GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED O'REILLY AUTO PARTS STORE
3919 PHELAN ROAD
PHELAN, CALIFORNIA

KA PROJECT NO. 112-23065
JUNE 15, 2023

Prepared for:

MR. ATHENIA AGEE
O'REILLY AUTO PARTS
233 S. PATTERSON AVENUE
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Prepared by:

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Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

June 15, 2023 KA Project No. 112-23065

Ms. Athenia Agee
O'Reilly Auto Parts Store
233 S. Patterson Avenue
Springfield, MO 65802
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RE: **Geotechnical Engineering Investigation**
Proposed O'Reilly Auto Parts Store
3919 Phelan Road
Phelan, CA 92371

Dear Ms. Agee

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 (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A Pelayo

Jorge A. Pelayo, PE
Project Engineer
RCE No. 91269

JAP

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED O'REILLY AUTO PARTS STORE
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INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed O'Reilly Auto Parts Store to be located at the physical address of 3919 Phelan Road, in the city of Phelan, San Bernardino County, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, and pavement design.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A 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 subject 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 the work order authorization dated May 17, 2023 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 six (6) borings to depths of approximately fifteen (15) to twenty (20) feet below existing site grades 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.

- Performance of infiltration testing at two (2) locations in order to obtain approximate infiltration rates for the near surface soil conditions.

- 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.

Environmental services, such as a chemical analysis of soil and groundwater for possible environmental contaminates, were not in our scope of services.

PROPOSED CONSTRUCTION

On a preliminary basis, it is understood that the proposed development will include construction of an O'Reilly Auto Parts Store at the subject site. The proposed development is understood to be a single-story retail building and associated site improvements. It is assumed that the proposed structure will be wood frame, metal frame, or masonry block, construction with an approximate building footprint of 7,453 square feet. It is anticipated that the proposed construction will incorporate a shallow foundation system and slab-on-grade floor. The proposed development will include on-site parking and localized landscaped areas.

Foundation loads are understood to be on the order of 1.0 kip per linear foot for walls. Interior and exterior column loads are understood to be on the order of 30 kips. Floor slabs are understood to be subject to loads on the order of 125 psf.

The anticipated finished grade elevation for the proposed structure is assumed to be minimal to provide an adequate building pad for the development. As a result, cuts and fills are anticipated at the site on the order of 5 feet. In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The site is roughly a rectangular shaped parcel and encompasses an estimated area of approximately 2.3 acres. The site is located at the physical address of 3919 Phelan Road, in the city of Phelan, California.

The site is bound to the north by Phelan Road and a commercial plaza beyond, to the east by an existing shopping plaza, to the south by vacant land and vacant land, and to the west by Malpaso Road and vacant land beyond. The site's terrain is relatively flat and level. A few medium size trees are located within the site.

Presently, the site is a vacant parcel free of any above grade structures. Groundcover at the site consists of exposed soil, localized weed growth, and medium size trees scattered at the site. Buried utility lines are reportedly located along the western and northern perimeters of the site and may extend into portions of the site. Fills and cuts are anticipated to be on the order of approximately 5 in order to establish finished site grades and provide for positive site drainage.

GEOLOGIC SETTING

The subject site is located within the Mojave Desert Geomorphic Province (CGS Note 36). A broad interior region of isolated mountain ranges separated by expanses of desert plains. It has an interior enclosed drainage and many playas. There are two important fault trends that control topography a prominent NW-SE trend and a secondary east-west trend (apparent alignment with Transverse Ranges is significant). The Mojave province is wedged in a sharp angle between the Garlock Fault (southern boundary Sierra Nevada) and the San Andreas Fault, where it bends east from its northwest trend. The northern boundary of the Mojave is separated from the prominent Basin and Range by the eastern extension of the Garlock Fault.

The subject site is located in the El Mirage Valley and is bounded by the San Andreas fault to the southwest, the San Gabriel and San Bernardino Mountains to the south, the Antelope Valley to the north, and Lucerne Valley to the east.

The near-surface deposits in the vicinity of the subject site are indicated to be comprised of alluvium, lake, playa, and terrace deposits (Map Symbol Q) consisting of marine and nonmarine (continental) sedimentary rocks. See the attached Geologic Map (Figure 5) and Boring Logs (Appendix A) for a description of the earth materials encountered during our investigation.

The site under consideration is located in a seismically active area of Southern California. The San Andreas zone lies in the general vicinity of the site. The project site is located approximately 6.0 miles from the San Andreas Fault Zone. The area in consideration shows no mapped faults on-site according to maps prepared by the California Division of Mines and Geology (now known as the California Geologic Survey) and published by the International Conference of Building Officials (ICBO).

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling a total of six (6) borings to depths ranging from approximately fifteen (15) to twenty (20) feet below existing site grade, using a truck-mounted drill rig; in addition, two (2) borings (IT-1 to IT-2) were advanced to a depth of approximately 5 feet for the purpose of infiltration testing. One bulk subgrade sample was obtained from the site for laboratory R-Value testing. The approximate boring and bulk sample 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 subsurface soils. 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, R-Value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. Groundcover consisted of approximately 2 feet of medium dense poorly-grade (SP) sand soils. Below the medium dense soils, dense to very dense poorly-graded sands were encountered up to the maximum depth explored, 20 feet below current site grades.

Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 18 to 57 blows per foot to over 50 blows per six inches. Dry densities measured on relatively undisturbed samples from within 10 feet of the existing ground surface ranged from approximately 103 to 121 pcf. Relatively undisturbed soil samples consolidated approximately 0.7 to 2.6 percent under a 2-ksf load when saturated. A relatively undisturbed soil sample had an angle of internal friction of 37 degrees.

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

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Groundwater was not encountered to the explored depth of 20 feet below ground surface. Based on a review of historic high groundwater elevation in the area by the Department of Water Resources, groundwater was observed at an elevation of approximately 254 feet below ground surface in Well 343884N1176082W001 located about 3.2 miles to the southwest of the subject site.

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.

SEISMICITY AND LIQUEFACTION POTENTIAL

Seismicity is a general term relating to the abrupt release of accumulated strain energy in the rock materials of the earth's crust in a given geographical area. The recurrence of accumulation and subsequent release of strain have resulted in faults and fault systems. Fault patterns and density reflect relative degrees of regional stress through time, but do not necessarily indicate recent seismic activity; therefore, the degree of seismic risk must be determined or estimated by the seismic record in any given region.

Soil liquefaction is a state of soil particle suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as clean sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. 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 ground shaking

The soils beneath the site consist of medium dense to very dense poorly-graded sands. Groundwater was not encountered in our borings. In accordance with the County of San Bernardino Hazard Mitigation Planning Map, the site is not located within an area designated as a liquefaction hazard zone. In addition, the absence of shallow groundwater within the upper 50 feet below site grades, suggest that liquefaction would not be conducive to liquefaction potential. The historic high groundwater is estimated at a depth in excess of 254 feet below ground surface. Based on these conditions encountered and the results of our laboratory testing, the subsurface conditions encountered at the subject site are not considered to be subject to liquefaction.

FAULT RUPTURE HAZARD ZONES

The Alquist-Priolo Geologic Hazards Zones Act went into effect in March, 1973. Since that time, the Act has been amended 11 times (Hart, 2007). The purpose of the Act, as provided in California Geologic Survey (CGS) Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The Act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones."

A Fault Rupture Hazard Zones Map has not been prepared for the vicinity of the subject site to date. During the site visit, our field engineer did not encounter any visible fault zones or faults projected to cross the vicinity of the subject site. The nearest significant zoned fault is a portion of the San Andreas Fault Zone, located approximately 6.0 miles from the subject site.

SEISMIC HAZARDS ZONES

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers.

A Seismic Hazard Zones Map has not been prepared for the vicinity of the subject site to date. Therefore, the area of the subject site is not located within an area designated by the State of California as a Seismic Hazards Zone. In addition, according with the County of San Bernardino Hazard

Mitigation Planning Map, the site is not located within an area designated as a liquefaction hazard zone (Figure 3).

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, and Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Tsunamis: Tsunamis are tidal waves generated by fault displacement or major ground movement. The site is several miles from the ocean. As such, tsunamis are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be medium dense to dense. Provided the recommendations in this report are incorporated into the design and construction of the proposed development, hydroconsolidation is not anticipated to be a significant concern for the subject site.

EXPANSIVE SOIL

The near-surface sand soils encountered at the site have been identified through laboratory testing as having a low expansion potential. Expansive soils have the potential to undergo volume change, or shrinkage and swelling, with changes in soil moisture. As expansive soils dry, the soil shrinks; when moisture is reintroduced into the soil, the soil swells.

SOIL CORROSIVITY

Corrosion tests were performed to evaluate the soil corrosivity to the buried structures. The tests consisted of sulfate content, chloride content, and resistivity and the results of the tests are included as follows:

Parameter	Results	Test Method
Resistivity	15,000 ohms-m	CA 643
Sulfate	201 ppm	CA 417
Chloride	98 ppm	CA 422
pH	7.6	EPA 9045C

INFILTRATION TESTING

Estimated infiltration rates were determined using the results of open borehole percolation testing performed at the subject site. The percolation testing indicated that the near surface medium dense poorly-graded sand soil were found to have infiltration rates of approximately 1.01 and 1.33 inches per hour. The location of these infiltration tests are presented on the attached Site Map, Figure 1.

