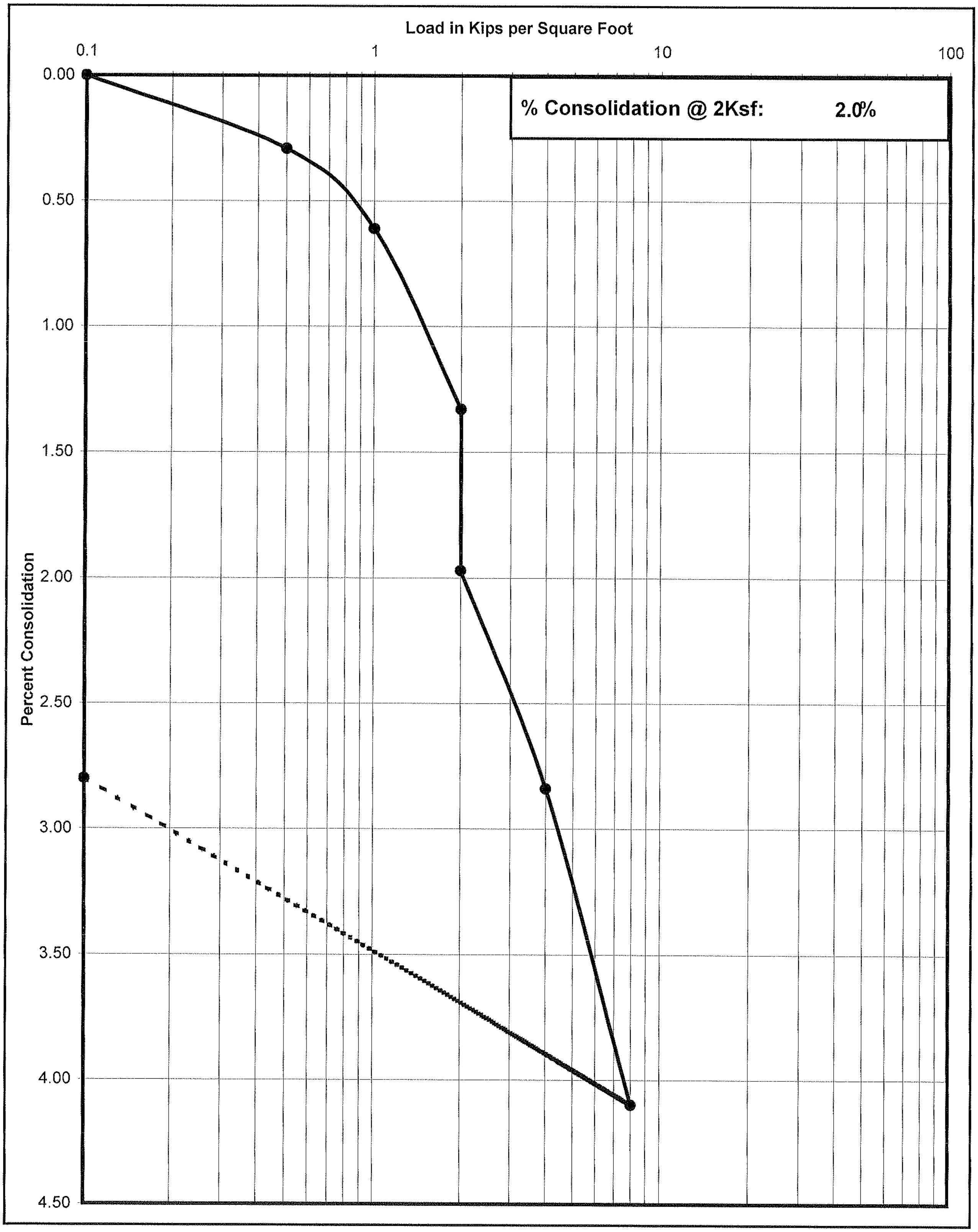
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B3 @ 2-3'	9/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

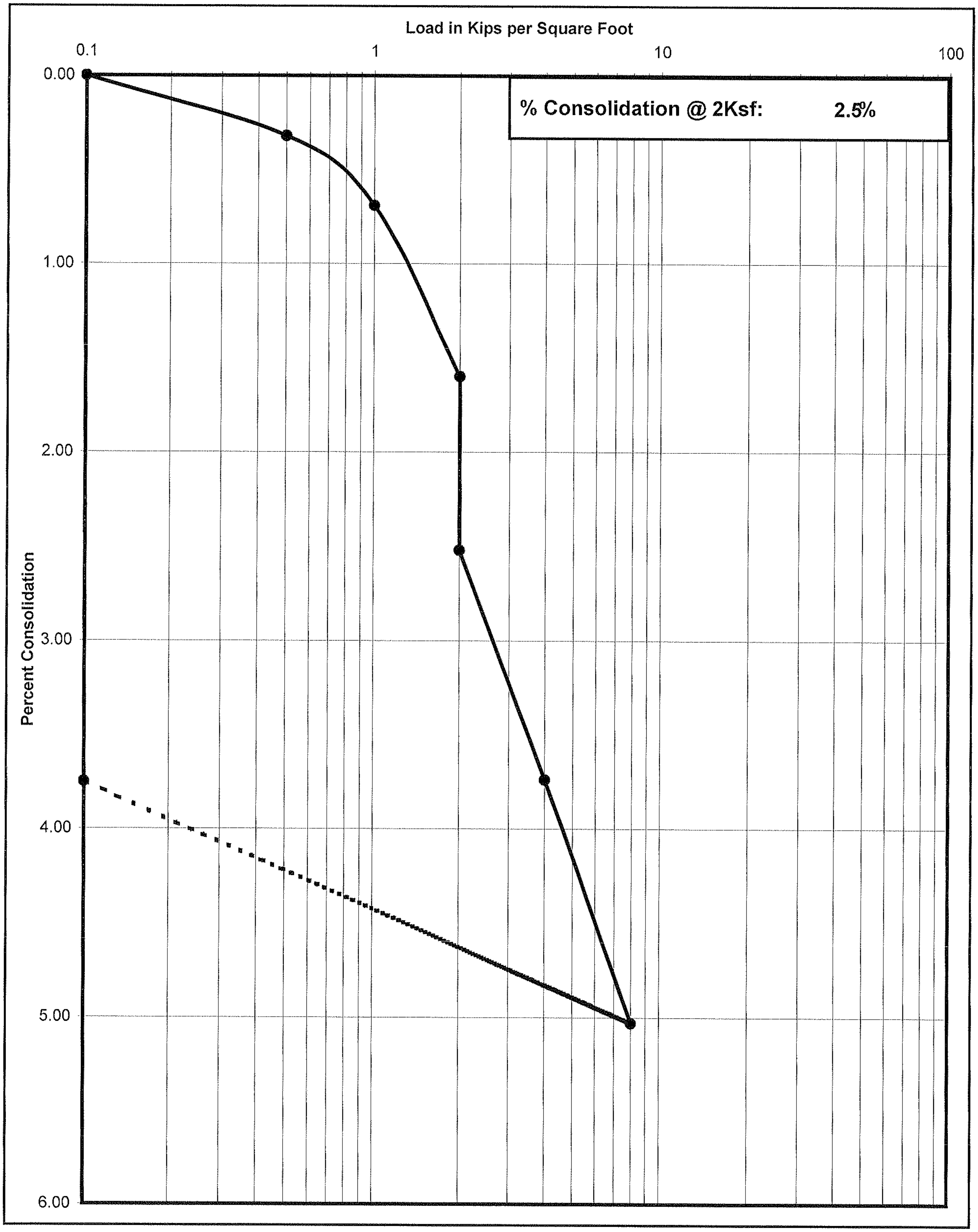
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B3 @ 5-6'	9/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

