

**GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED HOUSEHOLD HAZARDOUS WASTE FACILITY
SEC OF DOWNING AVENUE AND WEAR STREET
BAKERSFIELD, CALIFORNIA**

**PROJECT NO. 022-23052
JULY 28, 2023**

Prepared for:

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

July 28, 2023

KA No. 022-23052

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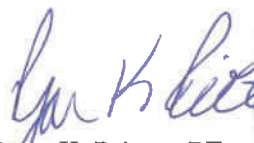
**RE: Geotechnical Engineering Investigation
Proposed Household Hazardous Waste Facility
SEC of Downing Avenue and Wear Street
Bakersfield, California**

Dear Mr. Frank:

In accordance with your request, we have completed a 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 (661) 837-9200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.


Ryan K. Privett, PE
Project Engineer
RCE No. 59372



RKP:ht

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PROPOSED HOUSEHOLD HAZARDOUS WASTE FACILITY
SEC OF DOWNING AVENUE AND WEAR STREET
BAKERSFIELD, CALIFORNIA**

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed household hazardous waste facility to be located at the southeast corner of Downing Avenue and Wear Street in Bakersfield, 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, pavement design, and soil cement reactivity.

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 was outlined in our proposal dated October 26, 2022 (KA Proposal P332-22) and 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 8 borings to depths ranging from approximately 10 to 20 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 development will consist of several items, including: 1) a 20,000 SF household hazardous waste building with associated warehouse, processing, and sorting areas; office area including restroom, shower/locker room, break room, and laundry facilities; 2) a 3,000 SF Stop & Shop (material reuse) building; 3) a 5,000 SF covered drive-up, drive-thru, drop-off, and staging area; 4) a 5,000 SF covered loading and shipping area. It is anticipated the buildings will be single- or two-story wood-framed or metal-framed structures utilizing concrete slab-on-grade construction. Footing loads are anticipated to be light to moderate. On-site asphalt-concrete and Portland cement concrete pavements and landscaping may also be associated with 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 rectangular in shape and encompasses approximately 5 acres. The site is located at the southeast corner of Downing Avenue and Wear Street in Bakersfield, California. The site is predominately surrounded by vacant land to the east, and commercial or industrial developments to the north, south, and west.

Review of historical aerial photographs indicates the site was previously utilized for storage of various equipment and materials, but no structures are known to have been previously located on the site. Numerous large trees were once centrally located near the northern site boundary, but have since been removed.

Presently, the majority of the site consists of vacant land. Some minor grading activities appeared to have been performed within the former material storage areas. Buried and overhead utilities are located along the edges of the site and may extend into the site. The site is covered by a low to medium scattered weed growth and the surface soils have a loose consistency. Asphalt and metal scrap debris were observed in isolated areas across the surface of the site. The site is relatively level with no major changes in grade.

GEOLOGIC SETTING

Geologically, the property is situated on the eastern flank, near the south end of the Great Valley Geomorphic Province. This province is a large northwesterly trending geosyncline or structural trough between the Coast Ranges and the Sierra Nevada Mountains. Erosion from both of these mountain systems has resulted in the deposition of immense thickness of sediments in the Valley floor. Heavily-laden streams from the Sierra Nevada have built very prominent alluvial fans along the margins of the San Joaquin Valley. This has resulted in a rather flat topography in the vicinity of the project site. The site is composed of alluvial deposits which are mostly cohesionless sands and silts.

The south end of the San Joaquin Valley is surrounded on all sides, excluding the north, by active fault systems (San Andreas, White Wolf-Breckenridge-Kern Canyon, and Garlock Faults). Numerous smaller faults exist within the valley floor.

There is on-going seismic activity in the Kern County area, with the most noticeable earthquake being the July 21, 1952 Kern County Earthquake. The initial shock was 7.7 magnitude shake with the epicenter near Wheeler Ridge, about 45 miles from Bakersfield. Vertical displacements of as much as 3 feet occurred at the fault line.

The closest known faults to the property are subsurface faults located at the Fruitvale Oil Field. These faults cut the older sediments and, although numerous, are not thought to be active in the last 2 million years.

No evidence was observed that indicated surface faulting has occurred across the property during the Holocene time. Faults not yet identified, however, may exist. The site is not within an Earthquake Fault Zone (Special Studies Zone).

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 8 borings to depths ranging from approximately 10 to 20 feet below existing site grade, using a truck-mounted drill rig. In addition, 2 bulk soil samples were collected from the proposed pavement areas for R-value testing for pavement design. Furthermore, 2 shallow percolation tests were performed in the area of the proposed septic system leach field. The approximate boring, bulk sample, and percolation test 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, permeability, R-value, and moisture density relationships of the materials encountered. In addition, chemical tests were

performed to evaluate the soil-cement reactivity. Details of the laboratory test program and results of the laboratory test 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 upper soils consisted of approximately 6 to 12 inches of very loose silty sand. These soils are disturbed, have low strength characteristics and are highly compressible when saturated.

Approximately 1 foot of fill material was encountered in several of the soil borings. The fill material predominately consisted of silty sand. 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 suggests that the fill soils were generally loosely placed.

Below the loose surface soils and fill material, approximately 3 to 4 feet of loose to medium dense silty sand was encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 9 to 28 blows per foot. Dry densities ranged from 108 to 115 pcf. Representative soil samples consolidated approximately 2 to 2½ percent under a 2 ksf load when saturated. A representative soil sample had an angle of internal friction of 35 degrees.

Below 4 to 5 feet, layers of predominately loose to dense silty sand, silty sand/sandy silt, silty sand/sand, or sand were encountered. Some of these soils contained trace amounts of gravel. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 12 to 62 blows per foot. Dry densities ranged from 99 to 120 pcf. A representative soil sample consolidated approximately 3 percent under a 2 ksf load when saturated. A representative soil sample had an angle of internal friction of 33 degrees. These soils had slightly stronger 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 logs of borings in Appendix A.

PERCOLATION TESTING

Two percolation tests were performed on the site. The percolation tests were performed at depths of 4 to 8 feet. The tests were conducted in accordance with the criteria set in the "Manual of Septic Tank Practice" published by the Department of Health, Education, and Welfare. The tests were performed within the project site to represent the anticipated sewage disposal areas. Results of the tests are as follows:

Test No.	Depth (feet)	Percolation Rate (min/inch)	Soil Type
P1	4	40 (Type V)	Silty Sand/Sandy Silt (SM/ML)
P2	8	13.3 (Type IV)	Silty Sand (SM)

The percolation tests indicate that these soils are Types IV and V soil, based on the Uniform Plumbing Code and County of Kern. The percolation rates given are based on 1 inch of fall within a 6-inch diameter hole with a 6-inch head of water.

PERMEABILITY TESTING

Two permeability tests were performed on soil samples collected from depths of 10 to 15 feet below existing site grade. The permeability tests were performed in accordance with ASTM Test Method D2434. The test results are as follows:

Boring No.	Depth (feet)	Coefficient of Permeability (cm/second)	Soil Type
B7	10-11	4.7×10^{-3}	Silty Sand/Sand (SM/SP)
B8	15-16	5.1×10^{-2}	Sand (SP)

The permeability tests and soils encountered in soil borings B7 and B8 indicate that the soils within a depth of 20 feet exhibit good infiltration characteristics and are likely to be suitable for use in conjunction with storm water drainage. It should be noted that mitigation measures may be necessary in order to prepare the drainage basin for complete storm water disposal within a 7-day period as required by the County of Kern. This will depend upon the total basin depth and required storage volume. Additional subsurface exploration below a depth of 20 feet may be necessary to identify suitable soil conditions at increased depth for drainage of the basin. Alternatively, the owner may consider the use of a shallow subsurface storm water disposal system.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was not encountered.

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.

GEOLOGIC AND SEISMIC HAZARDS

Soil liquefaction, a primary geologic/seismic hazard, is a state of soil particle suspension, caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs in soils, such as sands, in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sands. Liquefaction usually occurs under vibratory conditions, such as those induced by seismic events.

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

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

The predominant soils within the project site consist of layers of silty sand, silty sand/sandy silt, silty sand/sand, and sand. Groundwater was not encountered within the depths explored. In addition, groundwater has been historically encountered at depths greater than 50 feet below site grade within the project site and vicinity. Therefore, the potential for liquefaction and related settlement is low at this site and no liquefaction mitigation procedures are necessary for this project.

Secondary hazards from earthquakes include rupture, seiche, slope instability, landslides, lateral spreading, and subsidence. Since there are no known faults within the immediate area, ground rupture from surface faulting should not be a potential problem. Seiche, lateral spreading, slope instability, and landslides are not hazards in the area either. In addition, there are no known occurrences of structural or architectural damage due to deep subsidence in the Bakersfield area. The total and differential seismic-induced settlements should be less than 1-inch.

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 loose surface soils, fill material, and previous development appear to be conducive to the development of the project. The surface soils have a loose consistency. These soils are disturbed, have low strength characteristics, and are highly

compressible when saturated. Accordingly, it is recommended that the surface soils be recompact. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Approximately 1 foot of fill material was encountered within several of the soil borings drilled at the site. The fill material predominately consisted of silty sand. 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 suggests that fill soils were generally loosely placed. Therefore, it is recommended that the fill soils be excavated and stockpiled so that the native soils can be prepared properly. Preliminary testing indicates the fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Fill soil intermixed with asphaltic concrete will not be suitable for re-use in building areas, but may be used in pavement areas, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, Krazan & Associates, Inc., should inspect the bottom of the excavation to verify no additional removal is required.

Structures are located within the project site vicinity. Associated with these developments are buried structures, such as utility lines that may extend into the project site. Demolition activities should include proper removal of any buried structures. Any buried structures, including loosely backfilled excavations, encountered should be properly removed and the resulting excavations backfilled. After demolition activities, it is recommended that these disturbed soils be removed and/or recompact. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

Trees were previously located on the site. Tree root removal operations should include roots greater than 1 inch in diameter. 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.

Sandy and gravelly 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 and gravelly 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 conventional foundations with an allowable bearing pressure of 2,500 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.

Site Preparation

General site clearing should include removal of vegetation; concrete and metal 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 foot of fill material was encountered within several of the soil borings drilled at the site. The fill material predominately consisted of silty sand. 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 suggests that fill soils were generally loosely placed. Therefore, it is recommended that the fill soils be excavated and stockpiled so that the native soils can be prepared properly. Preliminary testing indicates the fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Fill soil intermixed with asphaltic concrete will not be suitable for re-use in building areas, but may be used in pavement areas, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, Krazan & Associates, Inc., should inspect the bottom of the excavation to verify no additional removal is required.

Structures are located within the project site vicinity. Associated with these developments are buried structures, such as utility lines that may extend into the project site. Demolition activities should include proper removal of any buried structures encountered during construction. Any buried structures, including utilities or loosely backfilled excavations, encountered during construction should be properly removed and the resulting excavations backfilled. Disturbed areas caused by demolition activities should be removed and/or recompacted. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels 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. Existing 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 cleaned to firm native ground and backfilled with Engineered Fill.

In order to provide uniform foundation support, it is recommended that following stripping operations, fill removal, and demolition activities, the upper 12 inches of underlying exposed native soils within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-

conditioned to at or above optimum moisture content, and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that the proposed structure foundations and floor slabs be supported by a minimum of 12 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond structural elements. The on-site soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Fill soil intermixed with asphaltic concrete will not be suitable for re-use in building areas, but may be used in pavement areas, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan and 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. Soft or pliant areas should be excavated to firm native ground. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Following stripping operations, fill removal, and demolition activities, the exposed subgrade in exterior flatwork and pavement areas should be excavated/scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to at or above optimum moisture content, and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Limits of recompaction should extend 2 feet flatwork and pavements. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

It is recommended that any uncertified fill material encountered within pavement areas be removed and/or recompact. The fill material should be moisture-conditioned to at or above optimum moisture and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. As an alternative the Owner may elect not to recompact the existing fill within paved areas. However, the Owner should be aware that the paved areas may settle which may require annual maintenance. At a minimum it is recommended that the upper 12 inches of subgrade soil be moisture conditioned as necessary and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 12 inches below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

Trees were previously located on the site. Tree root removal operations should include roots greater than 1 inch in diameter. 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.

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 organic-free, on-site, upper native and fill soils are predominately silty sand, silty sand/sandy silt, silty sand/sand, or sand. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Fill soil intermixed with asphaltic concrete will not be suitable for re-use in building areas, but may be used in pavement areas, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 12 inches below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

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 predominantly non-expansive granular material with a plasticity index less than 10 and an expansion index less than 15. Imported Fill should be free from rocks and lumps greater than 4 inches in maximum dimension. All Imported Fill material should be submitted for approval to the Soils Engineer at least 48 hours prior to delivery to the site.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to at or above optimum moisture content, and compacted to achieve at least 90 percent of 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 1804 of the 2022 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 1 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 reduced; 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 and gravelly 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 and gravelly 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 and over-excavation, the site should be suitable for shallow footing support. The proposed buildings may be supported on a shallow foundation system bearing on a minimum of 12 inches of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,875 psf
Dead-Plus-Live Load	2,500 psf
Total Load, Including Wind or Seismic Loads	3,325 psf

Footings should have a minimum 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. Ultimate design of foundations and reinforcement should be performed by the project's Structural Engineer.