The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

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 surficial soils, appear to be conducive to the development of the project.

To reduce post-construction soil movement and provide uniform support for the buildings to be constructed at the subject site, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of five (5) below existing grades. In addition, foundations should be bearing on a minimum of three (3) feet of Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally a minimum of five (5) feet beyond edges of the proposed footings and building appurtenances. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive area, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Prior to placement of any fill soils, the upper eight (8) inches of native subgrade soils exposed in the over-excavation bottom should be scarified, moisture-conditioned to near optimum moisture-content, and recompacted to a minimum of 90 percent of the maximum dry density based on ASTM D1557 Test

Method. All fill material should be compacted to a minimum of 95 percent of the maximum density based on ASTM D1557 Test Method.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and compacted to achieve at least 95 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Trees are located within the project site vicinity. Tree or root removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Groundwater Influence on Structures/Construction

During our field investigation free groundwater was not encountered in any of the borings drilled as part of this investigation. It is not anticipated that groundwater will impact the proposed development. If groundwater is encountered, our firm should be consulted prior to dewatering the site. In addition to the groundwater level, 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 and existing utilities, structures; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. A few Joshua trees were located on site, special handling should be taken to relocate these trees. Site stripping should extend to a minimum depth of 2 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 either stockpiled or reused in planned landscape areas or non-structural areas, or hauled offsite to an approved disposal location.

Any excavations that result from clearing operations should be backfilled with Engineered Fill. Krazan & Associates' field staff should be present during site clearing operations to enable us to locate areas where depressions or disturbed soils are present and to allow our staff to observe and test the backfill as it is placed. If site clearing and backfilling operations occur without appropriate observation and testing by a qualified geotechnical consultant, there may be the need to over-excavate the building area to identify uncontrolled fills prior to mass grading of the building pad.

As with site clearing operations, any buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill.

Overexcavation and Recompaction – Building and Foundation Areas

To reduce post-construction soil movement and provide uniform support for the buildings to be constructed at the subject site, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of five (5) below existing grades. In addition, foundations should be bearing on a minimum of three (3) feet of Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally a minimum of five (5) feet beyond edges of the proposed footings and building appurtenances. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Fills and cuts are anticipated to be on the order of approximately 5 feet to establish finished site grades and provide for positive site drainage.

Trees are located within the project site vicinity. Tree or root removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

Overexcavation and Recompaction – Proposed Parking Area

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive areas, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Any buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill, compacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. 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. 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 encountered, should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

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 on-site native soils are predominately poorly-graded sands. These soils will be suitable for reuse as Non-Expansive Engineered Fill, provided they are cleansed of excessive organics, fragments greater than 6 inches in diameter, and debris.

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

Imported Non-Expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to at least optimum moisture-content, and compacted to achieve at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required 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 2 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Slots or weep holes should be placed in drop inlets or other surface drainage devices in pavement areas to allow free drainage of adjoining base course materials. Cutoff walls should be installed at pavement edges adjacent to vehicular traffic areas; these walls should extend to a minimum depth of 12 inches below pavement subgrades to limit the amount of seepage water that can infiltrate the pavements. Where cutoff walls are undesirable subgrade drains can be constructed to transport excess water away from planters to drainage interceptors. If cutoff walls can be successfully used at the site, construction of subgrade drains is considered unnecessary.

Utility Trench Backfill

Utility 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 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.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

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

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

The proposed structures may be supported on a shallow foundation system bearing on a minimum of three (3) feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,000 psf
Dead-Plus-Live Load	2,650 psf
Total Load, including wind or seismic loads	3,525 psf

The 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 15 inches, regardless of load.

The total soil movement is not expected to exceed 1 inch. Differential movement measured across a horizontal distance of 30 feet 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.

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.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 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 300 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Floor Slabs and Exterior Flatwork

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 practices. 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.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 24-inch centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To 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 31 pounds per square foot per foot of depth. Walls incapable of this deflection or are fully constrained walls against deflection may be designed for an equivalent fluid at-rest pressure of 50 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

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

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 wide 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 ⅛ inch in diameter, while perforations should be no more than ¼ 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.

R-Value Test Results and Pavement Design

One bulk soil sample was obtained from the project site for R-Value testing at the location shown on the attached site plan. The sample was tested in accordance with the State of California Materials Manual Test Designation 301. Results of the test are as follows:

Sample	Depth	Description	R-Value at Equilibrium
1	0-36"	Poorly-Graded Sand (SP)	77

The test results are moderate and indicate great 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***
***** 95% 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. Following grading operations, it is recommended additional R-Value testing be performed to verify the design R-Value.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT
LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	4.0”	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.5"	4.0”	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***
******Minimum compressive strength of 3000 psi***

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. 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	1.000	Table 1613.2.3 (1)
S_S	1.533	Section 1613.2.1
S_{MS}	1.533	Section 1613.2.3
S_{DS}	1.022	Section 1613.2.4
Site Coefficient F_v	1.700	Table 1613.2.3 (2)
S_1	0.629	Section 1613.2.1
S_{M1}	1.069	Section 1613.2.3
S_{D1}	0.713	Section 1613.2.4
T_S	0.698	Section 1613.2
PGA_M	0.739	Figure 22.7

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

Infiltration Testing

The shallow soil conditions present at the subject site were evaluated by drilling two shallow borings in the vicinity of the infiltration test. The borings drilled at the site indicated the subsurface soil conditions consisted of medium dense poorly-graded sand.

Infiltration rates were determined in accordance with the County of San Bernardino Technical Guidance Document for Water Quality Management, infiltration testing has been performed in general accordance with the Riverside County Open Borehole Protocols.

Infiltration testing was performed at two (2) locations within the proposed infiltration area located at the subject site. The approximate test locations are identified on the attached site plan. In order to perform these tests, two borings were drilled to a depth of approximately ten (10) feet below existing site grades. Infiltration testing has been performed at each of the boring locations. Infiltration testing has been performed using open borehole percolation testing. The resulting infiltration rates have been calculated using the Inverse Borehole procedures prescribed in the County of San Bernardino Technical Guidance Document for Water Quality Management (Riverside County Open Borehole Test Procedures).

The conversion equation is used:

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Prior to infiltration testing, approximately four inches of gravel was placed at the bottom of the borehole. The borehole was pre-soaked prior to testing using clean water. The depth of the borehole was measured at each reading to verify the overall depth. The depth of water in the borehole was measured using a water level indicator or well sounder.

The estimated infiltration rates were determined using the results of open borehole percolation testing at two (2) locations at the subject site. The infiltration rates have been calculated using the Inverse Borehole procedures.

The infiltration rates at the end of the tests indicated an infiltration rate of approximately 1.01 and 1.33 inches per hour. Detailed results of the infiltration testing are included as an attachment to this report. The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

It is recommended that the location of the infiltration systems not be closer than ten feet (10’) as measured laterally from the edge of the adjacent property line, ten feet (10’) from the outside edge of any foundation and five (5’) from the edge of any right-of way to the outside edges of the infiltration system.

If the infiltration location is within ten feet (10’) from the proposed foundation, it is recommended that this infiltration system should be impervious from the finished ground surface to a depth that will achieve a diagonal distance of a minimum of ten feet (10’) below the bottom of the closest footing in the project.

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. ACI 318-19 has developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

One soil sample was 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 201 ppm, which classifies this material as Class S1 based on the ACI 318-19, Table 19.3.1.1. Therefore, it is recommended that concrete in contact with soil utilize Type II cement and have a minimum compressive strength of 4,000 psi with a maximum water to cement ratio of 0.50.

Chemical tests were performed on near-surface soil samples. This testing indicates the chloride concentration was 98 ppm, minimum resistivity was 15,000 ohm-cm, and the soils had a pH value of 7.6. The test results indicate that the soils are mildly corrosive to buried metal objects. A qualified corrosion engineer may be consulted regarding mitigation of the corrosion effects of the onsite soils on underground metal utilities.

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 upon 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 (951) 273-1011.