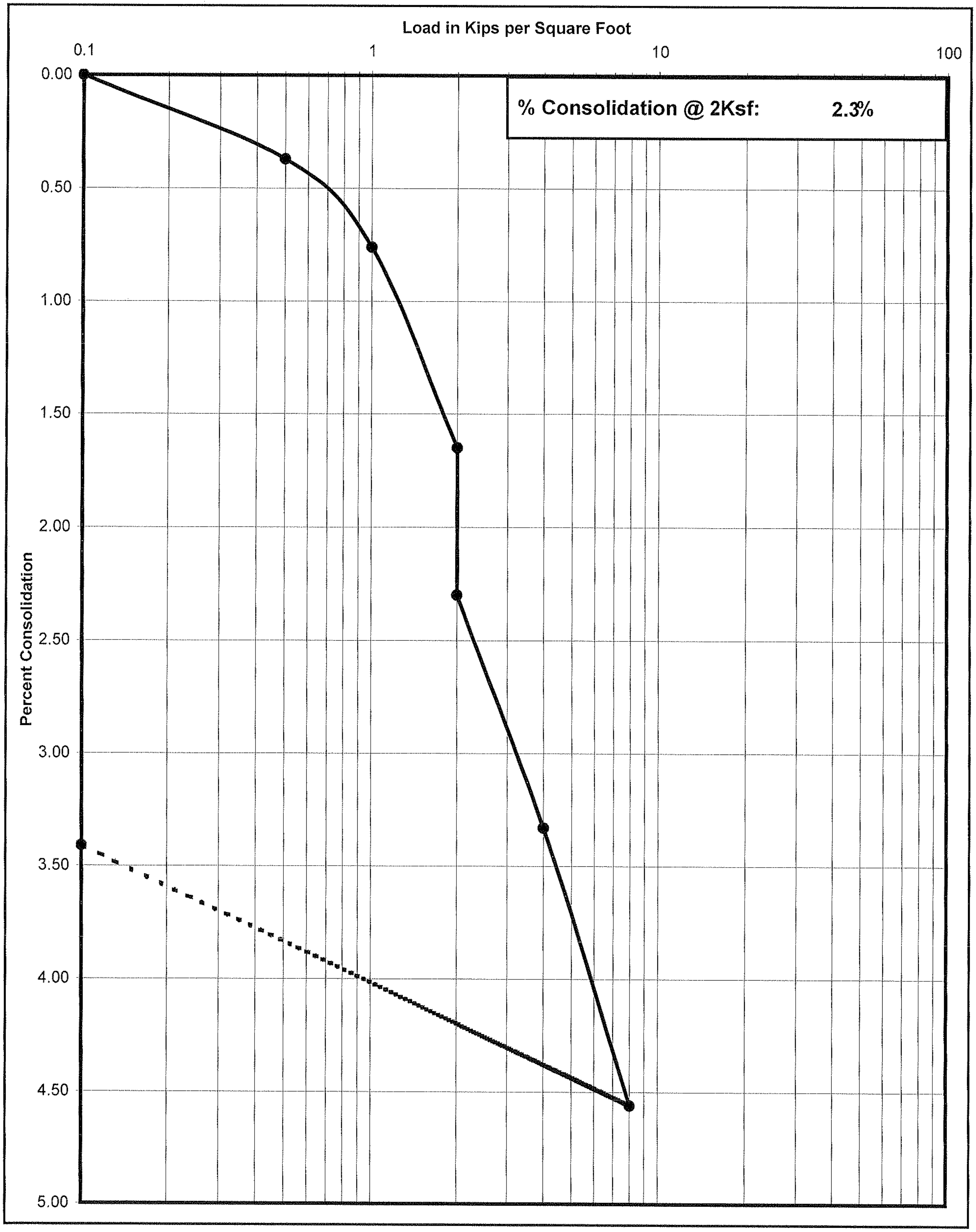
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B5 @ 2-3'	9/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

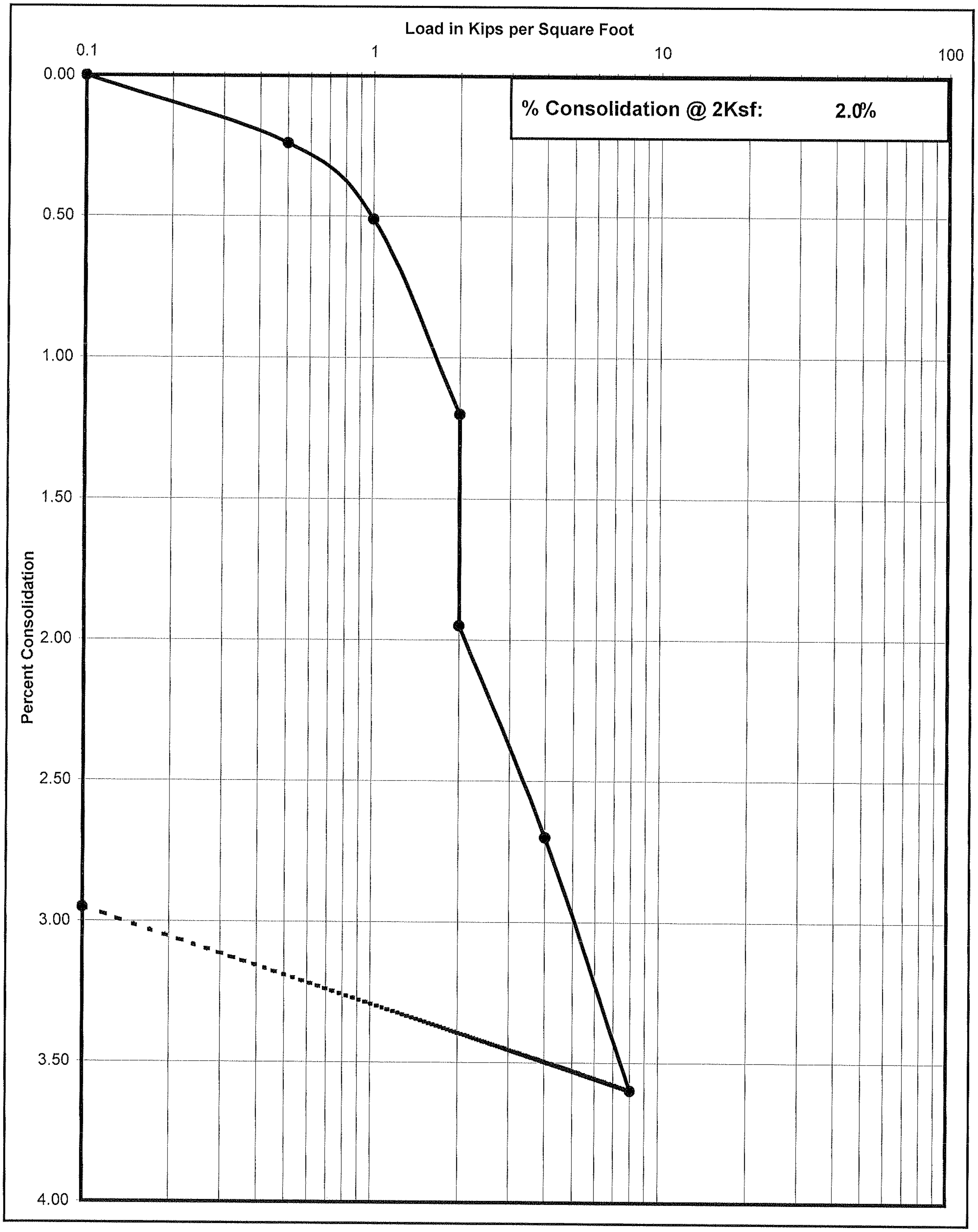
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B5 @ 5-6'	9/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