The footing excavations should not be allowed to dry out 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.

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

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 allowable 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 value above may be used for short duration, wind, or seismic loads.

Excavation Stability

Temporary excavations planned for the construction of the tank structures may be excavated, according to the accepted engineering practices following Occupational Safety and Health Administration (OSHA) standards by a Contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (ft)	Slope (Horizontal:Vertical)
	Temporary
0-5	1½:1
5-10	1½:1
10-15	1¾:1
15-20	2:1

If, due to space limitation, excavation near existing structures or roads is performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavation and installation. A specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. The lateral pressures provided below may be used in the design of a braced-type shoring system.

Recommended Lateral Earth Pressure for Braced Shoring	
Depth of Excavation Below Ground Surface (feet)	Lateral Soil Pressure (psf)
0	35 H
0.25 H	35 H
H	35 H
Where H is the total depth of the excavation in feet.	

The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given above.

Since the Contractor has the ultimate responsibility for excavation stability, he may design a different shoring system for the excavation.

The excavation/shoring recommendations provided herein are based on soil characteristics derived from limited test borings drilled within the site. Variations in soil conditions will likely be encountered during the excavations. Krazan & Associates, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation.

Floor Slabs and Exterior Flatwork

In areas that will utilize moisture-sensitive floor coverings, concrete slab-on-grade floors 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.

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. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

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 reduce 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 reduce 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 35 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 55 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.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete, or other suitable backfill to reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2018). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall, in the center line of the drainage blanket and should have a minimum diameter of four inches. Collector pipes may be either slotted or perforated. Slots should be no wider than $\frac{1}{8}$ inch, while perforations should be no more than $\frac{1}{4}$ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

The 2022 CBC requires determination of dynamic seismic lateral earth pressures on foundation walls and retaining walls supporting more than 6 feet of backfill height due to design earthquake ground motions. The Site Modified Peak Ground Acceleration (PGA_M), based on ASCE7-16 and information from the SEAOC and OSHPD Seismic Design Maps website (<https://seismicmaps.org>), is 0.476. We recommend an incremental seismic lateral pressure of 21 pcf be included in the stability analyses for the retaining wall. The incremental seismic lateral pressure should be applied in a reverse triangular distribution at the back side of the wall.

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.

R-Value Test Results and Pavement Design

Two subgrade soil samples were obtained from the project site for R-value testing at the locations shown on the attached site plan. The samples were tested in accordance with the State of California Materials Manual Test Designation 301. Results of the tests are as follows:

Sample	Depth	Description	R-Value at Equilibrium
1	12-24"	Silty Sand (SM)	59
2	12-24"	Silty Sand (SM)	58

The test results are moderate and indicate good subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	12.0"
4.5	2.5"	4.0"	12.0"
5.0	2.5"	4.0"	12.0"
5.5	3.0"	4.0"	12.0"
6.0	3.0"	4.0"	12.0"
6.5	3.5"	4.0"	12.0"
7.0	4.0"	4.0"	12.0"
7.5	4.0"	4.0"	12.0"

* 95% compaction based on ASTM Test Method D1557 or CAL 216

** 90% compaction based on ASTM Test Method D1557 or CAL 216

If traffic indices are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic, and an index of 7.0 may be used for light truck traffic.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete Pavement Sections based on the design procedures developed by the Portland Cement Association.

PORTLAND CEMENT PAVEMENT LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	--	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	7.0"	--	12.0"

* 95% compaction based on ASTM Test Method D1557 or CAL 216

** 90% compaction based on ASTM Test Method D1557 or CAL 216

***Minimum compressive strength of 3000 psi

It is recommended that any uncertified fill material encountered within pavement areas be removed and/or recompacted. The fill material should be moisture-conditioned to near optimum moisture and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. As an alternative, the Owner may elect not to recompact the existing fill within paved areas. However, the Owner should be aware that the paved areas may settle, which may require annual maintenance. At a minimum, it is recommended that the upper 12 inches of subgrade soil be moisture-conditioned as necessary and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Seismic Parameters – 2022 California Building Code

The Site Class per Section 1613 of the 2022 California Building Code (2022 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. A site modified peak ground acceleration (PGA_M) of 0.476 may be used for seismic analysis. For seismic design of the structures based on the seismic provisions of the 2022 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.200	Table 1613.2.3 (1)
S_s	0.909	Section 1613.2.1
S_{MS}	1.091	Section 1613.2.3
S_{DS}	0.727	Section 1613.2.4
Site Coefficient F_v	1.968	Table 1613.2.3 (2)
S_1	0.332	Section 1613.2.1
S_{M1}	0.653	Section 1613.2.3
S_{D1}	0.436	Section 1613.2.4
T_s	0.599	Section 1613.2

* Based on Equivalent Lateral Force (ELF) Design Procedure being used.

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 CBC 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 (18.4 ppm) and are below the maximum allowable values established by HUD/FHA and CBC. 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 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.

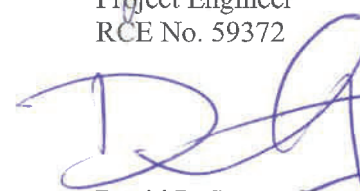
If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (661) 837-9200.

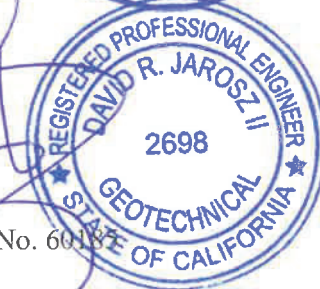
Respectfully submitted,

KRAZAN & ASSOCIATES, INC.


Ryan K. Privett, PE
Project Engineer
RCE No. 59372

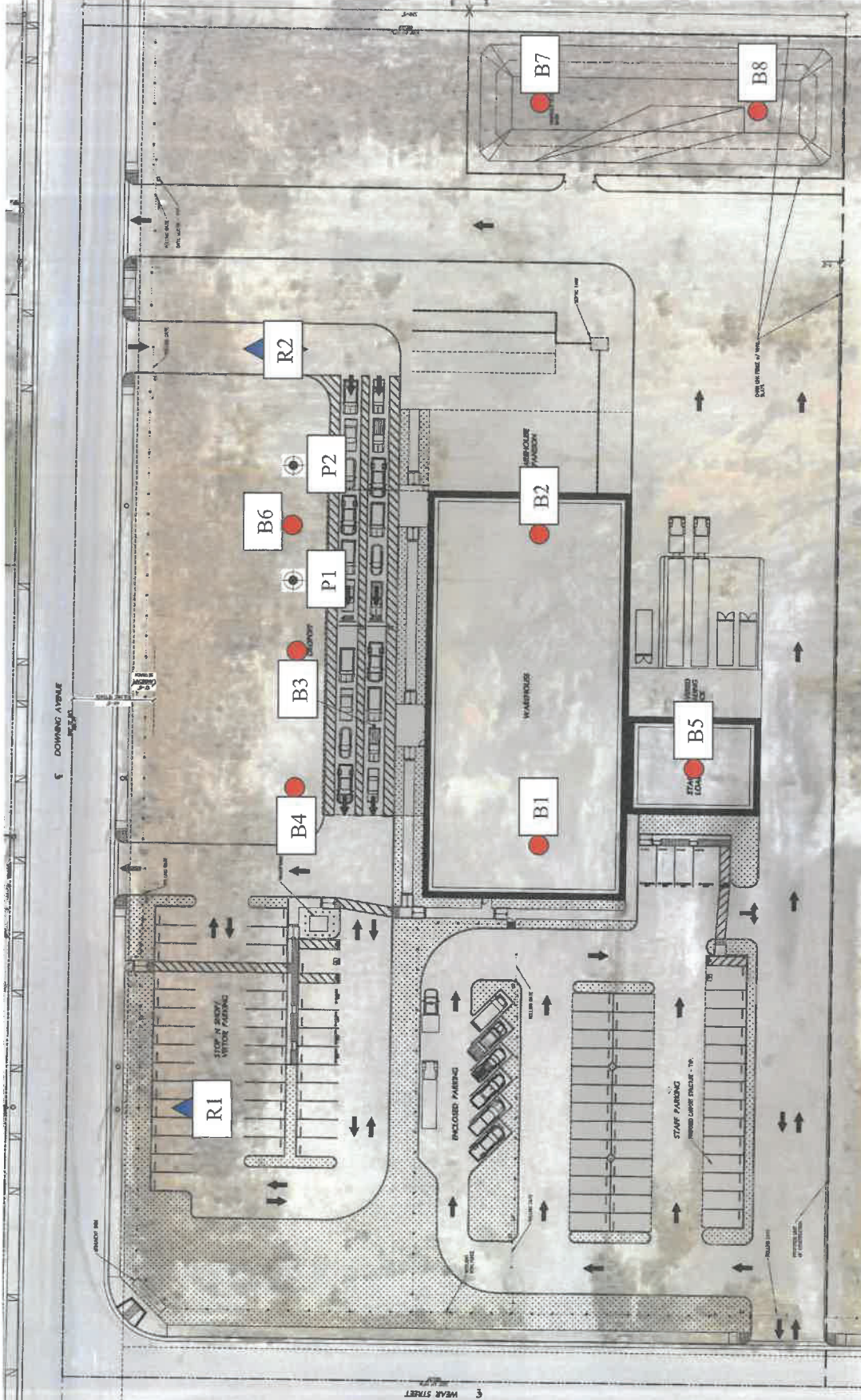



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60187

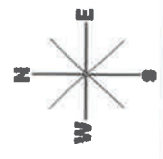


RKP/DRJ:ht

**SIGNATURE OF QUALIFIED PROFESSIONAL:**



- APPROXIMATE BORING LOCATION
- ▲ APPROXIMATE R-VALUE LOCATION
- ⊙ APPROXIMATE PERMEATION TEST LOCATION



SITE MAP		Scale:	Date:
Household Hazardous Waste Facility SEC Downing Avenue and Wear Street Bakersfield, California	NTS	NTS	July 2023
	HT	HT	Approved by: DJ
	022-23052	Project No. 022-23052	Figure No. 1



APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Eight 4½-inch diameter 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 were performed at selected depths. This test represents the resistance to driving a 2½-inch diameter split barrel sampler. 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. All samples were returned to our Clovis 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 determined for the undisturbed samples representative of the subsurface material. Permeability 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.

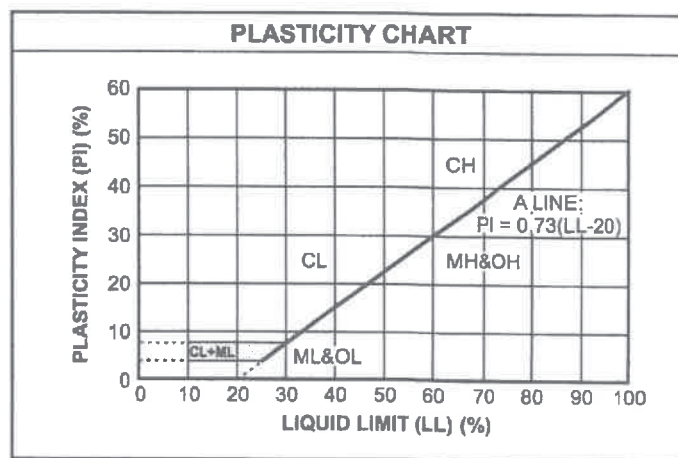
The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	 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
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	 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 or 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
<i>Granular Soils</i>	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
<i>Cohesive Soils</i>	
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	12 to 13 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 0.42
Fine-grained	No. 40 to No. 200	0.42 to 0.074
Silt and Clay	Below No. 200	Below 0.074



Log of Boring B1

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-1

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.							
0		Ground Surface					20	40	60	10	20	30	40
0		SILTY SAND (SM) FILL, fine- to medium-grained; dark brown, damp, drills easily											
2		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily	115.1	1.4		28							
4													
6			120.9	2.9		30							
8													
10		SAND (SP) Medium dense, fine- to coarse-grained; light brown, damp, drills easily	107.3	0.8		19							
12													
14													
16			119.9	1.2		26							
18													
20													

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B2

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-2

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
0		Ground Surface					20 40 60	10 20 30 40			
0		SILTY SAND (SM) FILL, fine- to medium-grained; dark brown, damp, drills easily									
2		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily	108.6	1.3		19					
4											
6			101.5	9.8		21					
8											
10		End of Borehole									
12											
14											
16											
18											
20											

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-3

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.							
0		Ground Surface											
2		SILTY SAND (SM) FILL, fine- to medium-grained; dark brown, damp, drills easily											
2		SILTY SAND (SM) Loose, fine- to medium-grained; brown, damp, drills easily	112.9	4.4		13							
4													
6			113.4	5.4		12							
8													
8		SAND (SP) Medium dense, fine- to medium-grained; brown, damp, drills easily	114.9	5.4		17							
10													
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B4

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-4

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
2		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, damp, drills easily Loose below 12 inches	113.0	4.6		9							
4													
6			100.6	10.0		15							
8		End of Borehole											
10													
12													
14													
16													
18													
20													