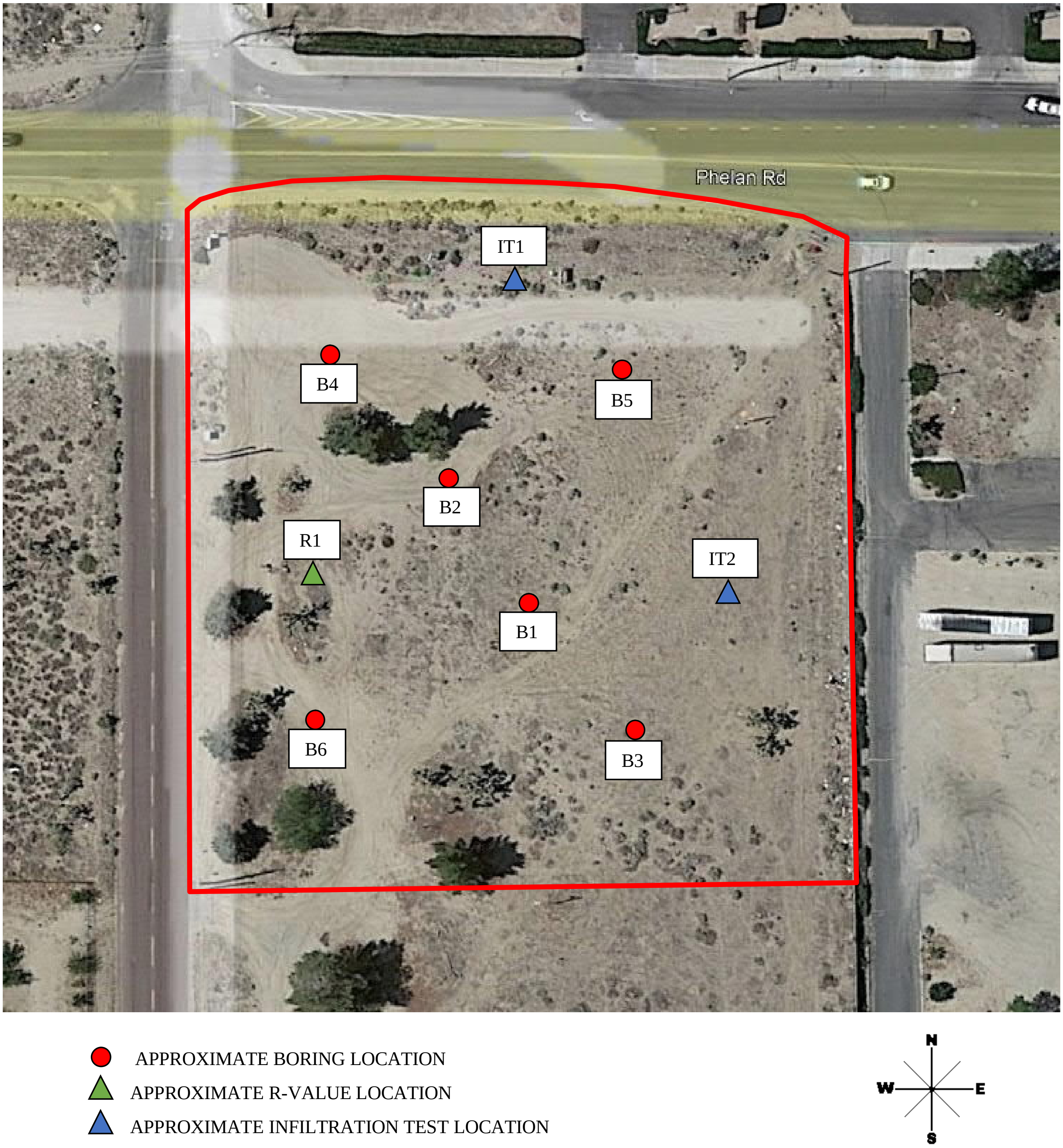
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER
JORGE A. PELAYO
91269
CIVIL
STATE OF CALIFORNIA

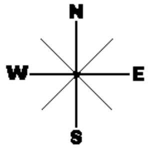
Jorge A Pelayo

Jorge A. Pelayo, PE
Project Engineer
RCE No. 91269

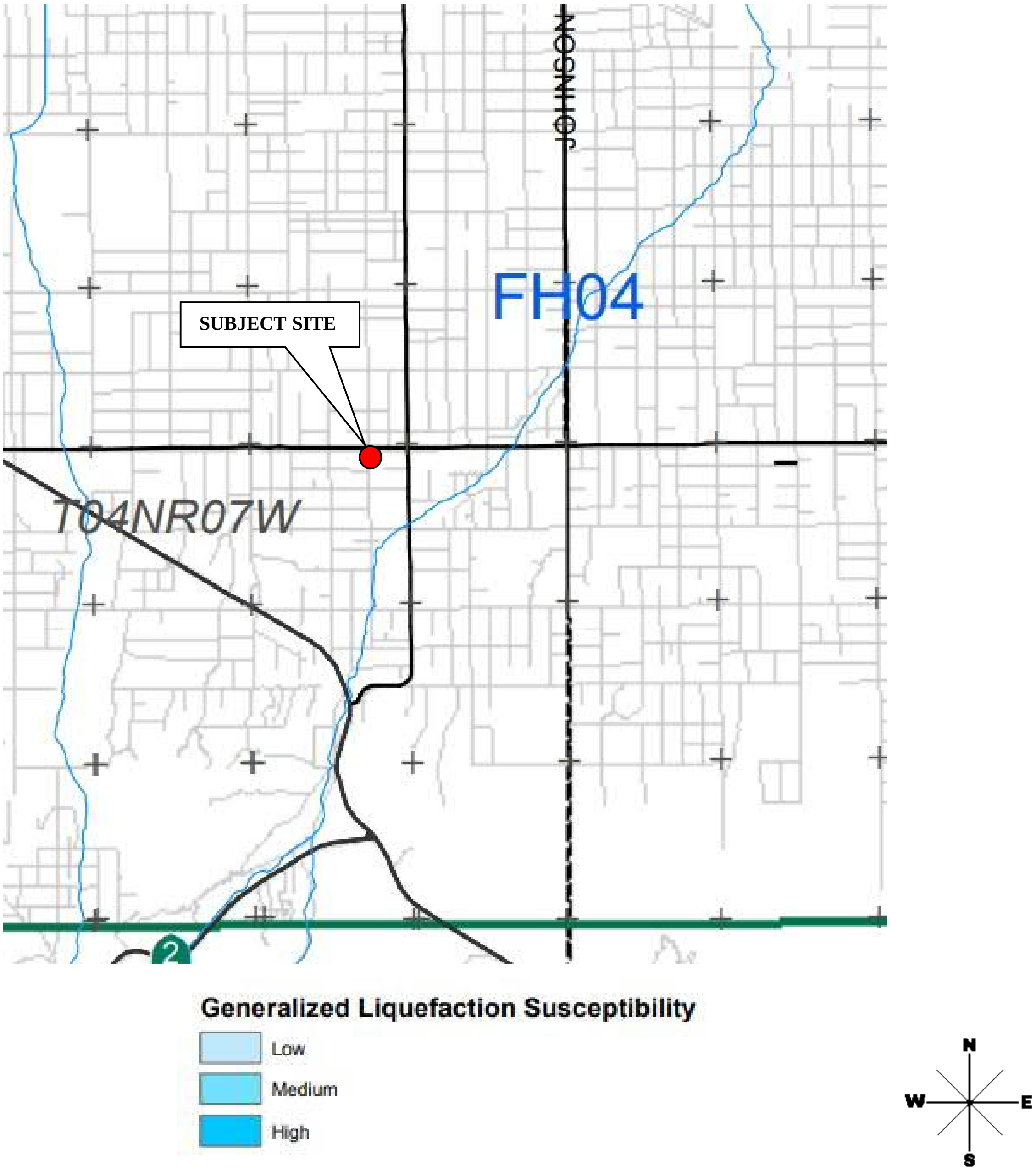
Figures



SITE MAP	**Scale:** NTS	**Date:** Jun., 2023	Krazan GEOTECHNICAL ENGINEERING
PROPOSED O'REILLY AUTO PARTS STORE **3919 PHELAN ROAD** **PHELAN, CALIFORNIA**	**Drawn by:** GR	**Approved by:** JAP	
	Project No. 112-23065	**Figure No.** 1	



VICINITY MAP	**Scale:** As Shown	**Date:** Jun., 2023	**Krazan** **GEOTECHNICAL ENGINEERING**
PROPOSED O'REILLY **AUTO PARTS STORE** **3919 PHELAN ROAD** **PHELAN, CALIFORNIA**	**Drawn by:** GR **Project No.** 112-23065	**Approved by:** JAP **Figure No.** 2	



Source: San Bernardino County Land Use Plan General Plan Geologic Hazard Overlays, EHFH C

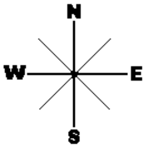
SAN BERNARDINO COUNTY LAND USE PLAN GEOLOGIC HAZARD OVERLAYS

PROPOSED O'REILLY AUTO PARTS STORE
3919 PHELAN ROAD
PHELAN, CALIFORNIA

Scale: NTS	**Date:** Jun., 2023
Drawn by: GR	**Approved by:** JAP
Project No. 112-23065	**Figure No.** 3