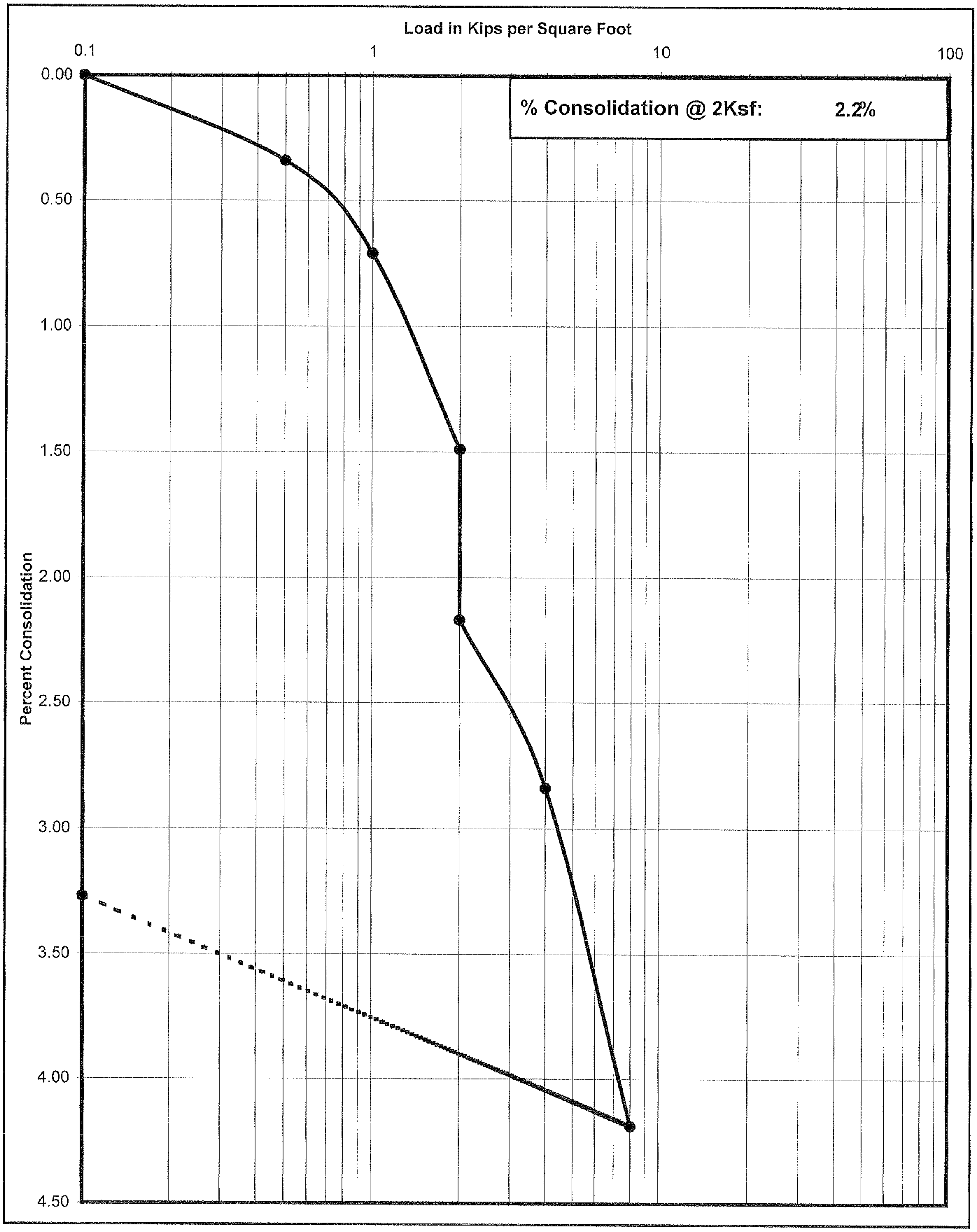
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B6 @ 2-3'	9/8/2010	SM