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B5

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-5

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
0		Ground Surface									
2		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, damp, drills easily Loose below 12 inches Medium dense below 2 feet	114.0	2.7		18					
4											
6			104.4	4.6		23					
8											
10		End of Borehole									
12											
14											
16											
18											
20											

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B6

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-6

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.							
							20	40	60	10	20	30	40
0		Ground Surface											
		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, damp, drills easily Loose below 12 inches											
2			110.8	3.3		12							
4		SILTY SAND/SANDY SILT (SM/ML) Medium dense, fine- to medium-grained; brown, damp, drills easily											
			113.2	2.8		16							
6													
		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily											
8						17							
10													
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B7

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-7

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
		Ground Surface					20 40 60	10 20 30 40			
0		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, damp, drills easily									
2		Loose below 12 inches Medium dense below 2 feet	113.2	1.2		18					
4		SILTY SAND/SANDY SILT (SM/ML) Dense, fine- to medium-grained; brown, moist, drills firmly									
6			110.1	8.8		62					
8		SILTY SAND/SAND (SM/SP) Medium dense, fine- to medium-grained; light brown, damp, drills easily									
10			102.9	1.8		16					
12											
14		SAND (SP) Medium dense, fine- to medium-grained; light brown, damp, drills easily									
16				1.2		18					
18											
20											

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B8

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-8

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Dave Adams

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)				
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.								
0		Ground Surface												
		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, damp, drills easily Loose below 12 inches Medium dense below 2 feet												
2			108.1	1.3		17								
4														
6			100.1	8.1		24								
8		SAND (SP) Medium dense, fine- to medium-grained; light brown, damp, drills easily												
10				0.6		17								
12														
14			With GRAVEL below 13 feet											
16			99.7	3.3		17								
18														
20														

Drill Method: Solid Flight

Drill Date: 5-16-23

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

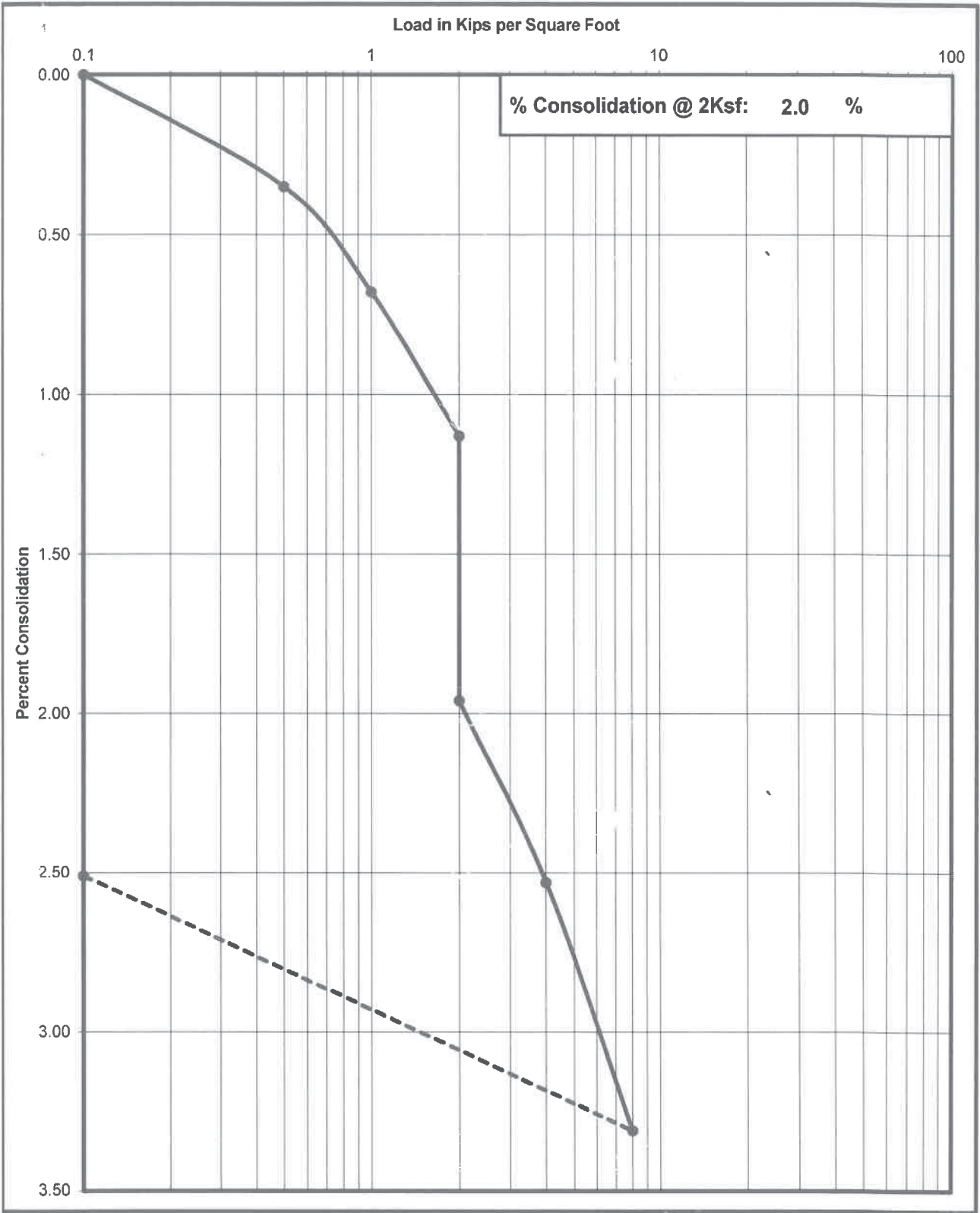
Driller: Jim Watts

Elevation: 20 Feet

Sheet: 1 of 1

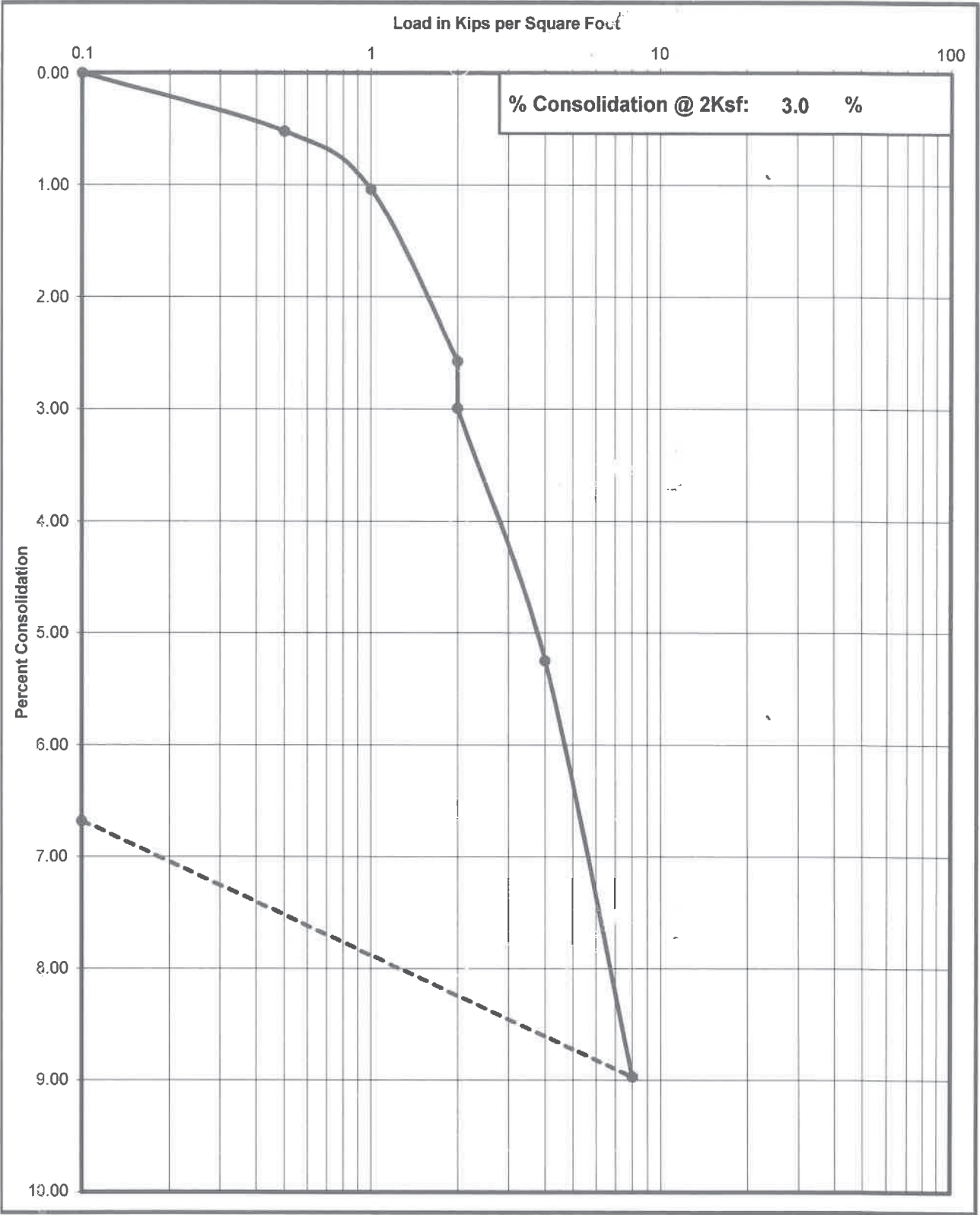
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
022-23052	B2 @ 2-3'	5/30/2023	SM



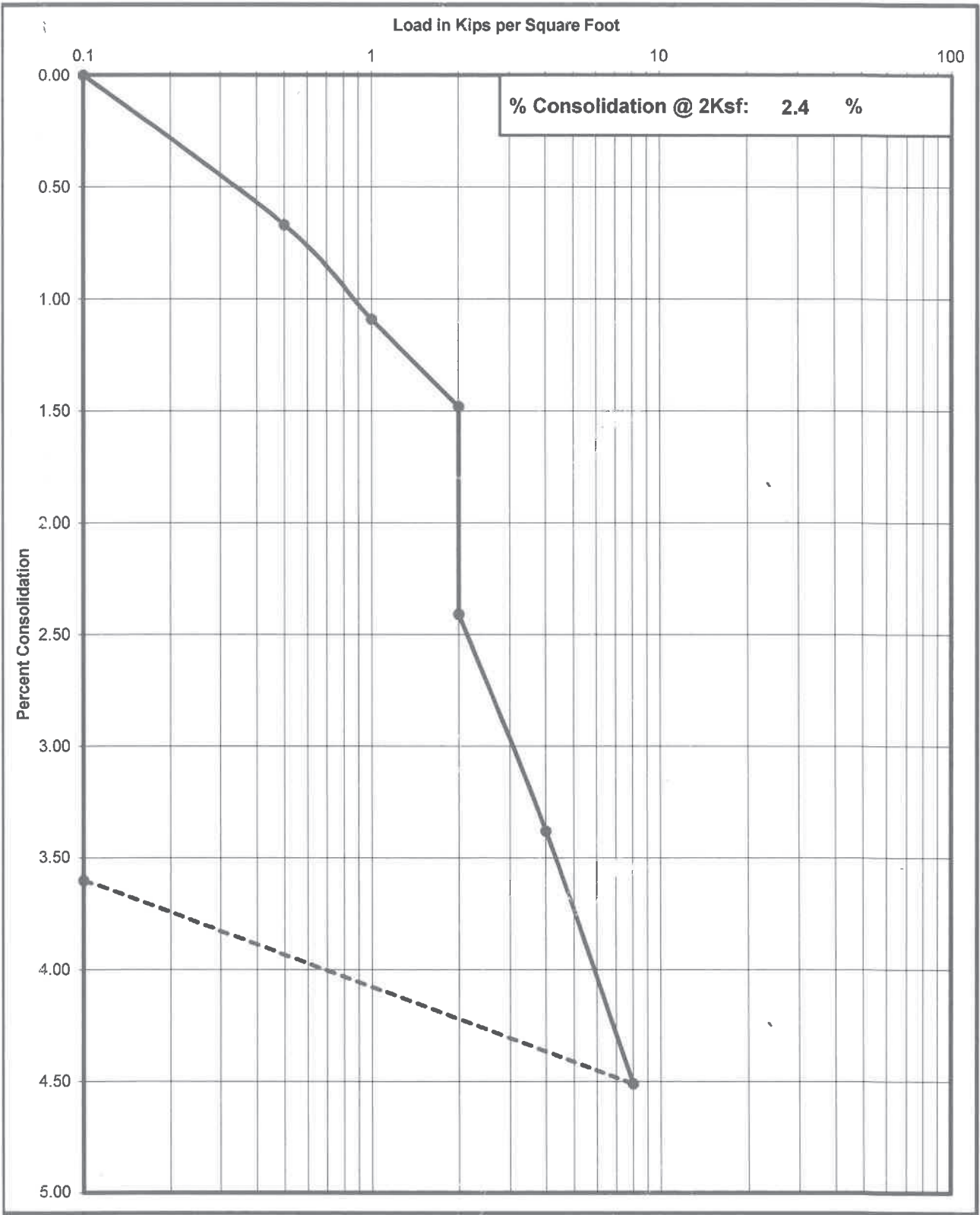
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
022-23052	B2 @ 5-6'	5/30/2023	SM