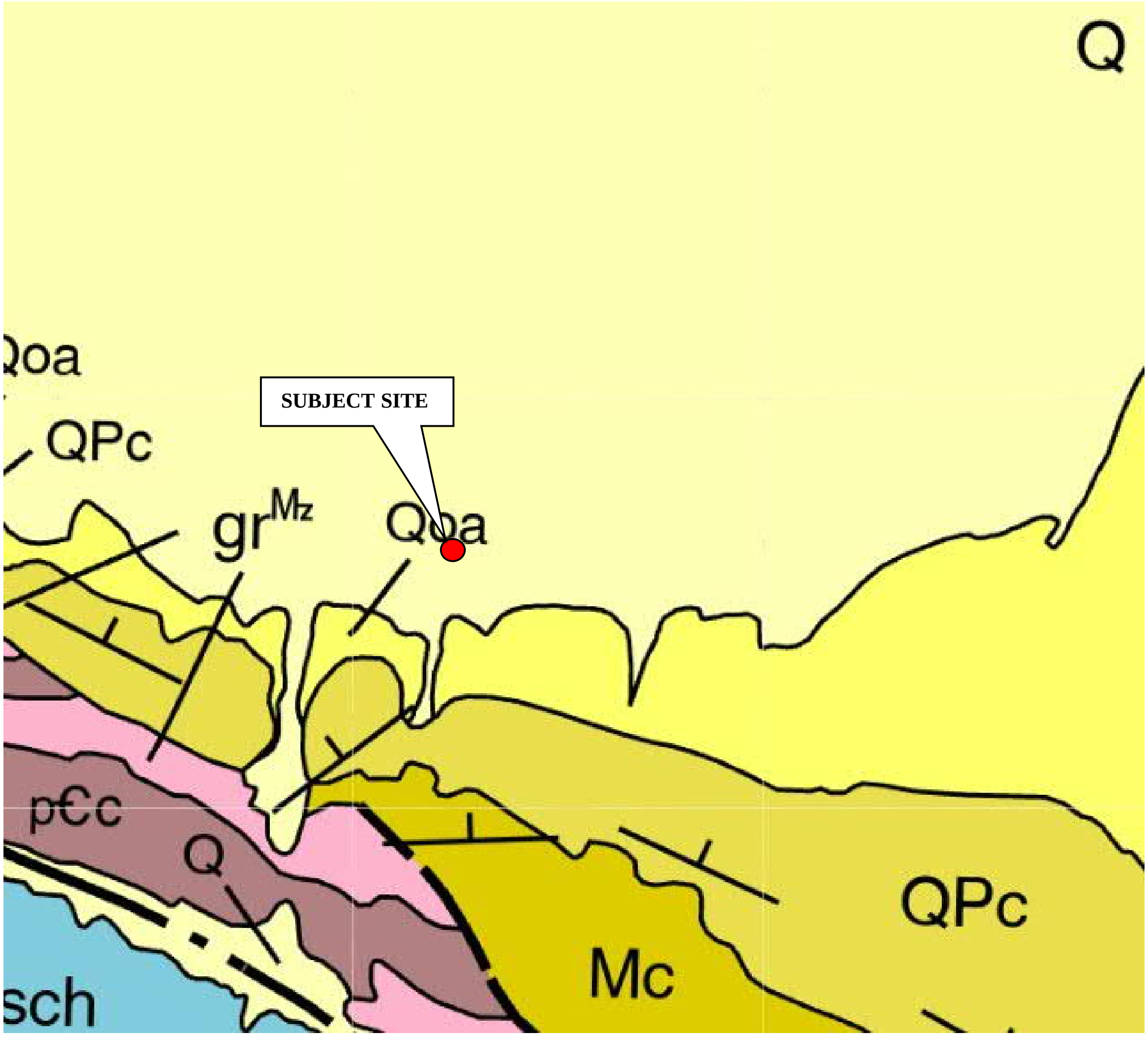
Krazan
GEOTECHNICAL ENGINEERING

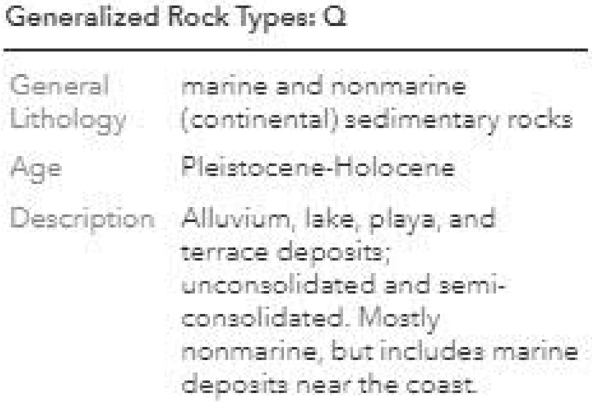
Depth to groundwater is approximately 254 feet below the ground surface elevation measured at well number 343884N1176082W001 on 07/15/10 about 3.2 mile southwest from the project site.



Source: Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

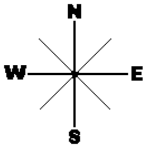
DEPARTMENT OF WATER RESOURCES: GROUNDWATER LEVEL MAP (SGMA DATA VIEWER)	**Scale:** As Shown	**Date:** Jun., 2023	**Krazan** **GEOTECHNICAL ENGINEERING**
PROPOSED O'REILLY AUTO PARTS STORE **3919 PHELAN ROAD** **PHELAN, CALIFORNIA**	**Drawn by:** GR	**Approved by:** JAP	
	Project No. 112-23065	**Figure No.** 4	





Generalized Rock Types: Q

General Lithology	marine and nonmarine (continental) sedimentary rocks
Age	Pleistocene-Holocene
Description	Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.



Source: Department of Conservation: Geologic Map of California, 2015

GEOLOGIC MAP	**Scale:** NTS	**Date:** Jun., 2023	Krazan **GEOTECHNICAL ENGINEERING**
PROPOSED O'REILLY AUTO PARTS STORE **3919 PHELAN ROAD** **PHELAN, CALIFORNIA**	**Drawn by:** GR	**Approved by:** JAP	
	Project No. 112-23065	**Figure No.** 5	

Log of Borings
&
Laboratory Testing

Appendix A

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Six (6) 8-inch diameter exploratory borings were advanced to depths of up to twenty feet below site grades. The boring locations are shown on the site plan.

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

Modified standard penetration tests and standard penetration tests were performed at selected depths. This test represents the resistance to driving a 2½-inch and 1½-inch diameter split barrel sampler, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with one-half of the block shaded. All samples were returned to our Corona laboratory for evaluation.

Laboratory Investigation

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

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

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

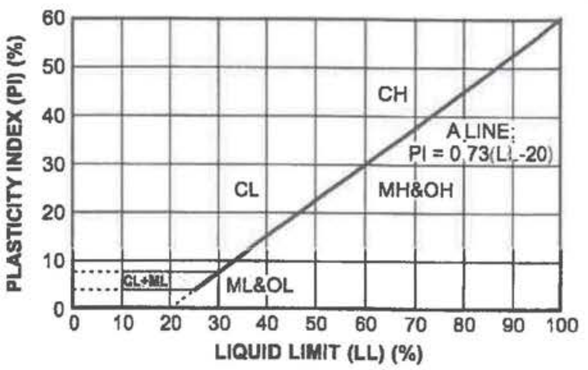
CONSISTENCY CLASSIFICATION

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

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	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 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



■ California Modified Split Spoon Sampler

◪ Standard Penetration Split Spoon Sampler

Log of Boring B1

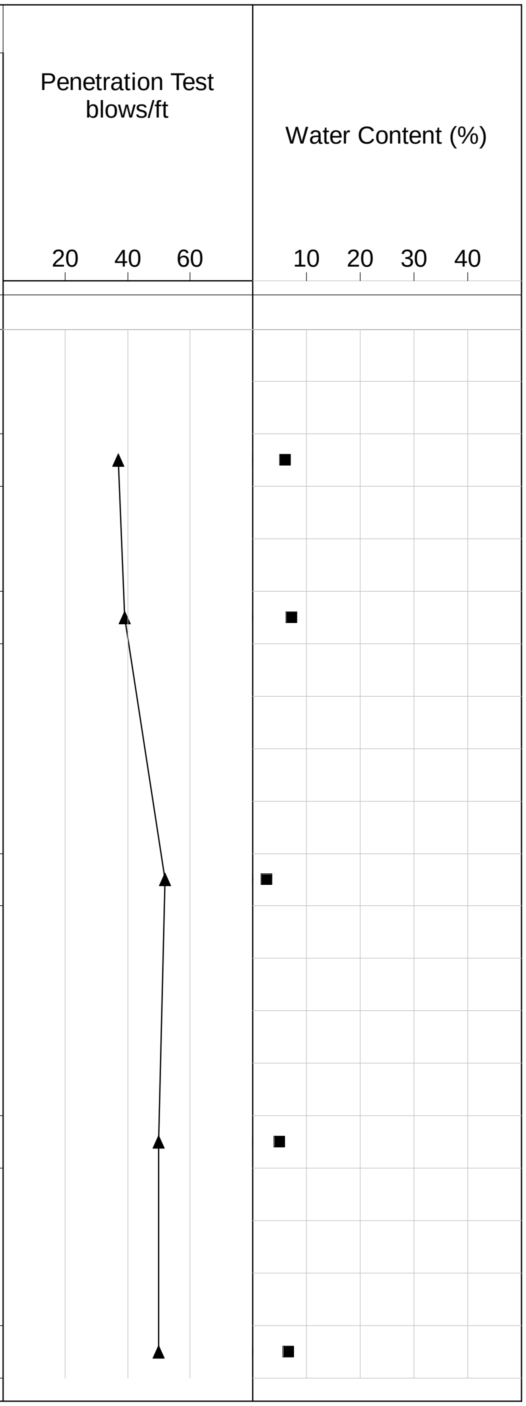
Project: Proposed O'Reilly Auto Parts Store
Project No: 112-23065