Krazan Testing Laboratory

Consolidation Test

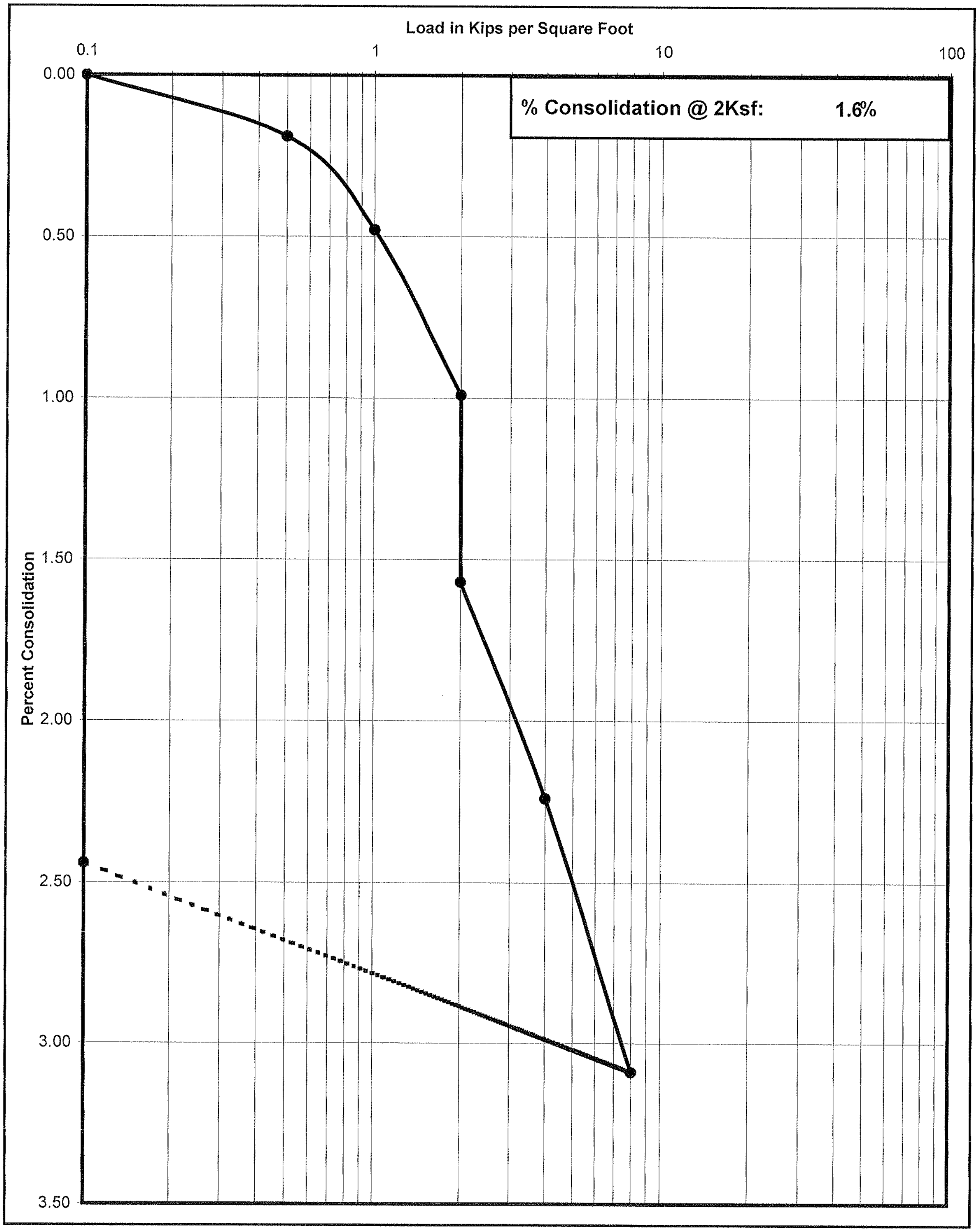
Project No	Boring No. & Depth	Date	Soil Classification
1210078	B6 @ 5-6'	9/8/2010	SM



Krazan Testing Laboratory

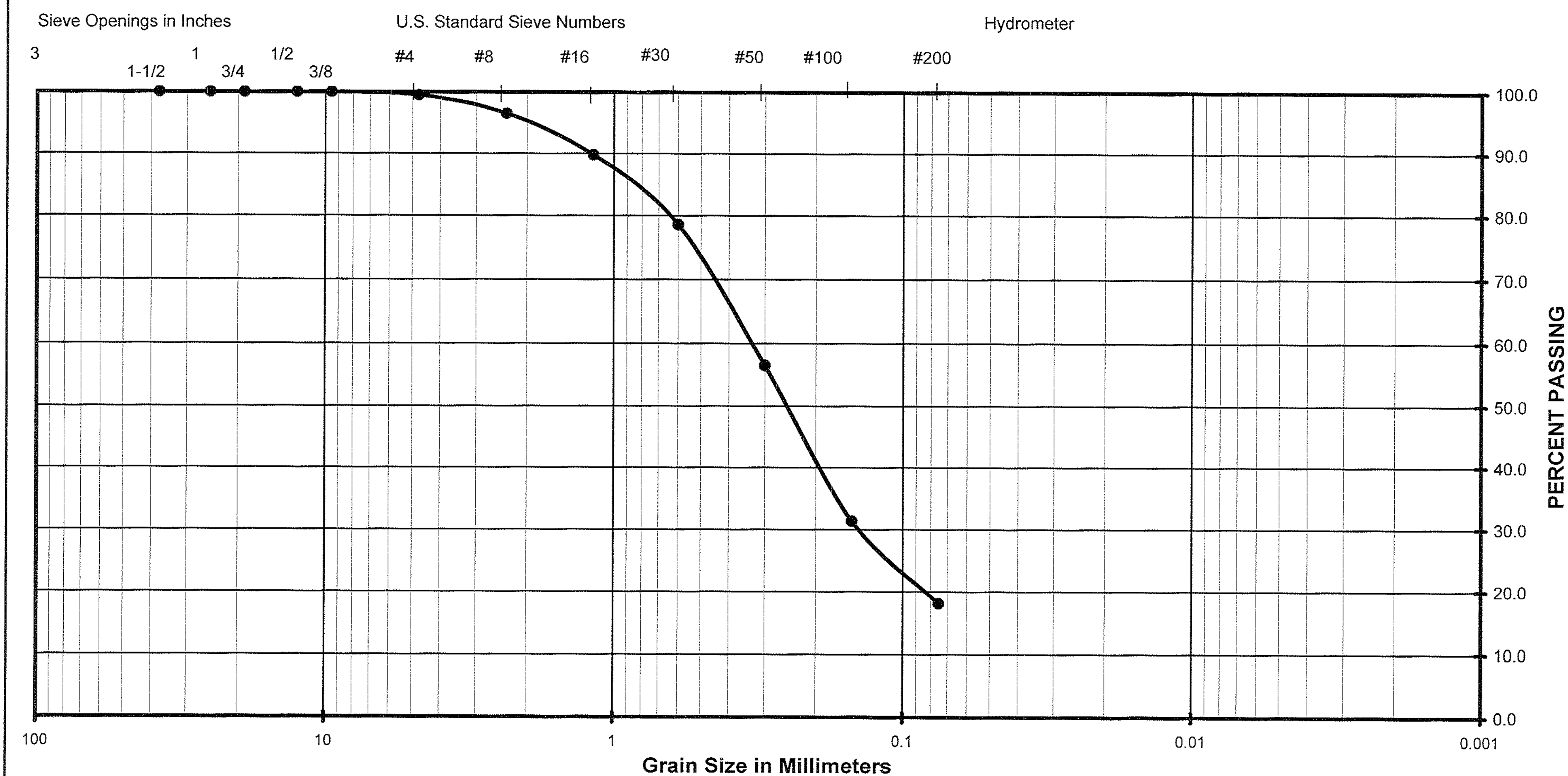
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
1210078	B7 @ 5-6'	9/8/2010	SM