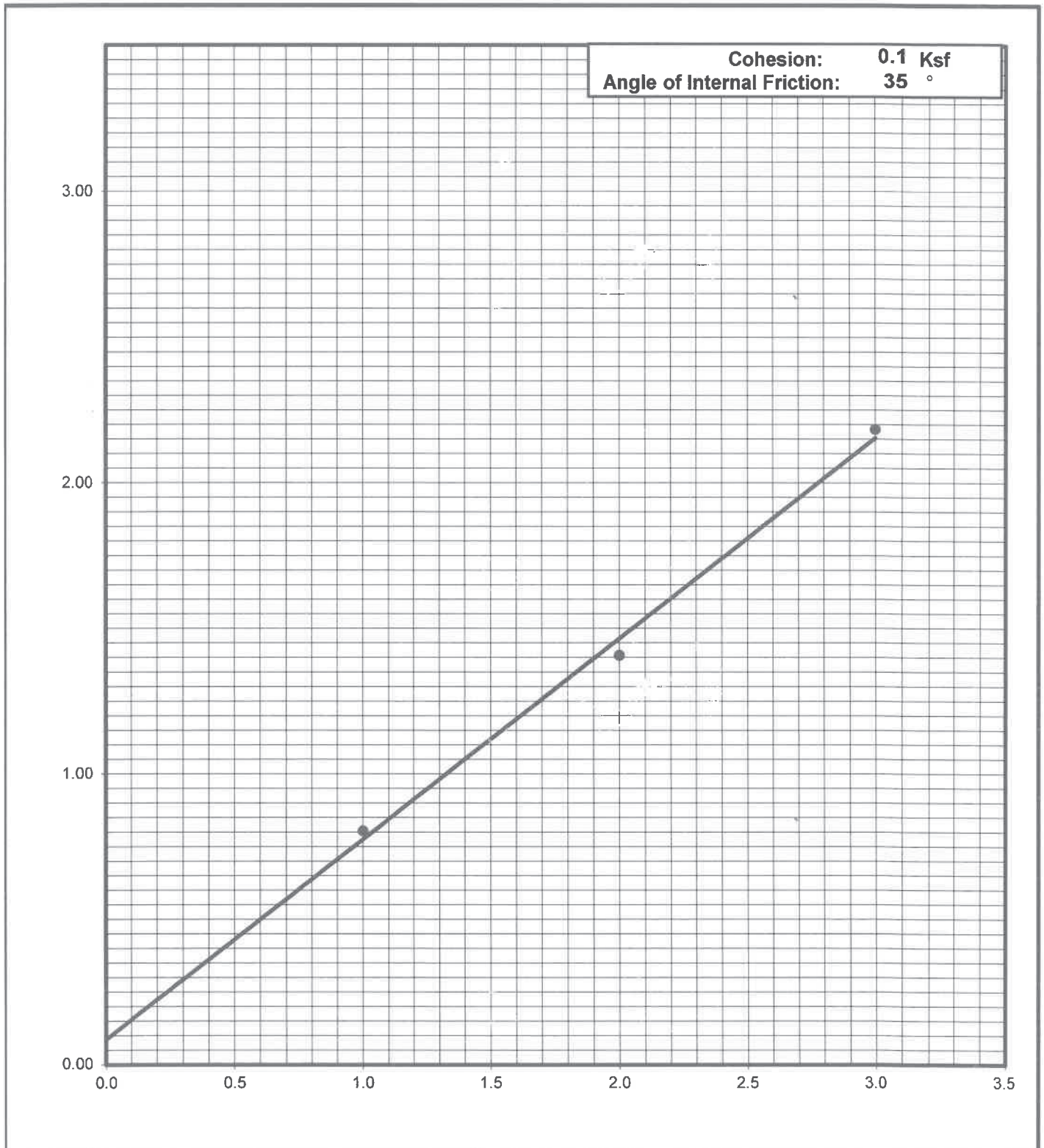
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
022-23052	B4 @ 2-3'	5/30/2023	SM



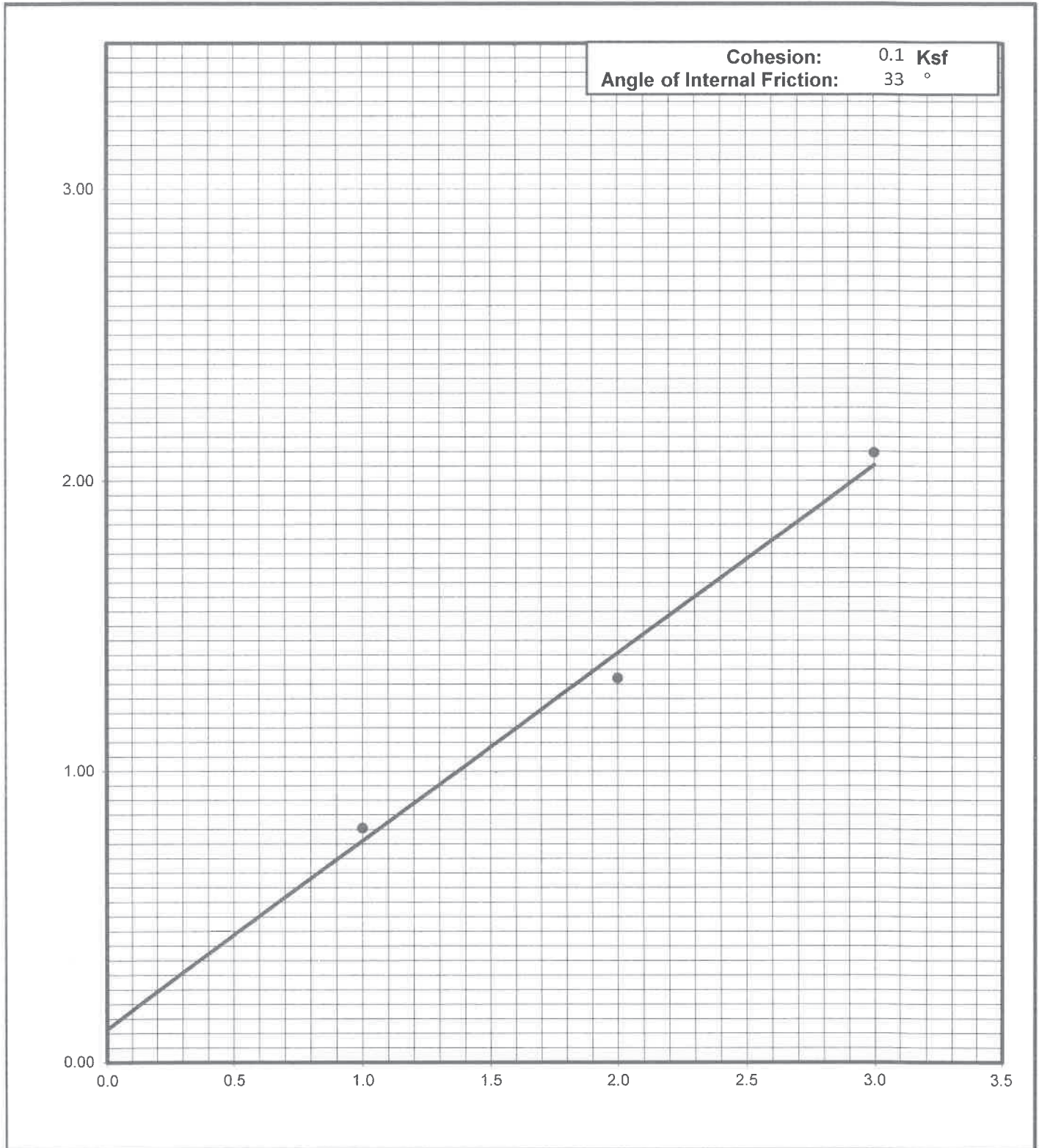
Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
022-23052	B6 @ 2-3'	SM	5/30/2023

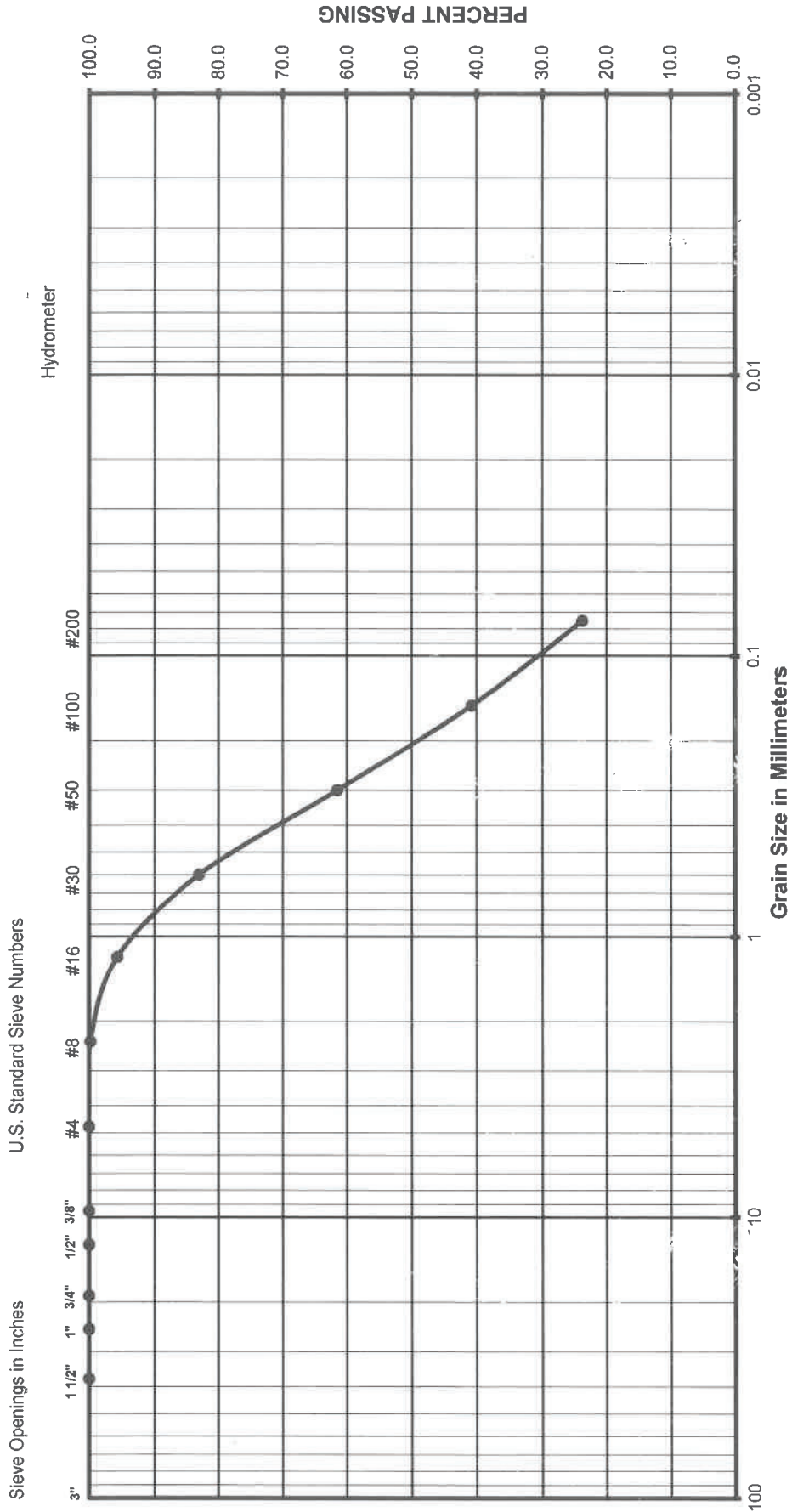


Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
022-23052	B7 @ 5-6'	SM/ML	5/30/2023