Client: O'Reilly Auto Parts Store
Figure No.: A-1

Location: 3919 Phelan Road, Phelan, CA
Logged By: Gabriel Ramirez

Depth to Water> Not Encountered
Initial: N/A
At Completion: N/A

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0	▨	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly				
2	▨		118.9	6.1	■	37
4	▨					
	▨		115.4	7.3	■	39
6	▨					
8	▨					
10	▨	Dense below 10 feet	116.1	2.7	■	52
12	▨					
14	▨					
	▨	Very dense below 15 feet		5.0	◪	50+
16	▨					
18	▨					
	▨	Water not encountered Backfilled with soil cuttings		6.7	◪	50+
20						



Drill Method: Hollow Stem
Drill Date: 6-5-23

Drill Rig: CME 75
Hole Size: 8 Inches

Krazan and Associates

Driller: One Way Drilling
Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B2

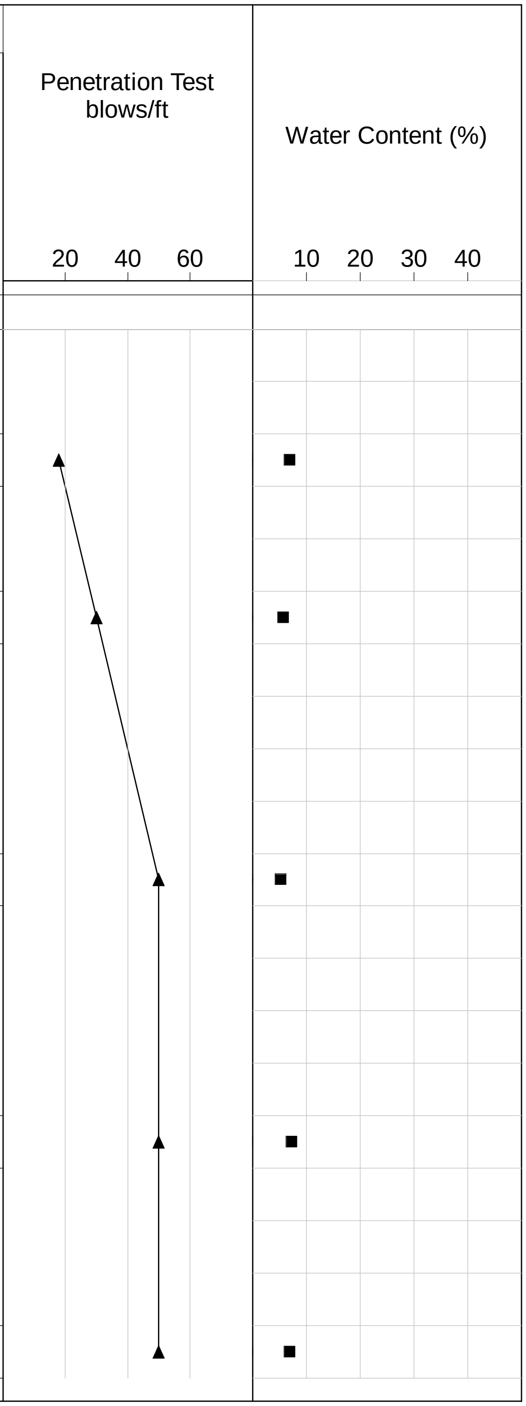
Project: Proposed O'Reilly Auto Parts Store
Project No: 112-23065

Client: O'Reilly Auto Parts Store
Figure No.: A-2

Location: 3919 Phelan Road, Phelan, CA
Logged By: Gabriel Ramirez

Depth to Water> Not Encountered
Initial: N/A
At Completion: N/A

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0	▒	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly				
2	▒		116.4	7.0	■	18
4	▒		121.3	5.8	■	30
10	▒	Very dense below 10 feet	119.5	5.3	■	50+
16	▒			7.3	◩	50+
18	▒	Water not encountered Backfilled with soil cuttings		7.0	◩	50+
20						



Drill Method: Hollow Stem
Drill Date: 6-5-23

Drill Rig: CME 75
Krazan and Associates
Hole Size: 8 Inches

Driller: One Way Drilling
Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Proposed O'Reilly Auto Parts Store

Project No: 112-23065

Client: O'Reilly Auto Parts Store

Figure No.: A-3

Location: 3919 Phelan Road, Phelan, CA

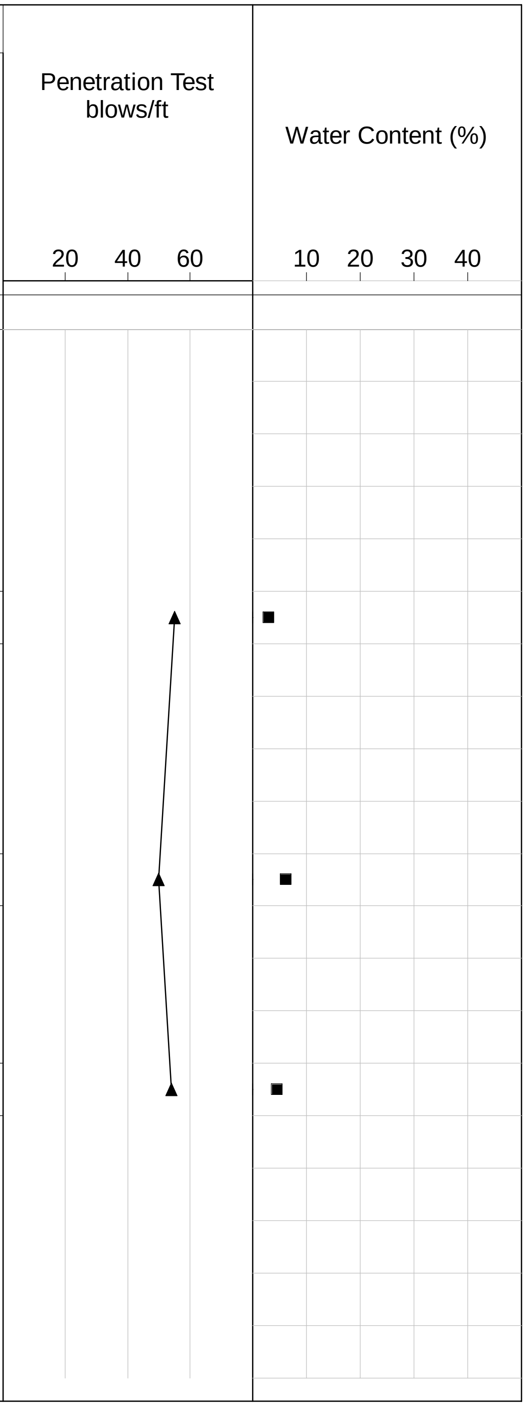
Logged By: Gabriel Ramirez

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0	▨	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly, dense below 5 feet				
	▨		115.1	3.0	■	55
10	▨	Very dense below 10 feet	119.2	6.3	■	50+
14	▨			4.6	◩	54
		End of Borehole Water not encountered Backfilled with soil cuttings				
20						



Drill Method: Hollow Stem

Drill Rig: CME 75

Driller: One Way Drilling

Krazan and Associates

Drill Date: 6-5-23

Hole Size: 8 Inches

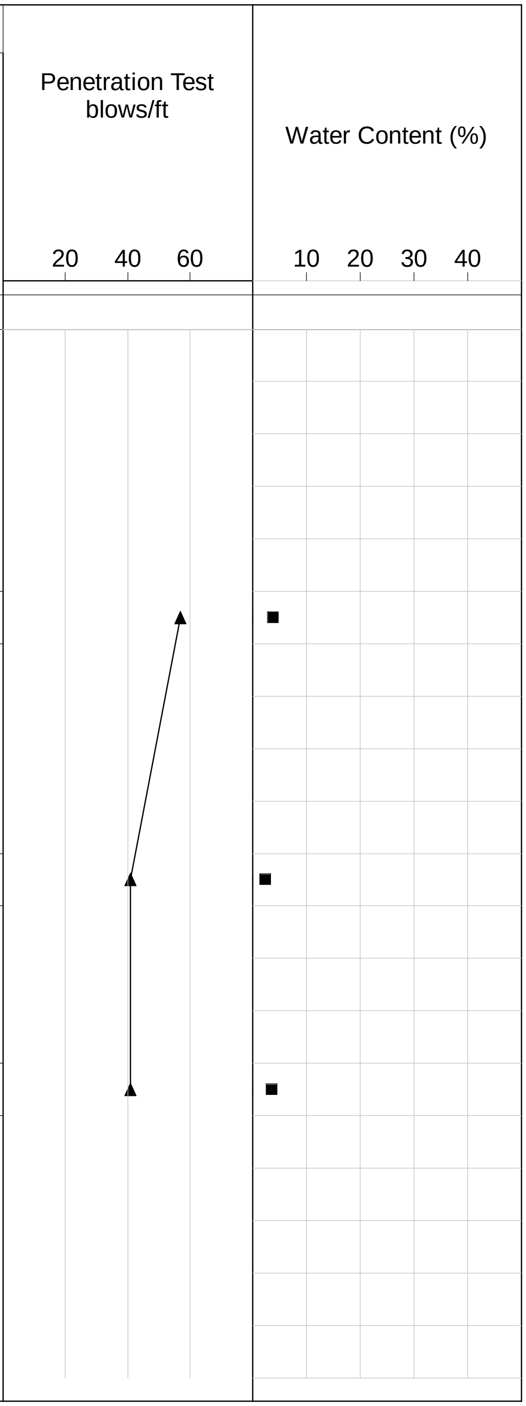
Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B4