Krazan Testing Laboratory

Grain Size Analysis



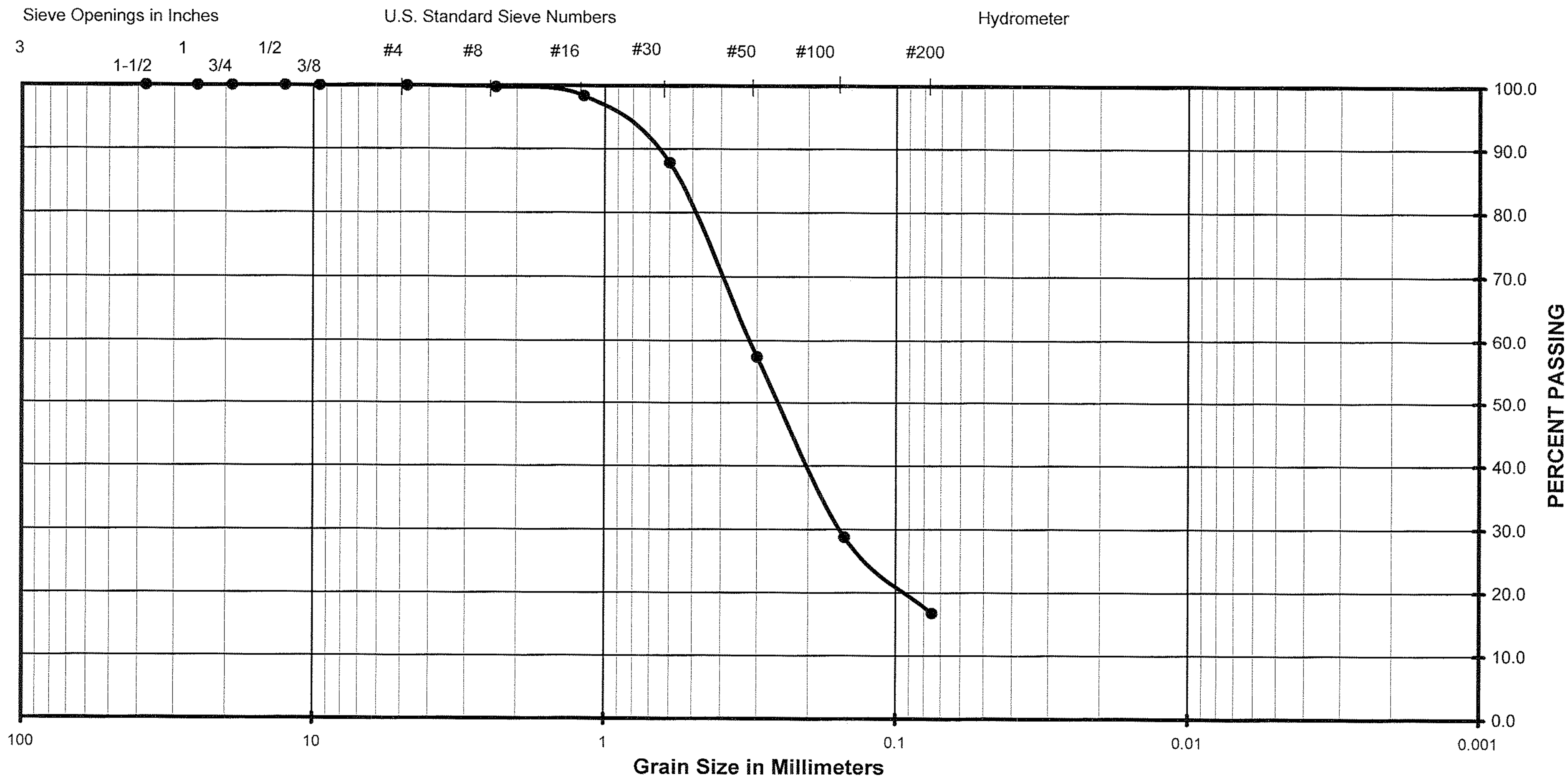
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	VA Central CA Health Care Sys
Project Number	1210078
Soil Classification	SM
Sample Number	B3 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis



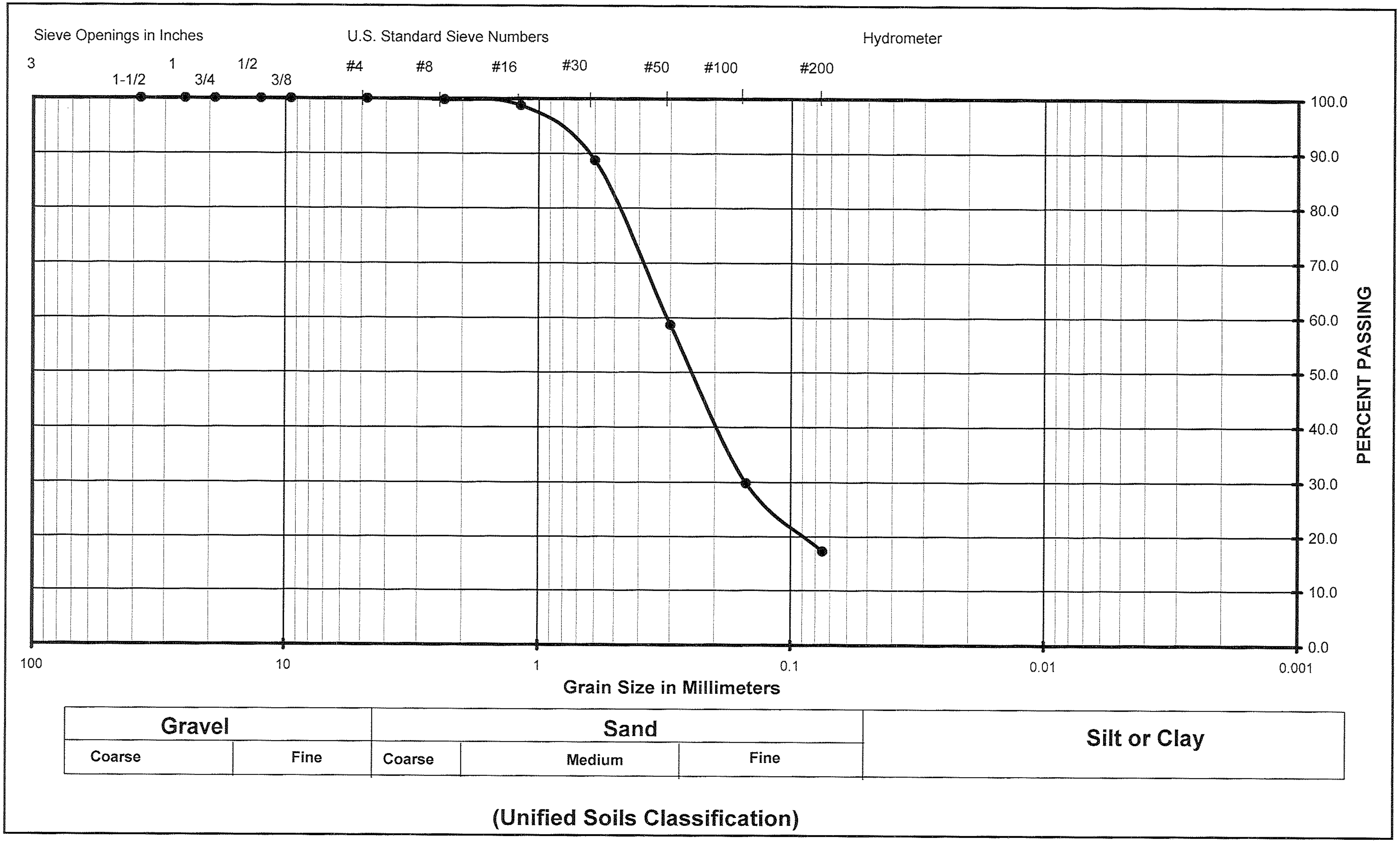
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	VA Central CA Health Care Sys
Project Number	1210078
Soil Classification	SM
Sample Number	B5 @ 2-3'