Grain Size Analysis



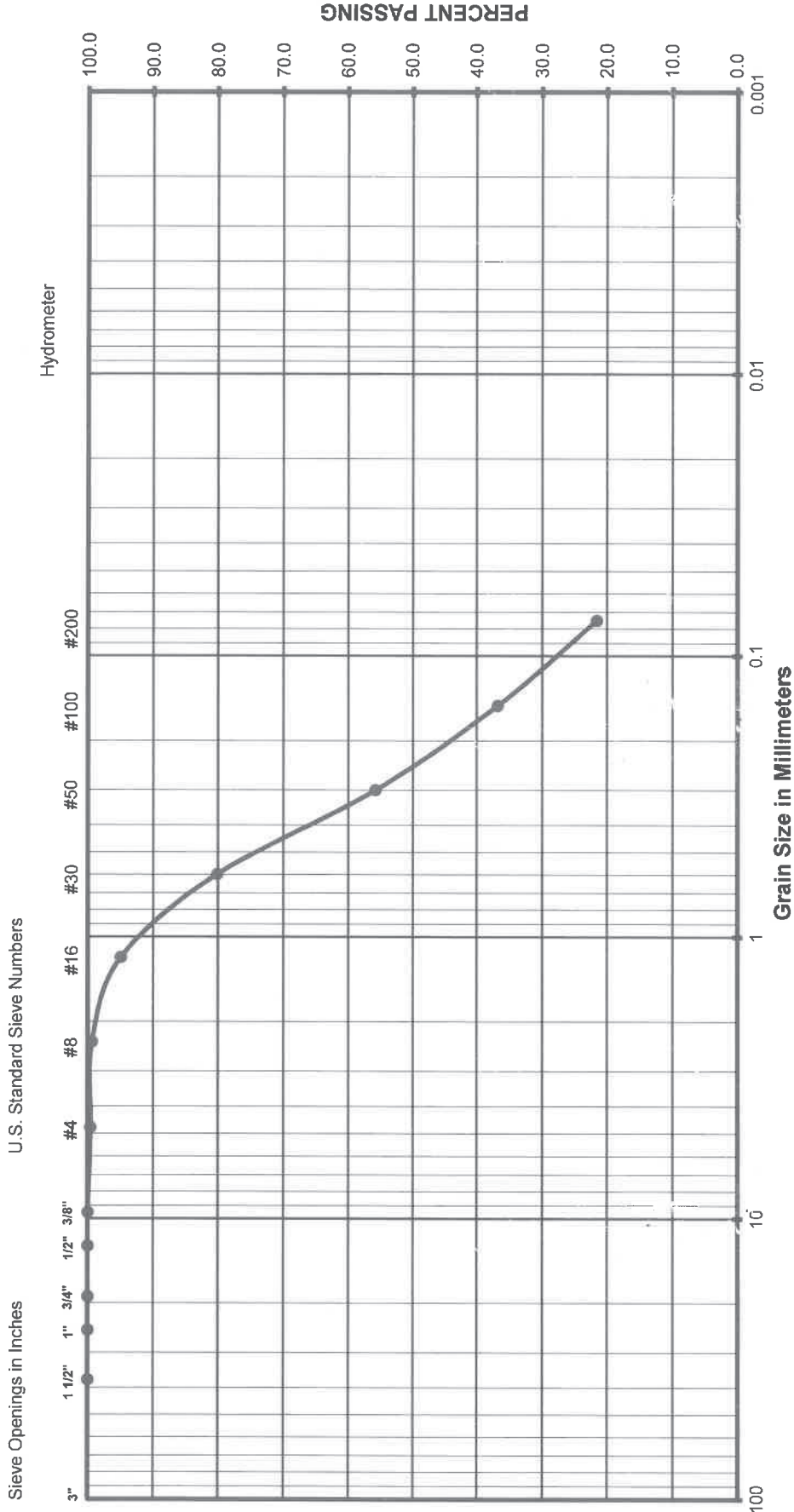
Gravel		Sand		Silt or Clay
Coarse	Fine	Coarse	Fine	

(Unified Soils Classification)

Project Name
Project Number
Soil Classification
Sample Number

Kern County Hazardous Waste Facility
022-23052
SM
B2 @ 2-3'

Grain Size Analysis



Soil Permeability

Constant Head

ASTM D-2434 / Cal 220

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 5/25/2023
 Sample Number : -
 Sample Location : B7 @ 10-11'
 Soil Classification : SM/SP

Max Dry Density	--	lb/cu.ft	Relative Density	--	Max. Particle Size	--
Optimum Moisture	--	%	%Over Optimum	--	% Passing 3/8"	--
Sample Dry Density	102.9	lb/cu.ft	Sample Diameter	7.6	% Passing # 10	--
Sample Moisture	1.8	%	Sample Length,cm	7.5	% Passing # 200	11.7
Sample Compaction	--	%	Sample Area sq.cm	45.4	Temperature	20.0
Comp. Procedure	Remolded to approximate In-Situ density				Type of Permeant	Tap Water

Test	Time sec	H1 cm	H2 cm	Flow Q
1	45	78	13.0	84.0
2	45	74	14.0	77.0
3	60	75	11.0	111.0
4				
5				
6				

Test	Time sec	Head Const.	Flow Q	K cm/sec	k20 cm/sec
1	45	65.0	84.0	4.74E-03	4.744E-03
2	45	60.0	77.0	4.71E-03	4.711E-03
3	60	64.0	111.0	4.78E-03	4.775E-03
4					
5					
6					

Permeability
4.7E-03 cm/sec
13.39892 ft/day
4890.61 ft/year

Soil Permeability

Constant Head

ASTM D-2434 / Cal 220

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 5/25/2023
 Sample Number : -
 Sample Location : B8 @ 15-16'
 Soil Classification : SP

Max Dry Density	--	lb/cu.ft	Relative Density	--	Max. Particle Size	--
Optimum Moisture	--	%	%Over Optimum	--	% Passing 3/8"	--
Sample Dry Density	99.5	lb/cu.ft	Sample Diameter	7.6	% Passing # 10	--
Sample Moisture	3.3	%	Sample Length,cm	7.5	% Passing # 200	4.2
Sample Compaction	--	%	Sample Area sq.cm	45.4	Temperature	20.0
Comp. Procedure	Remolded to approximate In-Situ density				Type of Permeant	Tap Water

Test	Time sec	H1 cm	H2 cm	Flow Q
1	30	77	56.0	193.0
2	35	75	53.0	237.0
3	40	73	52.0	259.0
4				
5				
6				

Test	Time sec	Head Const.	Flow Q	K cm/sec	k20 cm/sec
1	30	21.0	193.0	5.06E-02	5.061E-02
2	35	22.0	237.0	5.08E-02	5.085E-02
3	40	21.0	259.0	5.09E-02	5.094E-02
4					
5					
6					

Permeability
5.1E-02 cm/sec
143.4848 ft/day
52371.95 ft/year

R - VALUE TEST ASTM D - 2844 / CAL 301

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 6/7/2023
 Sample Location/Curve Number : RV#1
 Soil Classification : SM

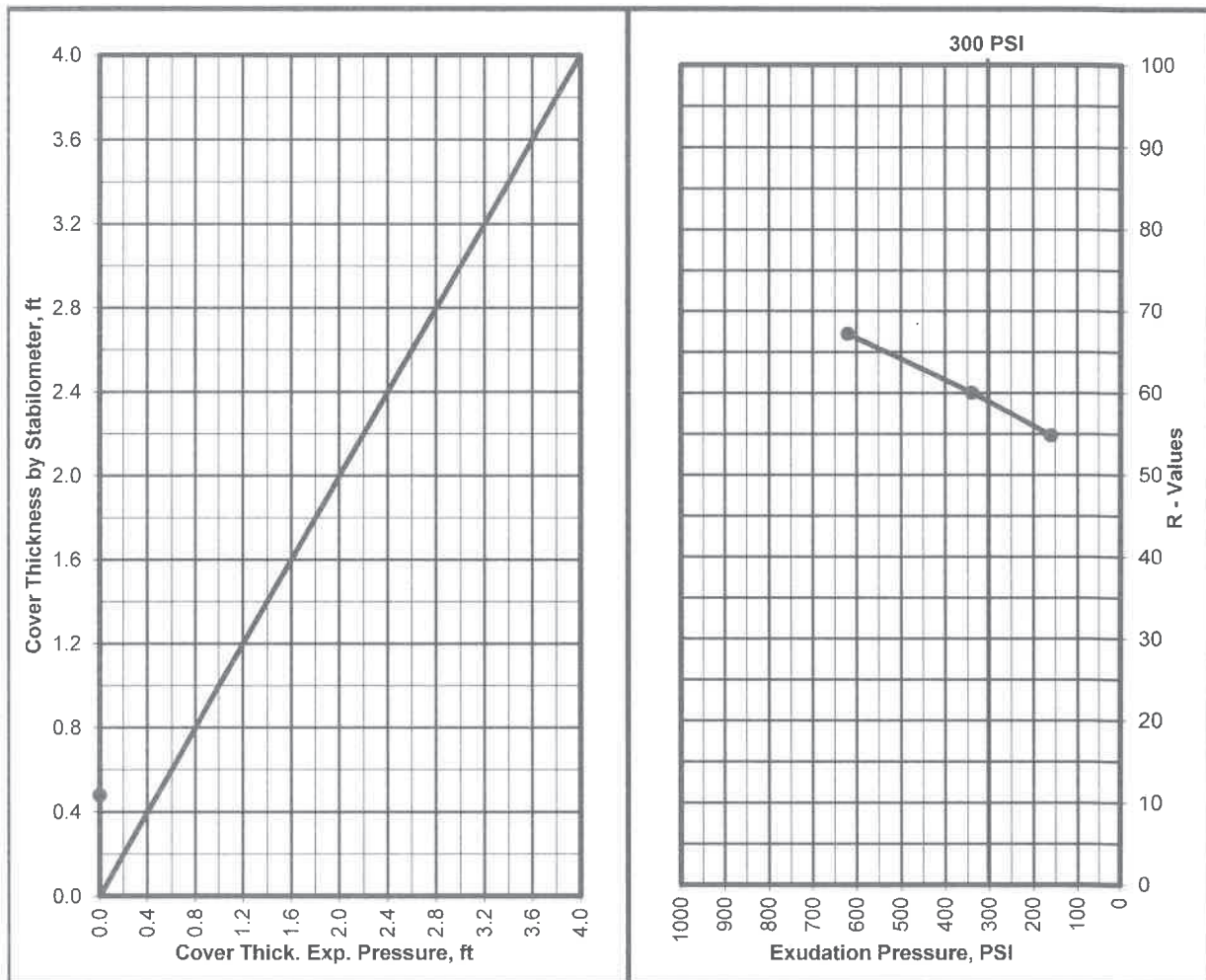
TEST	A	B	C
Percent Moisture @ Compaction, %	9.3	8.3	8.8
Dry Density, lbm/cu.ft.	122.7	123.8	123.3
Exudation Pressure, psi	160	620	340
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	55	67	60

R Value at 300 PSI Exudation Pressure

59

R Value by Expansion Pressure (TI =): 5

Expansion Pressure nil



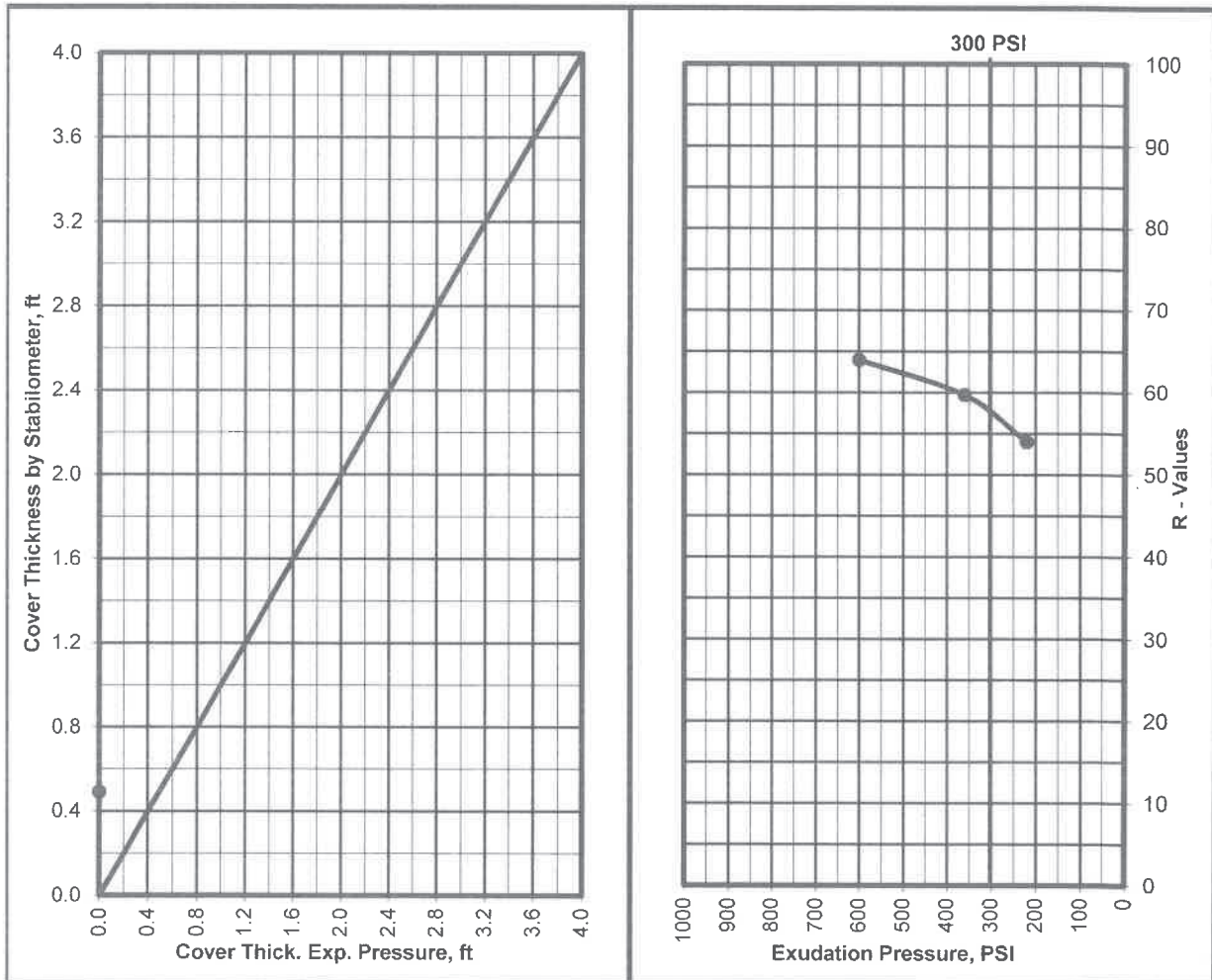
R - VALUE TEST

ASTM D - 2844 / CAL 301

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 6/7/2023
 Sample Location/Curve Number : RV#2
 Soil Classification : SM

TEST	A	B	C
Percent Moisture @ Compaction, %	9.3	8.3	8.8
Dry Density, lbm/cu.ft.	123.2	123.6	123.3
Exudation Pressure, psi	220	600	360
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	54	64	60

R Value at 300 PSI Exudation Pressure	58
R Value by Expansion Pressure (TI =): 5	Expansion Pressure nil



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 recompact 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 2018 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 2 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 2 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.