Project: Proposed O'Reilly Auto Parts Store
Project No: 112-23065
Client: O'Reilly Auto Parts Store
Figure No.: A-4
Location: 3919 Phelan Road, Phelan, CA
Logged By: Gabriel Ramirez
Depth to Water> Not Encountered
Initial: N/A
At Completion: N/A

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
	▨	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly, dense below 5 feet				
	▨		103.4	3.9	■	57
	▨		120.2	2.4	■	41
	▨			3.6	◩	41
		End of Borehole Water not encountered Backfilled with soil cuttings				



Drill Method: Hollow Stem
Drill Date: 6-5-23
Drill Rig: CME 75
Hole Size: 8 Inches
Driller: One Way Drilling
Elevation: 15 Feet

Krazan and Associates

Sheet: 1 of 1

Log of Boring B5

Project: Proposed O'Reilly Auto Parts Store

Project No: 112-23065

Client: O'Reilly Auto Parts Store

Figure No.: A-5

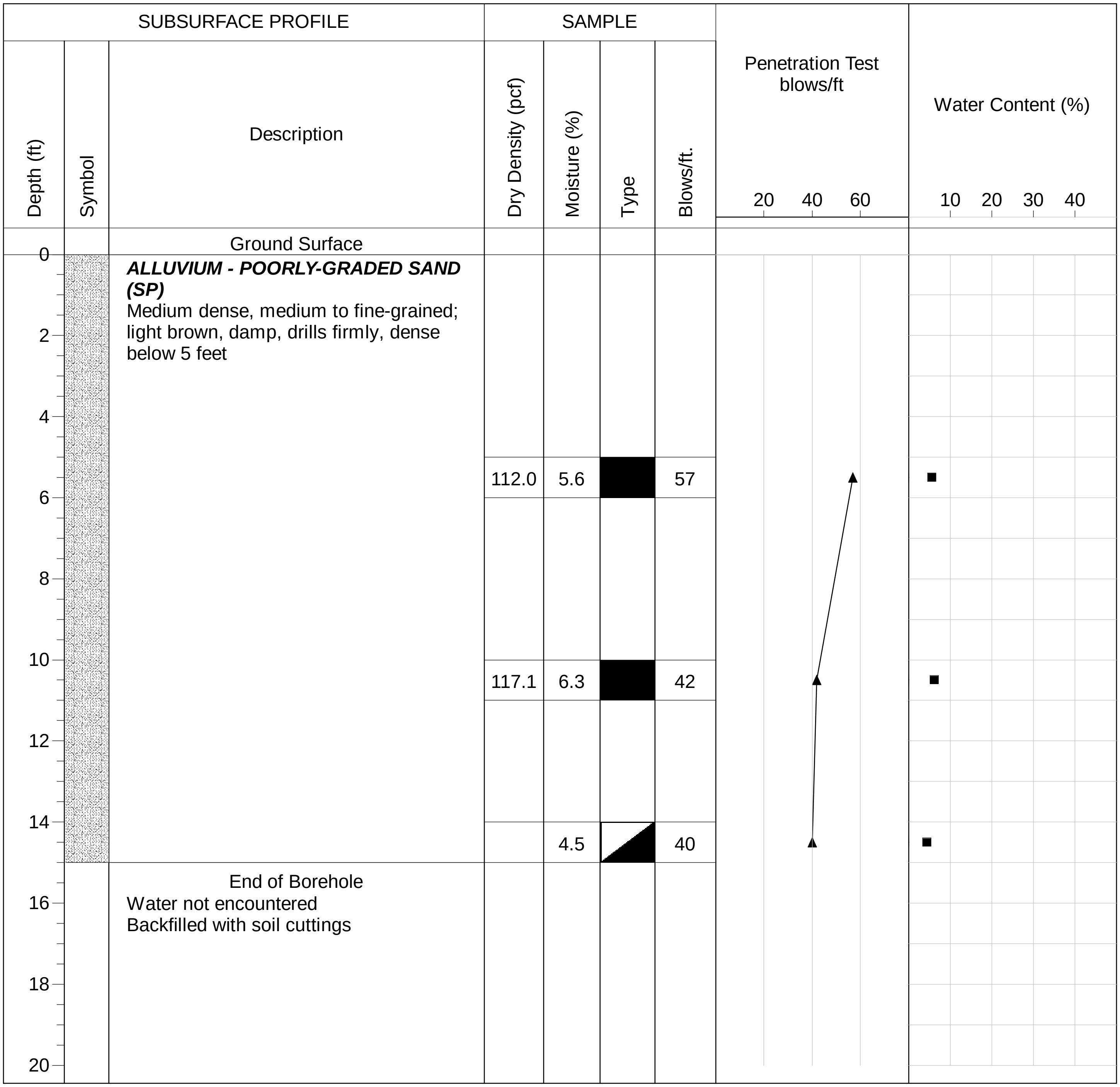
Location: 3919 Phelan Road, Phelan, CA

Logged By: Gabriel Ramirez

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0–15	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly, dense below 5 feet				
5–6		112.0	5.6	■	57
10–11		117.1	6.3	■	42
14–15			4.5	◢	40
15	End of Borehole Water not encountered Backfilled with soil cuttings				

Drill Method: Hollow Stem

Drill Date: 6-5-23

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8 Inches

Driller: One Way Drilling

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B6

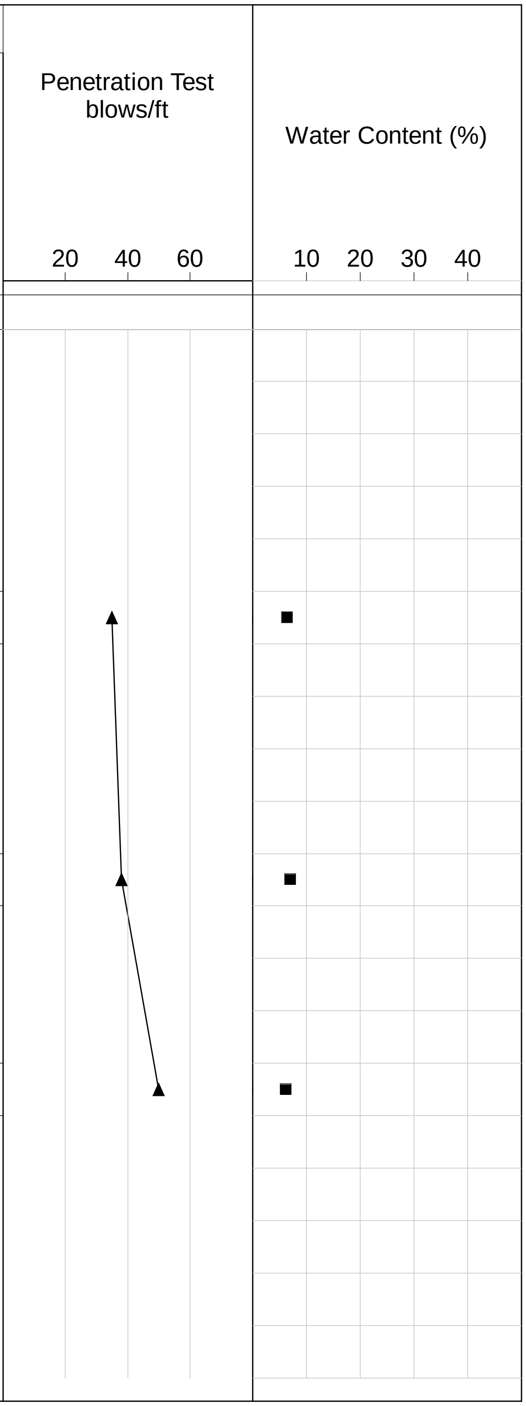
Project: Proposed O'Reilly Auto Parts Store
Project No: 112-23065

Client: O'Reilly Auto Parts Store
Figure No.: A-6

Location: 3919 Phelan Road, Phelan, CA
Logged By: Gabriel Ramirez

Depth to Water> Not Encountered
Initial: N/A
At Completion: N/A

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0	▨	***ALLUVIUM - POORLY-GRADED SAND (SP)*** Medium dense, medium to fine-grained; light brown, damp, drills firmly				
	▨		116.6	6.5	■	35
	▨		120.6	7.1	■	38
14	▨	Very dense below 14 feet		6.3	◪	50+
		End of Borehole Water not encountered Backfilled with soil cuttings				