Krazan Testing Laboratory

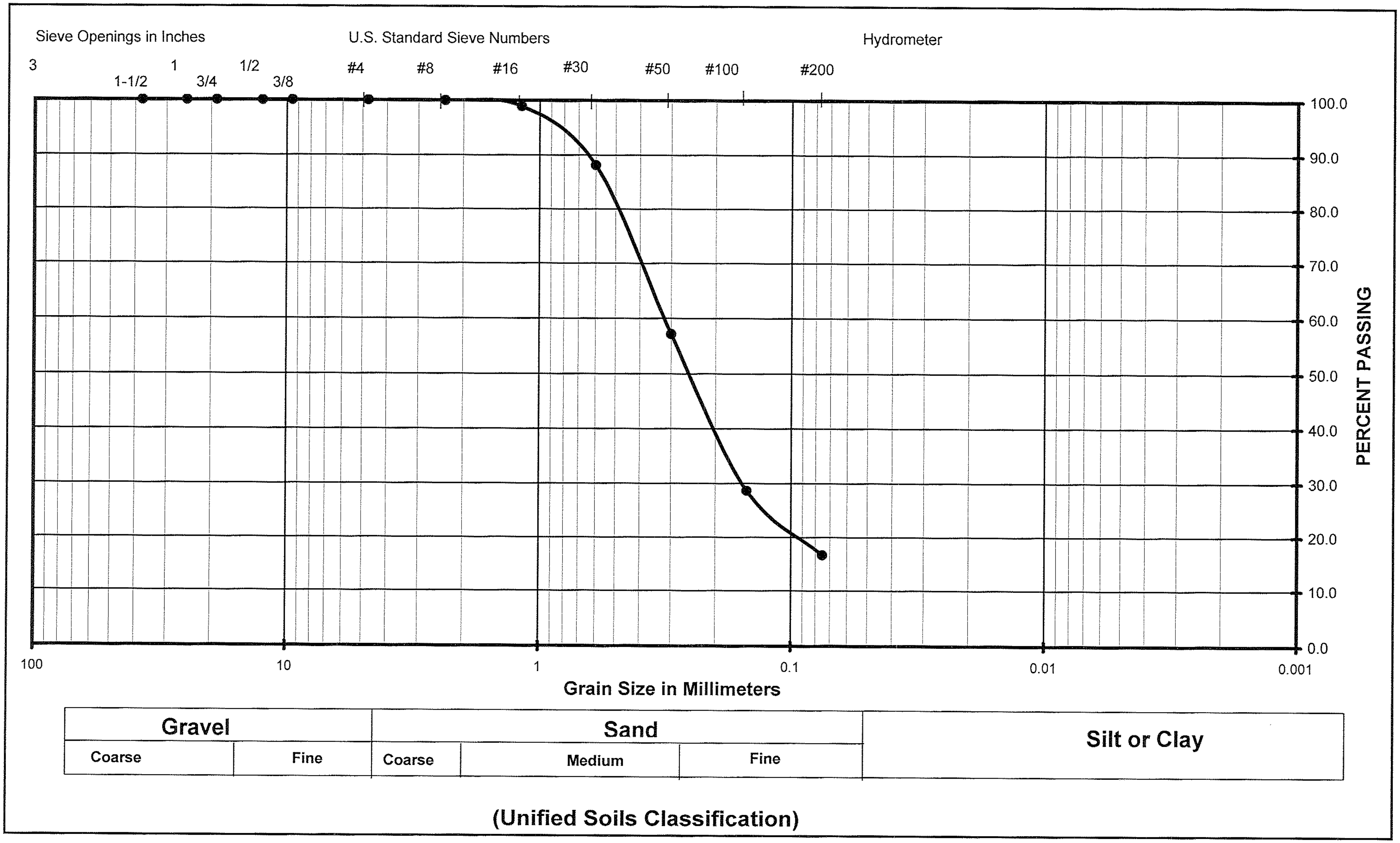
Grain Size Analysis



Project Name	VA Central CA Health Care Sys
Project Number	1210078
Soil Classification	SM
Sample Number	B6 @ 2-3'