**SOIL ABSORPTION EVALUATION
PROPOSED DRAINAGE BASIN
KERN COUNTY HAZARDOUS WASTE FACILITY
SEC OF DOWNING AVENUE AND WEAR STREET
BAKERSFIELD, CALIFORNIA**

**KA PROJECT NO. 022-23052
JUNE 28, 2024**

Prepared for:

**MR. GREG FRANK
SKARPHOL FRANK ASSOCIATES
925 17TH STREET
BAKERSFIELD, CALIFORNIA 93301**

Prepared by:

**KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
2205 COY AVENUE
BAKERSFIELD, CALIFORNIA 93307
(661) 837-9200**



GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

June 28, 2024

KA Project No. 022-23052

Mr. Greg Frank
Skarphol Frank Associates
925 17th Street
Bakersfield, California 93301

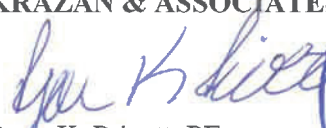
RE: Soil Absorption Evaluation
Proposed Drainage Basin
Kern County Hazardous Waste Facility
SEC of Downing Avenue and Wear Street
Bakersfield, California

Dear Mr. Frank:

In accordance with your request, we have completed a Soil Absorption Evaluation for the proposed drainage basin 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 (661) 837-9200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.


Ryan K. Privett, PE
Project Engineer
RCE No. 59372



RKP:ht

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June 28, 2024

KA Project No. 022-23052

**SOIL ABSORPTION EVALUATION
PROPOSED DRAINAGE BASIN
KERN COUNTY HAZARDOUS WASTE FACILITY
SEC DOWNING AVENUE AND WEAR STREET
BAKERSFIELD, CALIFORNIA**

INTRODUCTION

This report presents the results of our Soil Absorption Evaluation for the proposed Drainage Basin associated with Kern County Hazardous Waste Facility to be located at the southeast corner of Downing Avenue and Wear Street, in Bakersfield, California. A total of 2 exploratory soil borings were advanced within the proposed basin location to evaluate soil conditions and absorption characteristics of the subsoils. In addition, 2 permeability tests were performed on soil samples obtained from beneath the proposed drainage basin bottom, to evaluate the soil absorption characteristics.

A site plan showing the approximate boring locations is attached. A description of the field investigation, boring logs, boring log legend, along with the laboratory test results, is also attached.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered within the area of the proposed basin appear typical of those found in the geologic region of the site. In general, the upper soils consisted of approximately 6 to 12 inches of silty sand. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated.

Below the loose surface soils, approximately 7 to 7½ feet of medium dense silty sand was encountered. Field and laboratory tests suggest that these soils are moderately strong, and have moderate absorption characteristics. Penetration resistance ranged from 20 to 45 blows per foot. Dry densities ranged from 107 to 115 pcf. A representative soil sample had an angle of internal friction of 37 degrees.

Below approximately 8 to 8½ feet, approximately 6½ to 12 feet of loose to medium dense silty sand/sand was encountered. Field and laboratory tests suggest that these soils are moderately strong, slightly compressible, and have good absorption characteristics. Penetration resistance ranged from 13 to 35 blows per foot. Dry densities ranged from 100 to 119 pcf. A representative soil sample had a coefficient of permeability of 1.4×10^{-2} cm/sec.

Below approximately 15 to 20 feet, predominately medium dense to very dense sand was encountered. Field and laboratory tests suggest that these soils are moderately strong, and have good absorption characteristics. Penetration resistance ranged from 16 blows per foot to more than 50 blows per 6 inches. Dry densities ranged from 103 to 113 pcf. A representative soil sample had a coefficient of permeability of 2.9×10^{-2} cm/sec. These soils extended to the termination depth of our borings.

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

GROUNDWATER CONDITIONS

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was not encountered.

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.

BASIN SLOPE STABILITY

It is understood that the proposed basin will consist of slopes up to approximately 10.8 to 12.5 feet high. Maximum proposed slopes along the edge of the basin are proposed to be 2:1 (horizontal to vertical). The basin high-water level is anticipated to be approximately 8 feet.

Section 408-7.03 of the County of Kern Standards for Drainage states that "a slope stability analysis will be required when the design water depth exceeds eight (8) feet **and** side slopes are steeper than 3:1." The design water depth for the basin does not exceed 8 feet. Therefore, a slope stability analysis is not required for this basin as currently designed.

PERMEABILITY TESTING

Two permeability tests were performed on soil samples collected from depths of 10 to 15 feet below existing site grade. The permeability tests were performed in accordance with ASTM Test Method D2434. The test results are as follows:

Boring No.	Depth (feet)	Coefficient of Permeability (cm/second)	Soil Type
B101	10-11	1.4×10^{-2}	Silty Sand/Sand (SM/SP)
B102	15-16	2.9×10^{-2}	Sand (SP)

DRAINAGE

The proposed drainage basin is still in the design phase. It is estimated that the maximum volume of water to be retained in the basin is approximately 67,100 cubic feet. It is understood the basin will have a minimum bottom area of approximately 4,565 square feet. It is anticipated that side slopes will be constructed at 2:1 (horizontal to vertical), and that the high-water level will be approximately 8 feet above basin bottom.

Permeability tests were performed on the soils at depths ranging from 10 to 15 feet. These soils had coefficients of permeability ranging from 1.4×10^{-2} to 2.9×10^{-2} cm/sec.

Based on the proposed inflows, subsurface soil conditions, and provided the drainage basin has a minimum bottom area of 4,565 square feet and extends to a minimum depth of 10.8 to 12.5 feet below existing site grade, it is anticipated the basin will drain within 7 days provided the recommendations in the Site Preparation section of this report are followed.

SITE PREPARATION

General site clearing should include removal of vegetation and existing utilities; trees and associated root systems; rubble; 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 reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Within areas to receive fill, following stripping operations, the upper 6 inches of soil should be excavated/scarified, worked until uniform and free from large clods, moisture-conditioned as necessary, and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. It is recommended that the new fill to be placed within the slope be benched into the slope. The bench should occur at every lift and extend at least 4 feet into the existing slope.

Any buried structures encountered during construction should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

In order to dispose of the water, within the required 7 days, it is recommended that the proposed drainage basin be constructed into the sandy soils encountered at the site. The proposed basin depth of 10.8 to 12.5 feet will extend well into the sandy soils encountered beginning at approximately 8 to 8½ feet below existing site grade. It is further recommended that a representative of our firm inspect the excavation operation to verify soil conditions below the bottom of the basin. The estimated soil absorption factors presented in this report are based on clear water and a factor of safety should be incorporated into the design of the drainage basin to compensate for soil clogging from water impurities.

The long-term absorption rate is highly dependent on the quality of infiltration water and the drainage basin maintenance. To maintain an adequate absorption rate, a maintenance program will be required. Annual maintenance should include the following:

1. Annual removal of the top 1 to 2 inches of sediment collecting on the surface of the basin. This removal of the silt and clay sediment accumulating on the surface will help to reduce the potential of silting (clogging) the upper soils within the pond.
2. Vegetation within the basin should be stripped or mowed yearly and removed from the basin site. The vegetation shall not be disced within the basin soils. Discing of organic material will reduce the upper soils permeability.

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 and 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.

Based on the estimated storage volume, high water levels and provided the basin is prepared as outlined above, it is anticipated the proposed basin will drain within 7 days.

FEASIBILITY OF ON-SITE SOILS FOR USE AS ENGINEERED FILL

The on-site soils are predominately silty sands and sands. 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.

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 as determined by 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.

UTILITY TRENCH BACKFILL

Drainage pipes may be installed in conjunction with the construction of the drainage basin. Trenches should be excavated according to accepted engineering practice 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 following periods of precipitation.

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. 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.

PIPE BEDDING AND ENVELOPE

Proper bedding and envelope should be provided for pipes. The bedding surface should be smooth and true to the design grade. At least 12 inches of compacted cohesionless soil bedding (100 percent passing the No. 4 Sieve and not more than 8 percent passing and No. 200 Sieve) should be provided below the pipes. An envelope of sandy backfill material should be placed along the sides of the pipe and a minimum depth of 12 inches or $\frac{1}{8}$ H over the top of pipe (H is the height of soil backfill above the top of the pipe).

Within soft and wet trenches, it is recommended to use a minimum of 6 inches of standard bedding underlain by 6 to 12 inches of coarse bedding material (100 percent passing the 2-inch sieve, 90 to 100 percent passing the 1½-inch Sieve, 30 to 50 percent passing the ¾-inch Sieve, 5 to 20 percent passing the ⅜-inch Sieve, and not more than 4 percent passing the No. 200 Sieve).

Pipe bedding and envelope should be brought to near optimum moisture content, placed in loose lifts not more than 8 inches in thickness, and compacted to achieve at least 85 percent of maximum density as determined by ASTM Test Method D1557 test procedure. Due to space limitations, a hand compactor may be required.

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.

The infiltration rates and life of the basin are estimates. The recommendations provided in this report will provide a basin which has good initial absorption characteristics. The long-term performance of the basin is difficult to estimate due to the uncontrolled variables.

Foundation and earthwork construction are 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

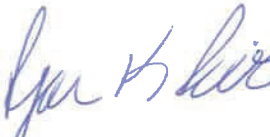
not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Soil Drainage Evaluation 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 (661) 837-9200.

Respectfully submitted,
KRAZAN & ASSOCIATES, Inc.

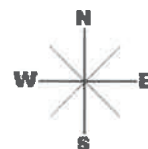
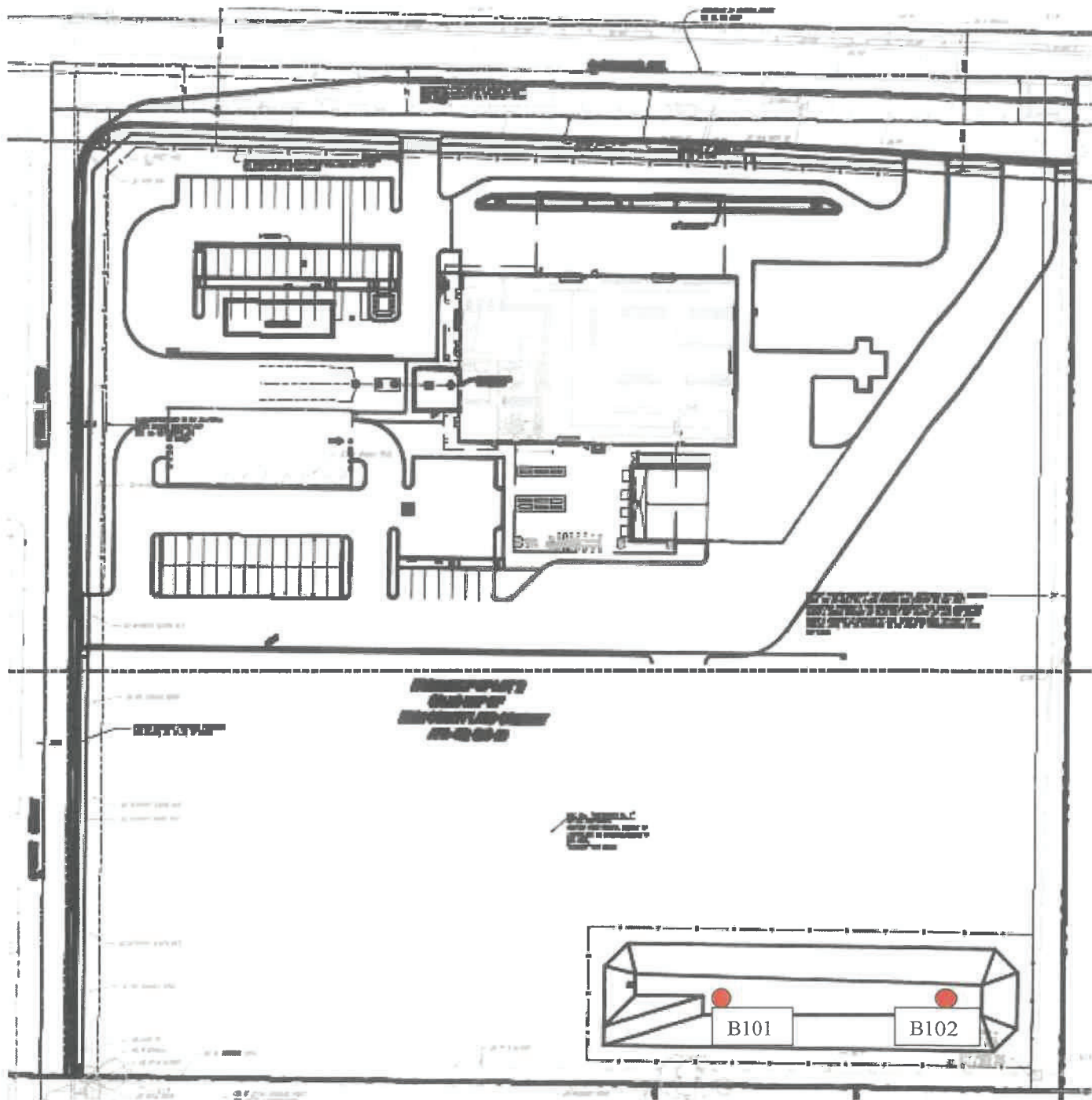

Ryan K. Privett, PE
Project Engineer
RCE No. 59372




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



RKP/DRJ:ht



● APPROXIMATE SOIL BORING LOCATION

SITE MAP	Scale: NTS	Date: June 2024	
SEC Downing Ave & Wear St 452-070-20	Drawn by: RP	Approved by: RP	
Bakersfield, California	Project No. 022-23052	Figure No. 1	

Drainage Calculations

Krazan and Associates Job # 022-23052

Date: 6/28/2024

Kern County Haz Waste

Description: Drainage Basin

Bakersfield, CA

Design Capacity (V_o) = 1.540404 AC-ft = 67100 ft³

Design Water Depth (H_I) = 8.00 ft.