Drill Method: Hollow Stem
Drill Date: 6-5-23

Drill Rig: CME 75
Krazan and Associates
Hole Size: 8 Inches

Driller: One Way Drilling
Elevation: 15 Feet
Sheet: 1 of 1

Sieve Analysis

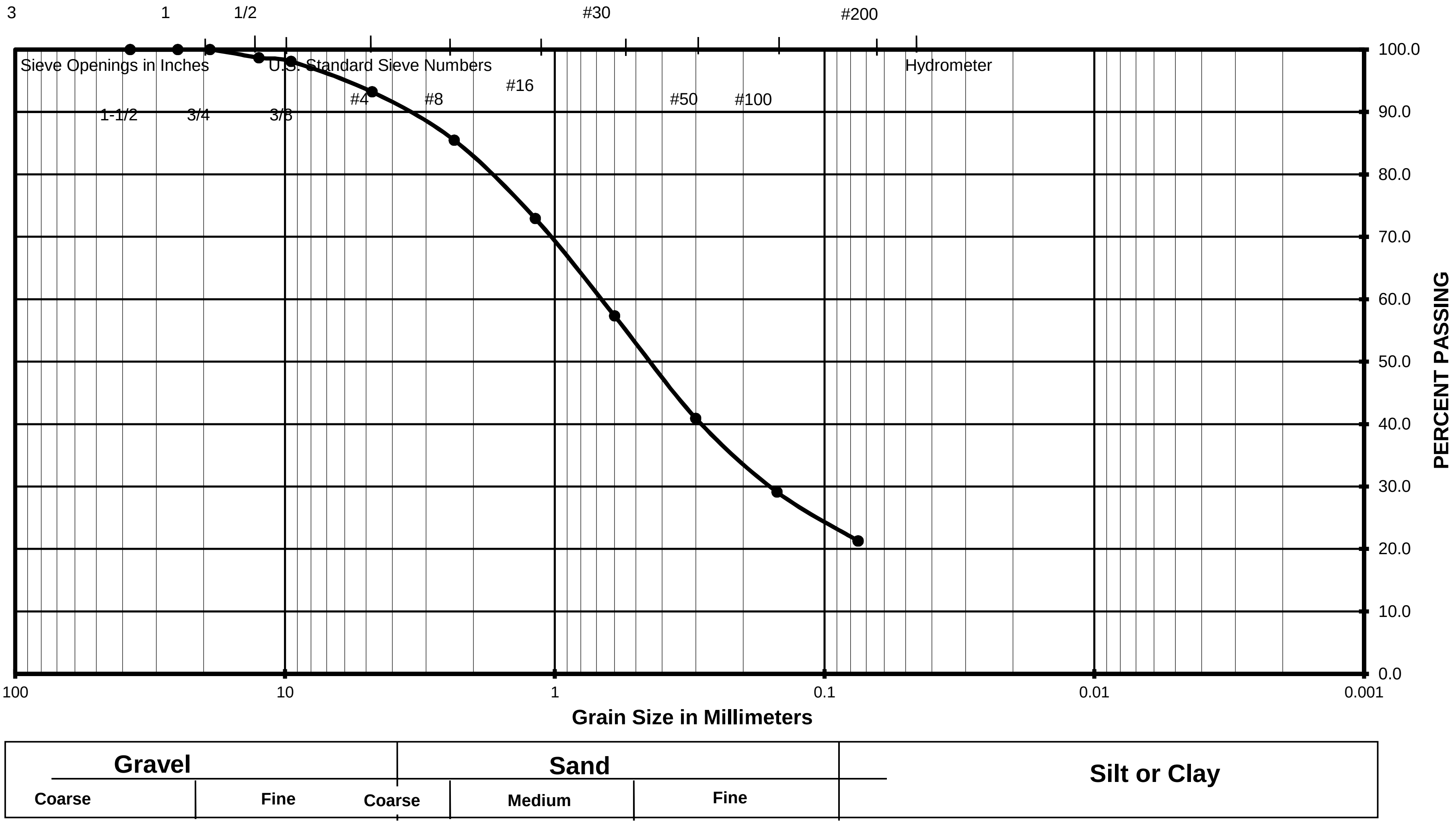
Project Number : 11223065
Project Name : O'Reilly Auto Parts Phelna
Date : 6/15/2023
Sample Location : B-1 @ 2'
Soil Classification : SP

Wet Weight	:	571.80
Dry Weight	:	571.80
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50	7.5	1.3	1.3	98.7
3/8"	9.50	3.4	0.6	1.9	98.1
#4	4.75	27.9	4.9	6.8	93.2
#8	2.36	44.2	7.7	14.5	85.5
#16	1.18	71.8	12.6	27.1	72.9
#30	0.60	89.2	15.6	42.7	57.3
#50	0.30	93.7	16.4	59.1	40.9
#100	0.15	67.5	11.8	70.9	29.1
#200	0.08	44.8	7.8	78.7	21.3

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	O'Reilly Auto Parts Phelna
Project Number	11223065
Soil Classification	SP
Sample Number	B-1 @ 2'

Krazan Testing Laboratory

Sieve Analysis

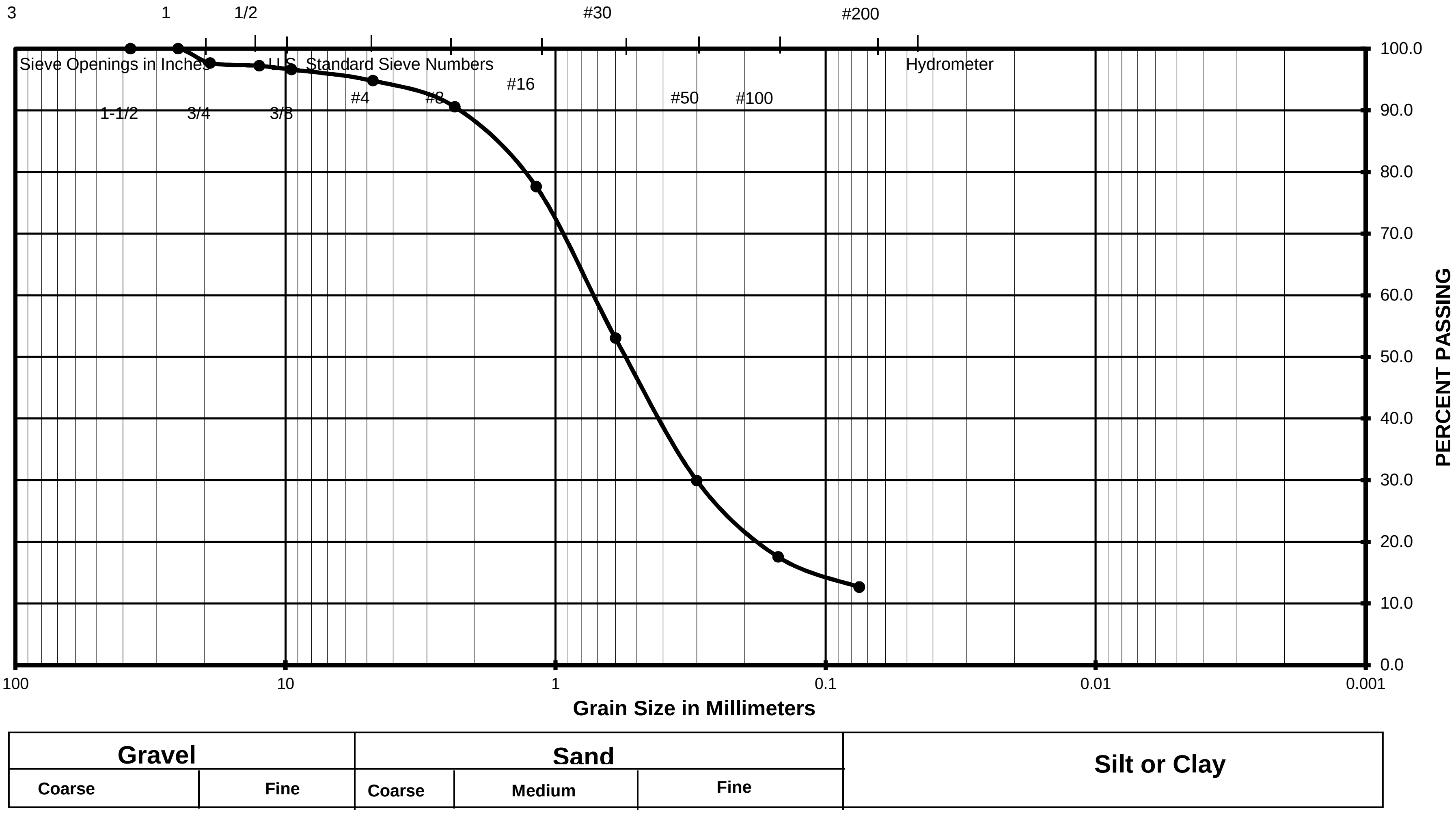
Project Number : 11223065
Project Name : O'Reilly Auto Parts Phelna
Date : 6/15/2023
Sample Location : B-1 @ 5'
Soil Classification : SP

Wet Weight	:	674.90
Dry Weight	:	674.90
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00	15.6	2.3	2.3	97.7
1/2"	12.50	3.2	0.5	2.8	97.2
3/8"	9.50	4.1	0.6	3.4	96.6
#4	4.75	12.2	1.8	5.2	94.8
#8	2.36	28.7	4.3	9.5	90.5
#16	1.18	87.2	12.9	22.4	77.6
#30	0.60	166.0	24.6	47.0	53.0
#50	0.30	155.8	23.1	70.1	29.9
#100	0.15	83.6	12.4	82.4	17.6
#200	0.08	33.1	4.9	87.3	12.7

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	O'Reilly Auto Parts Phelna
Project Number	11223065
Soil Classification	SP
Sample Number	B-1 @ 5'