Krazan Testing Laboratory

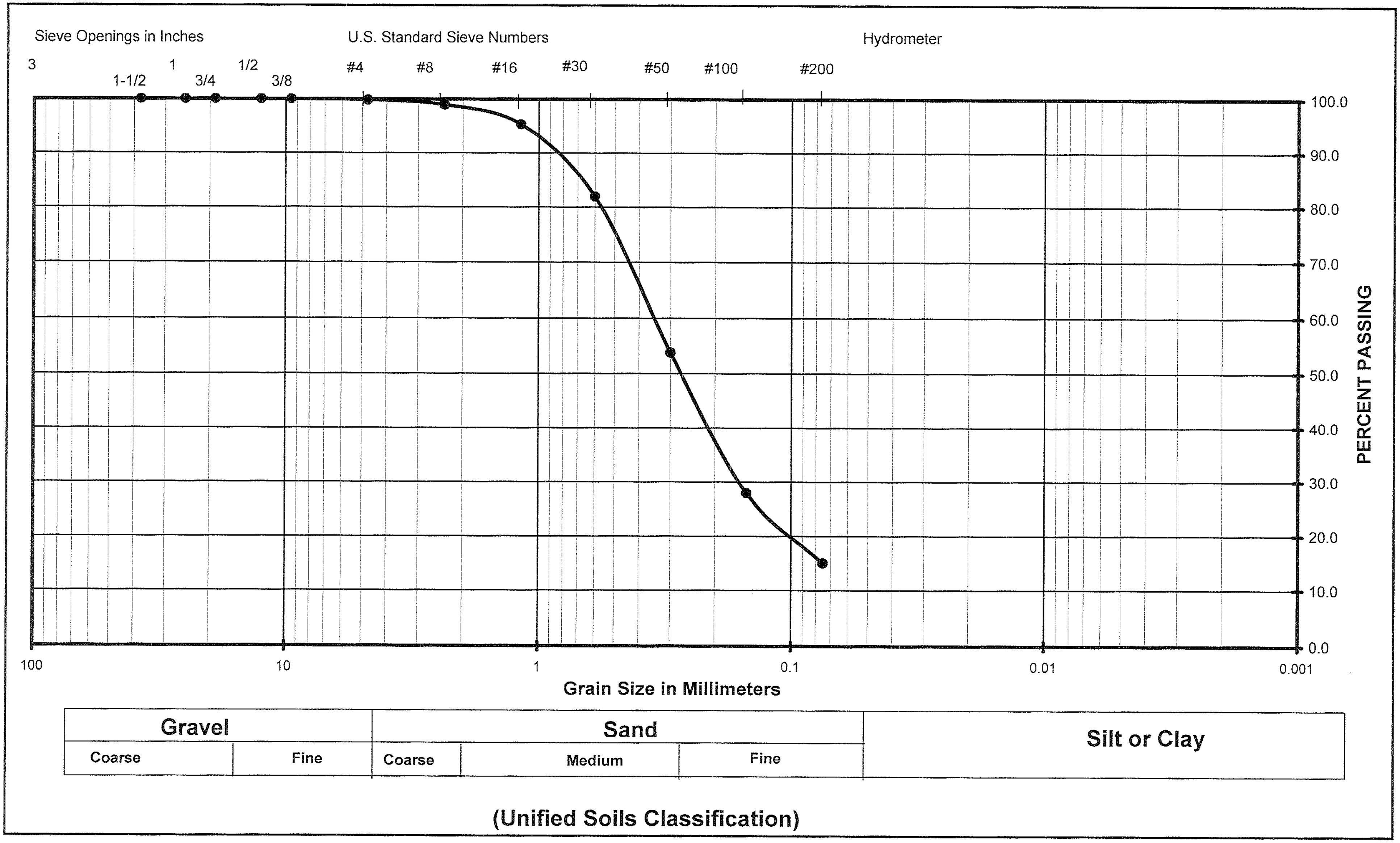
Grain Size Analysis



Project Name	VA Central CA Health Care Sys
Project Number	1210078
Soil Classification	SM
Sample Number	B6 @ 5-6'

Krazan Testing Laboratory

Grain Size Analysis

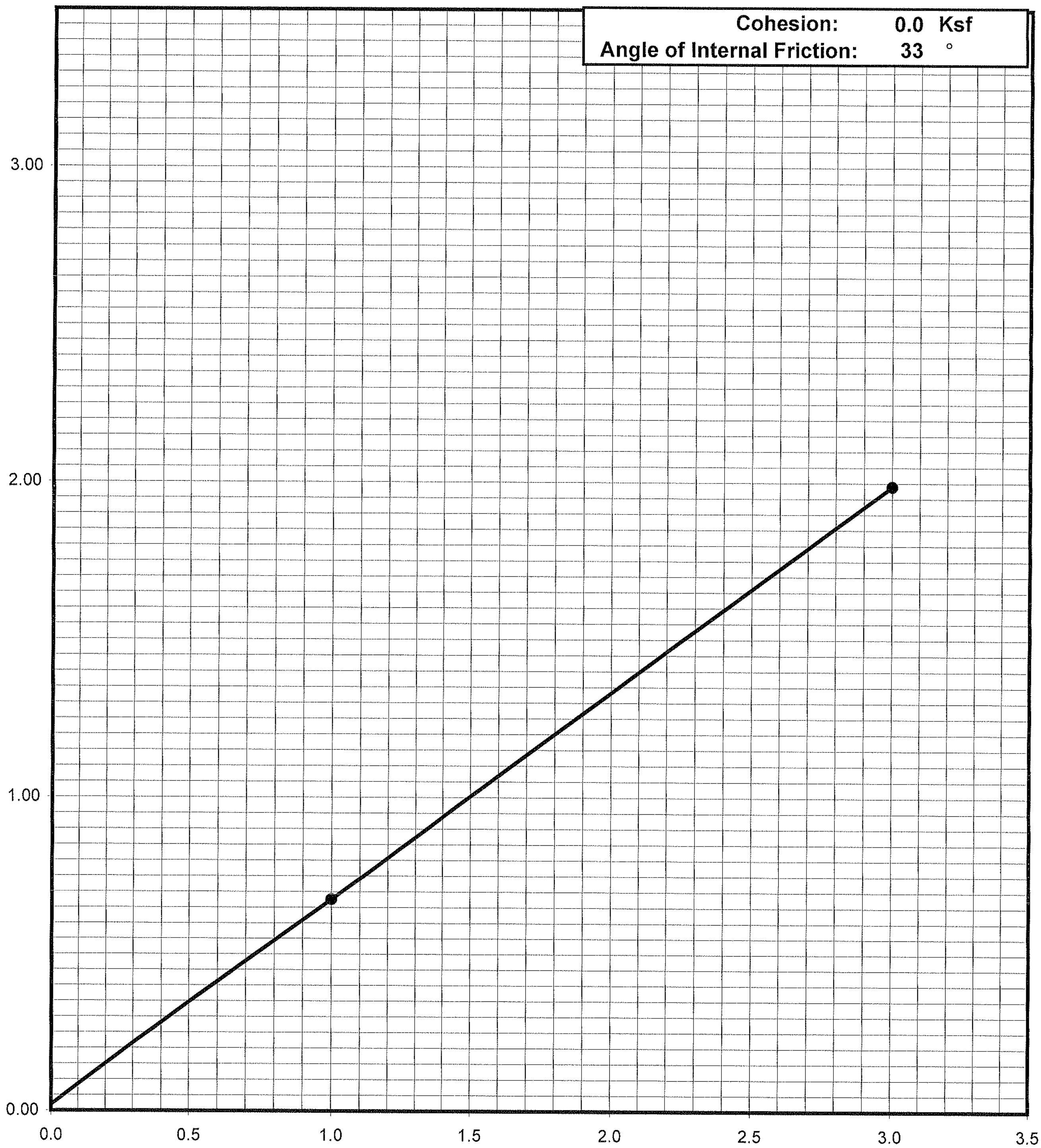


Project Name	VA Central CA Health Care Sys
Project Number	1210078
Soil Classification	SM
Sample Number	B7 @ 5-6'

Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

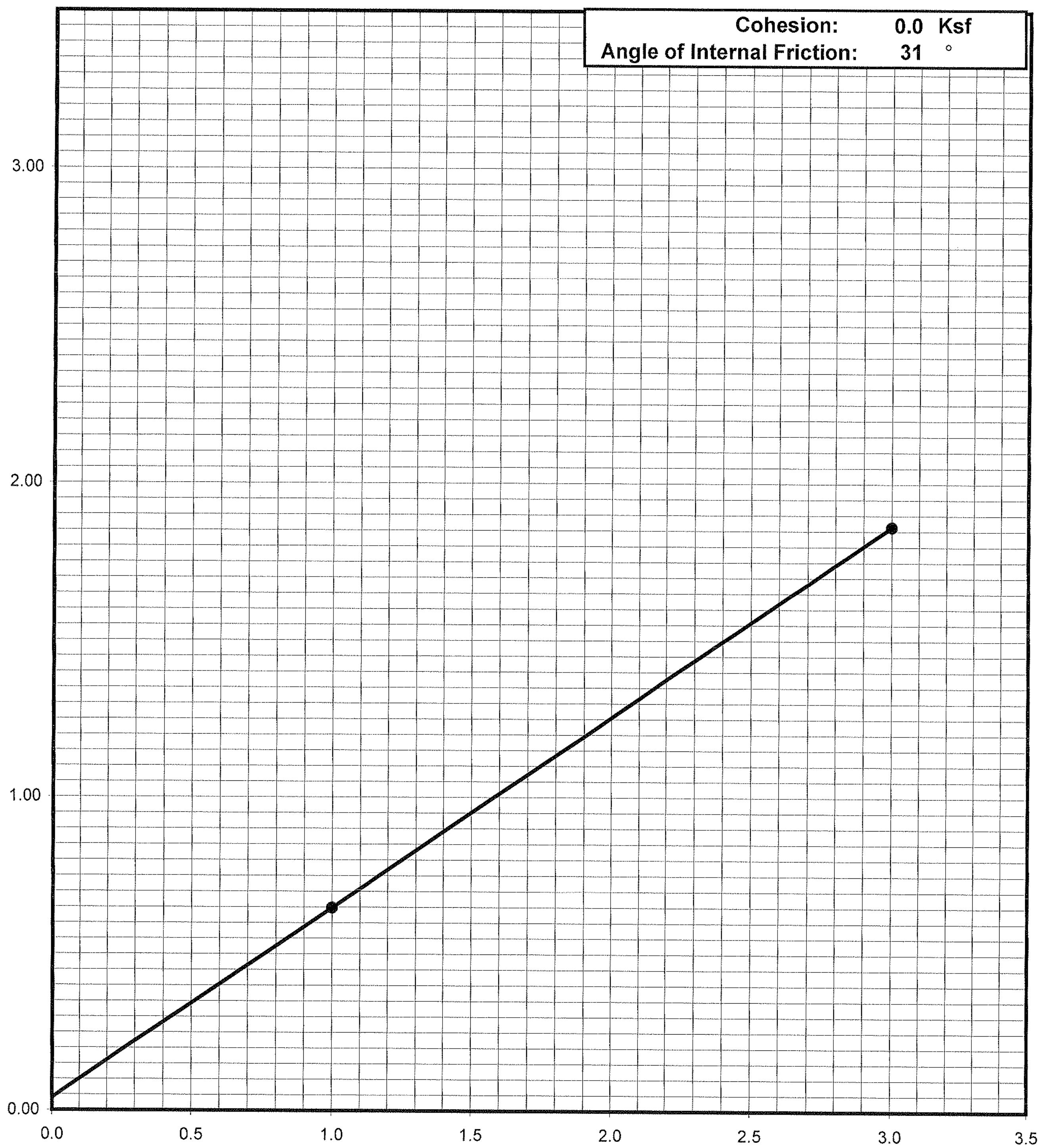
Project Number	Boring No. & Depth	Soil Type	Date
1210078	B1 @ 2-3'	SM	9/8/2010



Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

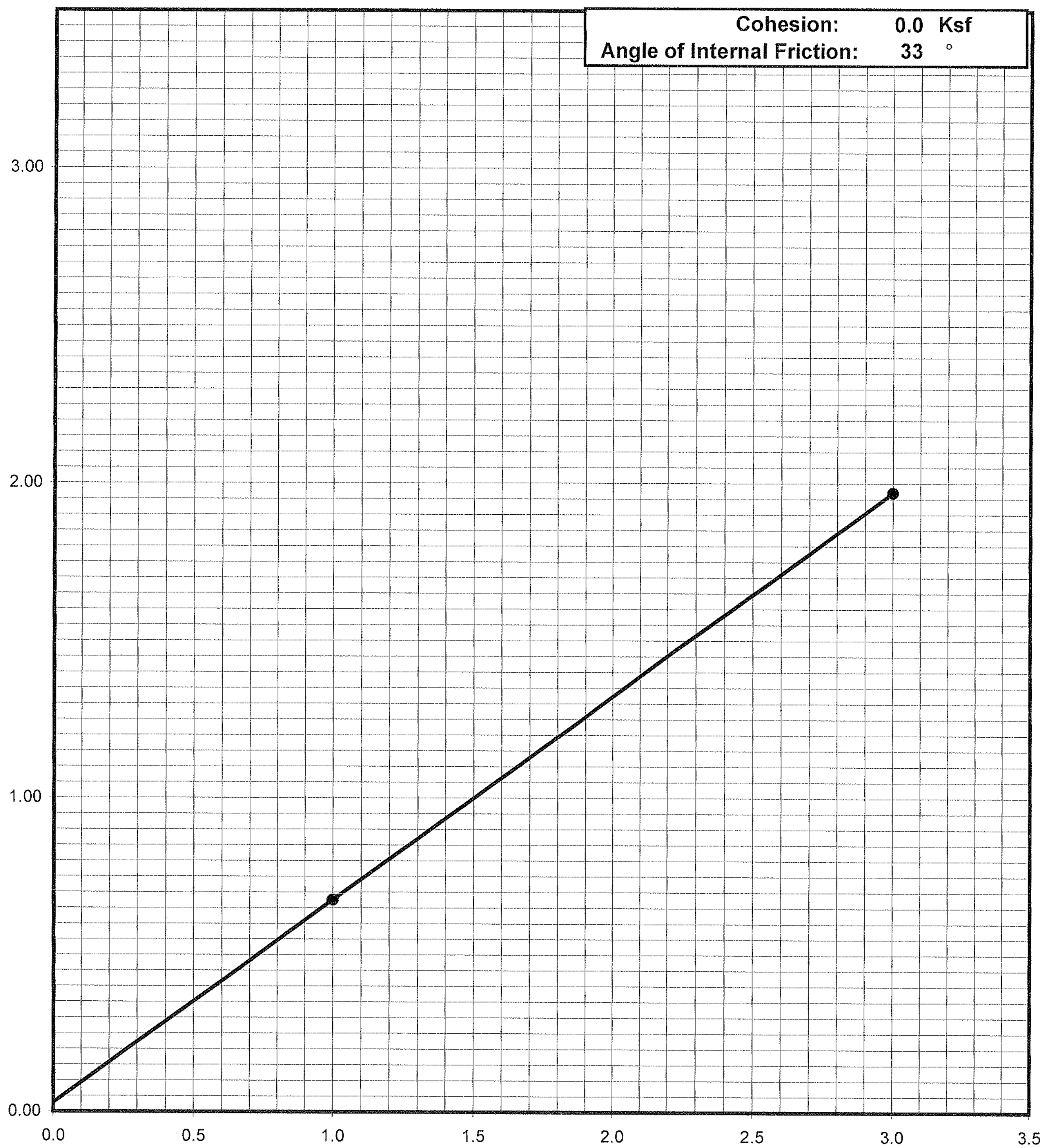
Project Number	Boring No. & Depth	Soil Type	Date
1210078	B4 @ 2-3'	SM	9/8/2010



Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
1210078	B7 @ 2-3'	SM	9/8/2010



Krazan Testing Laboratory

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. **DEFINITIONS** - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to is the May 2006 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. **SCOPE OF WORK** - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically noted as "Work Not Included."

3. **PREPARATION OF THE SUBGRADE** - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. **UNTREATED AGGREGATE BASE** - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, 1½ inches maximum size. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent.

5. **AGGREGATE SUBBASE** - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment and spreading and compacting mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50° F. The surfacing shall be rolled with a combination of steel wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.