Design Infiltration Rate (K) = 1.4 x 10⁻² = 0.014 cm/s = 39.7 ft/day

Over-excavation depth below basin bottom (H_o) = ft.

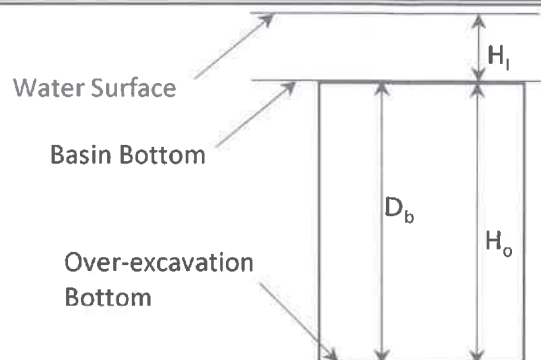
Width = 25.00 ft. Length = 182.58 ft. Area (A) = 4565 ft²

Sand Porosity = 0 Sand Storage Vol = 0 ft³

Target depth below basin (D_b) (min. 3 x H_I) = 24 ft. Safety Factor (FS) = 2

Surface Area (A) = 4565 ft²

Drain Time (t) = FSx V_o /KA = 0.7 days



APPENDIX A
FIELD INVESTIGATION

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Two 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 are described in accordance with the Unified Soil Classification System.

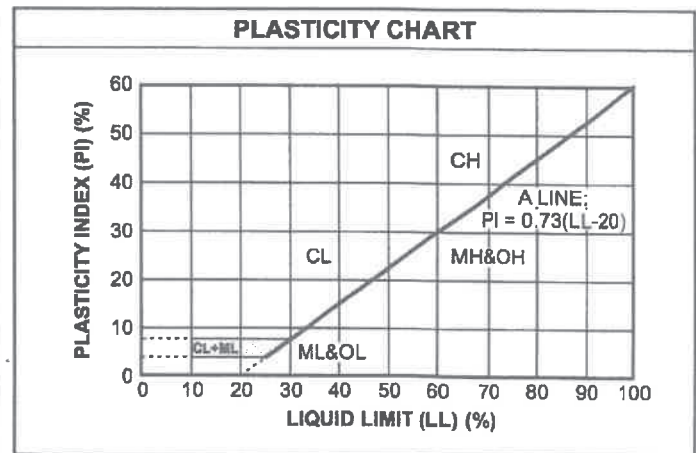
The logs of the exploratory borings are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	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
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	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
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
SILTS AND CLAYS Liquid limit 50% or greater	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
	PT	Peat and other highly organic soils
HIGHLY ORGANIC SOILS		

CONSISTENCY CLASSIFICATION	
Description	Blows per Foot
<i>Granular Soils</i>	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
<i>Cohesive Soils</i>	
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	12 to 13 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 0.42
Fine-grained	No. 40 to No. 200	0.42 to 0.074
Silt and Clay	Below No. 200	Below 0.074



Log of Boring B101

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-101

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
		Ground Surface					20 40 60	10 20 30 40			
0		SILTY SAND (SM) Very loose, fine-grained; light brown, damp, drills easily									
2		Medium dense below 12 inches									
		With trace CLAY below 3 feet	113.9	4.4		25					
4											
6			115.7	3.9		20					
8		SILTY SAND/SAND (SM/SP) Loose, fine- to medium-grained; gray, damp, drills easily									
10			108.6	4.7		13					
12											
14											
16		Medium dense and fine- to coarse- grained below 15 feet	119.5	1.3		28					
18											
20											

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 1 of 3

Log of Boring B101

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-101

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
							20 40 60	10	20	30	40
		SAND (SP) Medium dense, fine- to coarse-grained; brown, damp, drills easily	110.0	3.2		16					
22											
24											
26			110.9	3.7		38					
28											
30		Gray-brown with increased fines below 29 feet	107.9	2.3		37					
32											
34											
36		Dense with very coarse GRAVEL below 35 feet		1.9		43					
38		Very dense, with COBBLES and drills hard below 37 feet									
40											

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 2 of 3

Log of Boring B101

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-101

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.							
			106.1	3.7		50+							
42		Auger refusal at 42 feet											
		End of Borehole											
44													
46													
48													
50													
52													
54													
56													
58													
60													

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 3 of 3

Log of Boring B102

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-102

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
0		Ground Surface						20	40	60	10 20 30 40
0		SILTY SAND (SM) Very loose, fine-grained with trace CLAY; light gray, damp, drills easily									
2		Medium dense below 12 inches	115.6	1.4		29					
4											
4		Dense and drills firmly below 5 feet									
6			107.5	3.7		45					
8											
8		SILTY SAND/SAND (SM/SP) Medium dense, fine- to coarse-grained; gray, moist, drills easily									
10			100.2	7.1		35					
12											
14											
14		SAND (SP) Medium dense, fine- to coarse-grained; gray, damp, drills easily	112.3	1.4		25					
16											
18											
20		With trace gravel below 20 feet									

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 1 of 3

Log of Boring B102

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-102

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
							20 40 60	10 20 30 40			
22			113.4	2.3		33					
24											
26			106.4	1.6		37					
28											
30		With increased GRAVEL and orange-brown below 30 feet	103.0	2.4		35					
32											
34											
36		Dense with increased grain size below 35 feet	112.1	1.5		41					
38		Very dense, with COBBLES and drills hard below 38 feet									
40											

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 2 of 3

Log of Boring B102

Project: Kern County Hazardous Waste Facility

Project No: 022-23052

Client: Skarphol/Frank Associates

Figure No.: A-102

Location: SEC Downing Ave and Wear St, Bakersfield, California

Logged By: Michael Rupright

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
							20 40 60	10 20 30 40			
42		Auger refusal at 42 feet	107.4	2.6		50+					
		End of Borehole									
44											
46											
48											
50											
52											
54											
56											
58											
60											

Drill Method: Solid Flight

Drill Date: 5-6-24

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 4½ Inches

Driller: Jim Watts

Elevation: 42 Feet

Sheet: 3 of 3

Soil Permeability

Constant Head

ASTM D-2434 / Cal 220

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 5/21/2024
 Sample Number : -
 Sample Location : B101 @ 10-11'
 Soil Classification : SM/SP

Max Dry Density	--	lb/cu.ft	Relative Density	--	Max. Particle Size	--
Optimum Moisture	--	%	%Over Optimum	--	% Passing 3/8"	--
Sample Dry Density	108.6	lb/cu.ft	Sample Diameter	7.6	% Passing # 10	--
Sample Moisture	4.7	%	Sample Length,cm	7.5	% Passing # 200	7.5
Sample Compaction	--	%	Sample Area sq.cm	45.4	Temperature	20.0
Comp. Procedure	Remolded to approximate In-Situ density				Type of Permeant	Tap Water

Test	Time sec	H1 cm	H2 cm	Flow Q
1	45	76	43.0	127.0
2	45	74	46.0	107.0
3	45	79	41.0	151.0
4				
5				
6				

Test	Time sec	Head Const.	Flow Q	K cm/sec	k20 cm/sec
1	45	33.0	127.0	1.41E-02	1.413E-02
2	45	28.0	107.0	1.40E-02	1.403E-02
3	45	38.0	151.0	1.46E-02	1.459E-02
4					
5					
6					

Permeability
1.4E-02 cm/sec
40.24631 ft/day
14689.90 ft/year

Soil Permeability

Constant Head

ASTM D-2434 / Cal 220

Project Number : 022-23052
 Project Name : Kern County Hazardous Waste Facility
 Date : 5/21/2024
 Sample Number : -
 Sample Location : B102 @ 15-16'
 Soil Classification : SP

Max Dry Density	--	lb/cu.ft	Relative Density	--	Max. Particle Size	--
Optimum Moisture	--	%	%Over Optimum	--	% Passing 3/8"	--
Sample Dry Density	112.3	lb/cu.ft	Sample Diameter	7.6	% Passing # 10	--
Sample Moisture	1.4	%	Sample Length,cm	7.5	% Passing # 200	4.8
Sample Compaction	--	%	Sample Area sq.cm	45.4	Temperature	20.0
Comp. Procedure	Remolded to approximate In-Situ density				Type of Permeant	Tap Water

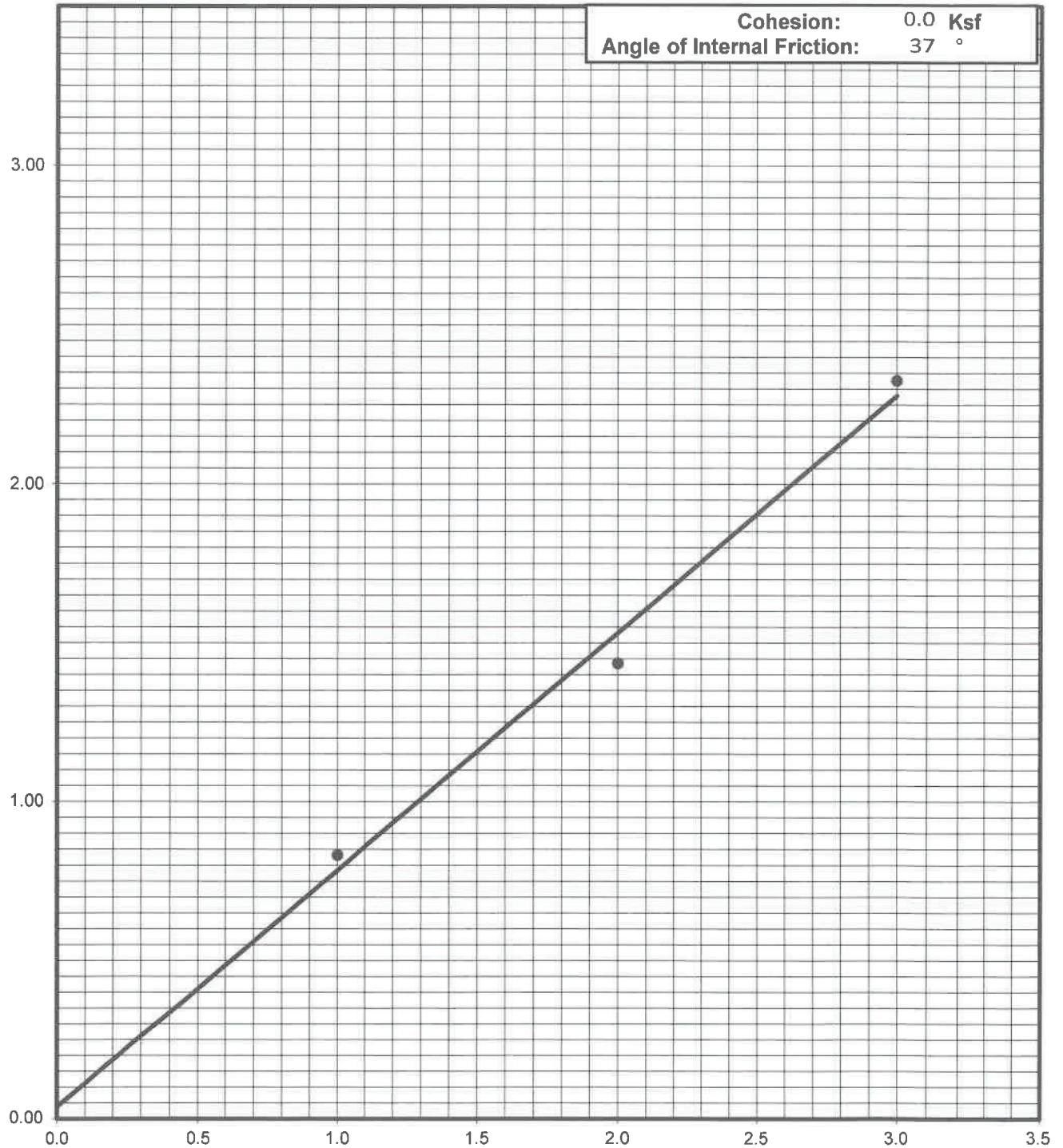
Test	Time sec	H1 cm	H2 cm	Flow Q
1	25	76	23.0	234.0
2	25	71	26.0	203.0
3	35	68	28.0	236.0
4				
5				
6				

Test	Time sec	Head Const.	Flow Q	K cm/sec	k20 cm/sec
1	25	53.0	234.0	2.92E-02	2.917E-02
2	25	45.0	203.0	2.98E-02	2.981E-02
3	35	40.0	236.0	2.78E-02	2.785E-02
4					
5					
6					

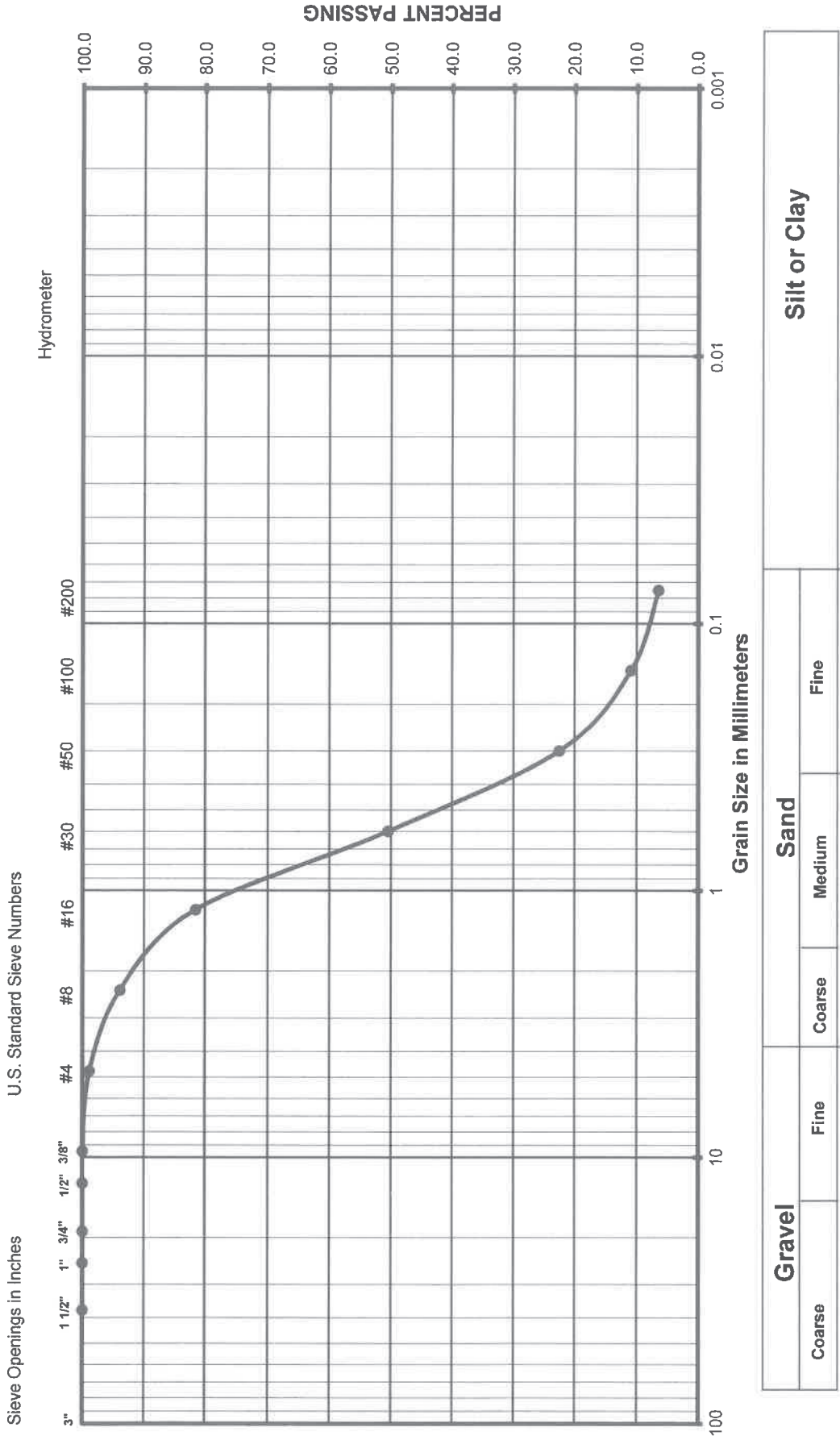
Permeability
2.9E-02 cm/sec
81.75662 ft/day
29841.17 ft/year

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

Project Number	Boring No. & Depth	Soil Type	Date
022-23052	B102 @ 5-6'	SM	5/22/2024



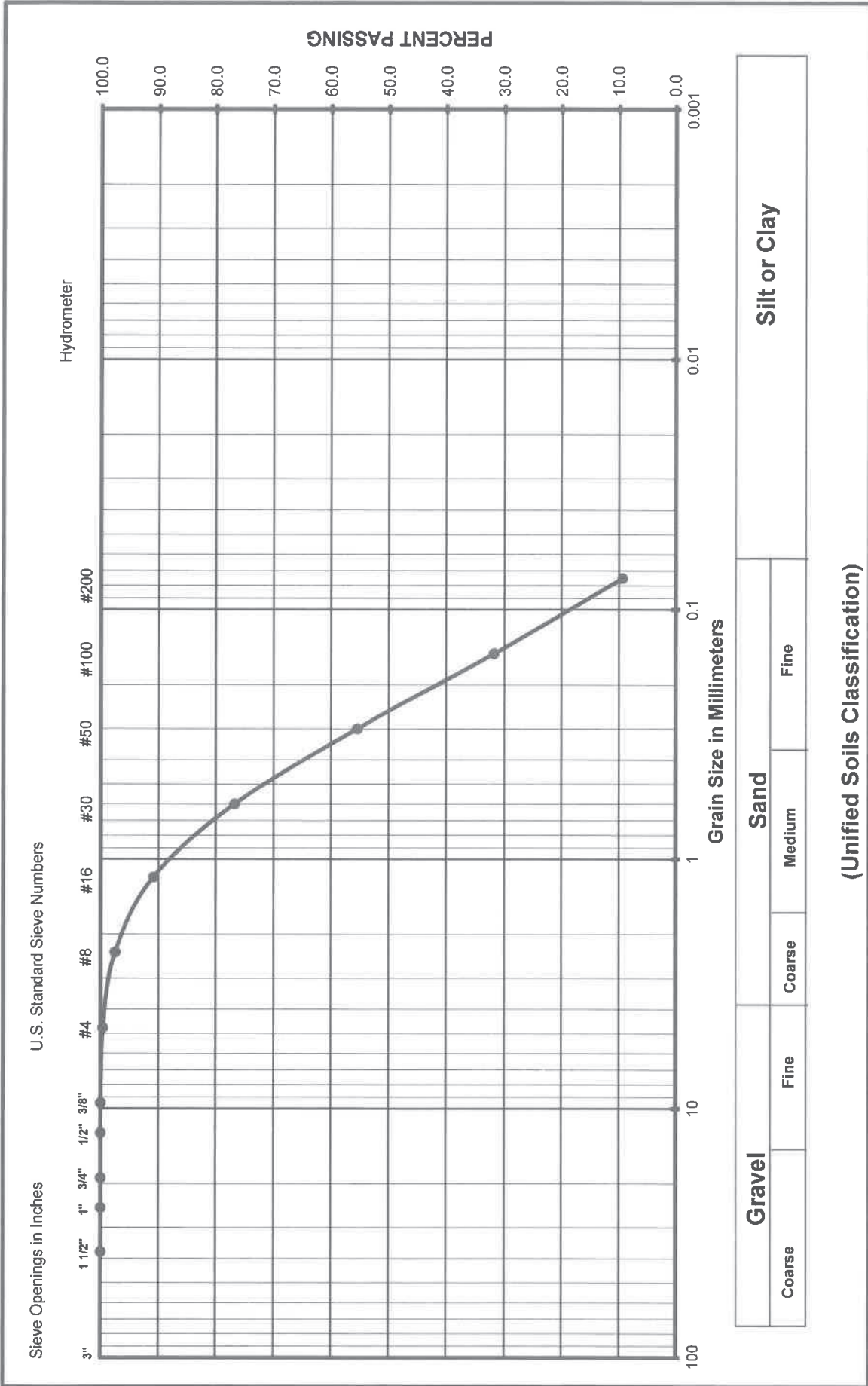
Grain Size Analysis



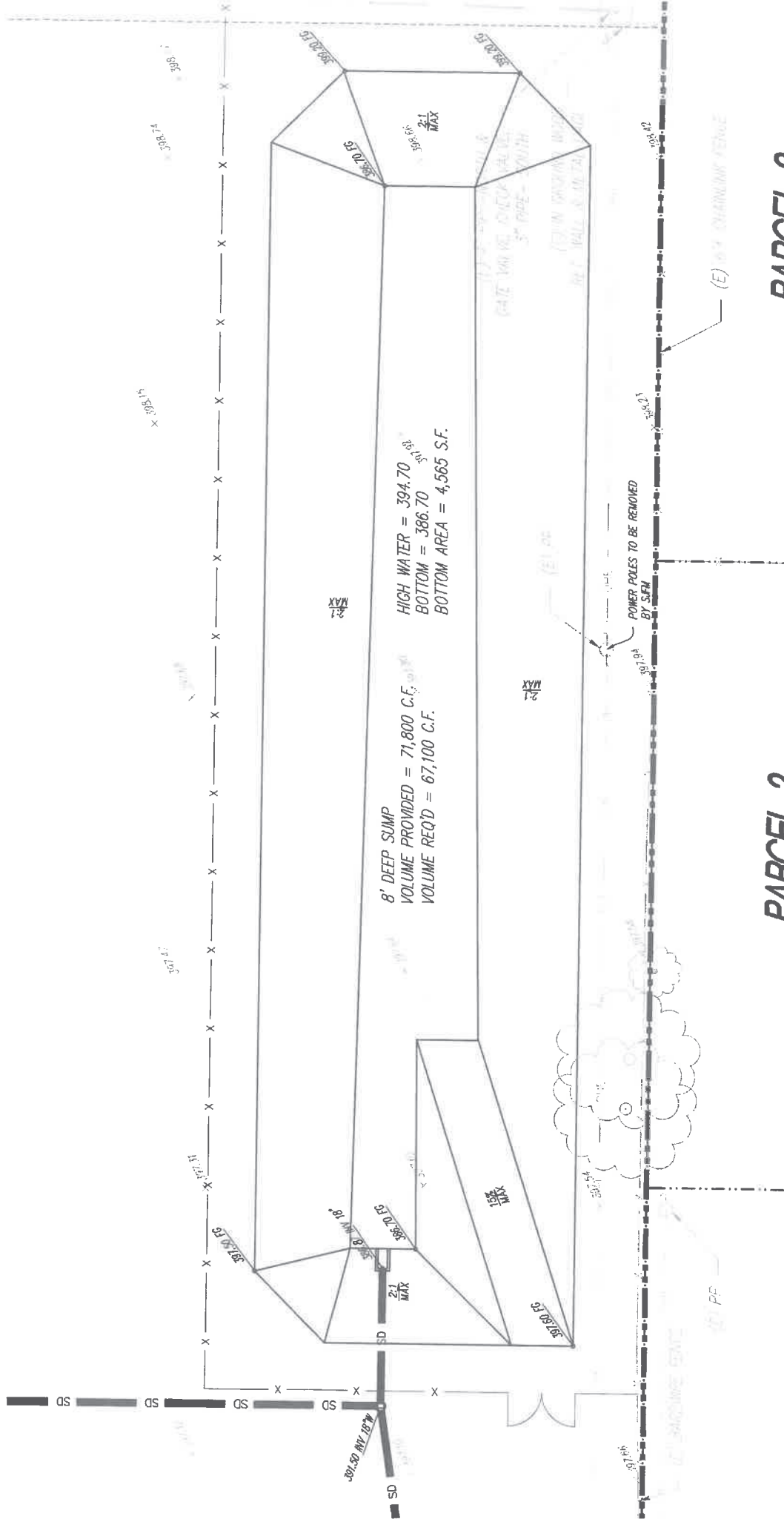
Project Name
Project Number
Soil Classification
Sample Number

Kern County Hazardous Waste Facility
022-23052
SM/SP
B101 @ 15-16'

Grain Size Analysis



Project Name: Kern County Hazardous Waste Facility
Project Number: 022-23052
Soil Classification: SM/SP
Sample Number: B102 @ 10-11'



PARCEL 2

PARCEL 2