Krazan Testing Laboratory

Sieve Analysis

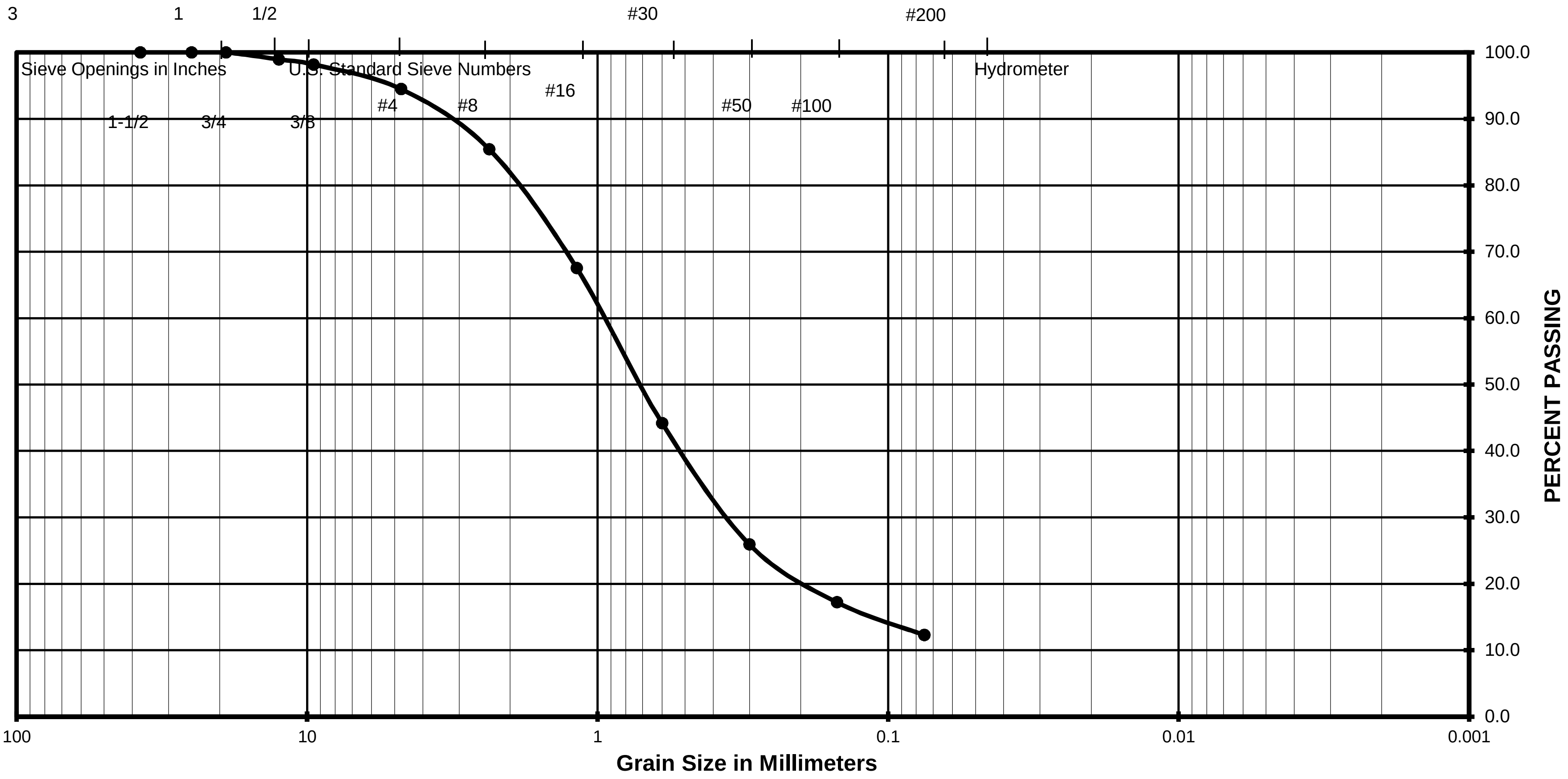
Project Number	: 11223065
Project Name	: O'Reilly Auto Parts Phelna
Date	: 6/15/2023
Sample Location	: B-1 @ 10'
Soil Classification	: SP

Wet Weight	:	681.30
Dry Weight	:	681.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50	7.2	1.1	1.1	98.9
3/8"	9.50	5.2	0.8	1.8	98.2
#4	4.75	25.2	3.7	5.5	94.5
#8	2.36	61.8	9.1	14.6	85.4
#16	1.18	121.8	17.9	32.5	67.5
#30	0.60	159.0	23.3	55.8	44.2
#50	0.30	124.6	18.3	74.1	25.9
#100	0.15	59.2	8.7	82.8	17.2
#200	0.08	33.6	4.9	87.7	12.3

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	O'Reilly Auto Parts Phelna
Project Number	11223065
Soil Classification	SP
Sample Number	B-1 @ 10'

Krazan Testing Laboratory

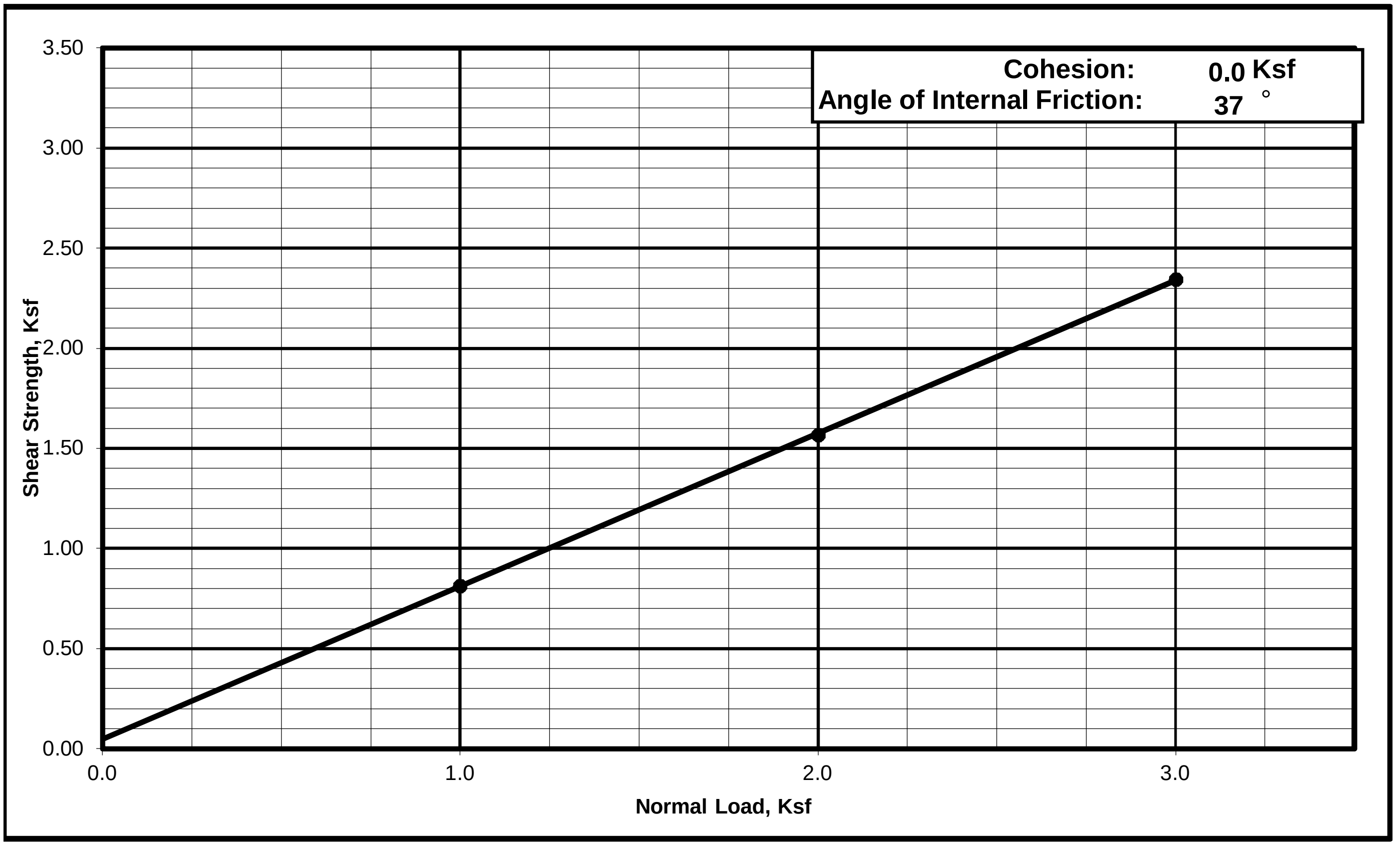
Direct Shear of Consolidated, Drained Soils
ASTM D - 3080 / AASHTO T - 236

Project Number : 11223065
Project Name : O'Reilly Auto Parts Phelna
Date : 6/15/2023
Sample Location : B-2 @ 5'
Soil Classification : SP
Sample Surface Area : 0.0289

STRESS DISPLACEMENT DATA

Lat. Disp. (in.)	Normal Load		
	1000	2000	3000
0	0	0	0
0.030	26.5	74.9	88.2
0.060	34.8	87.6	111.4
0.090	54.7	93.5	129.6
0.120	68.6	110.5	138.4
0.150	71.2	117.5	150
0.180	71.2	121.3	166.8
0.210	71.2	134.5	184.2
0.240	65.8	140	205.6
0.270	57.5	126.9	211
0.300			201
0.330			189.6
0.360			

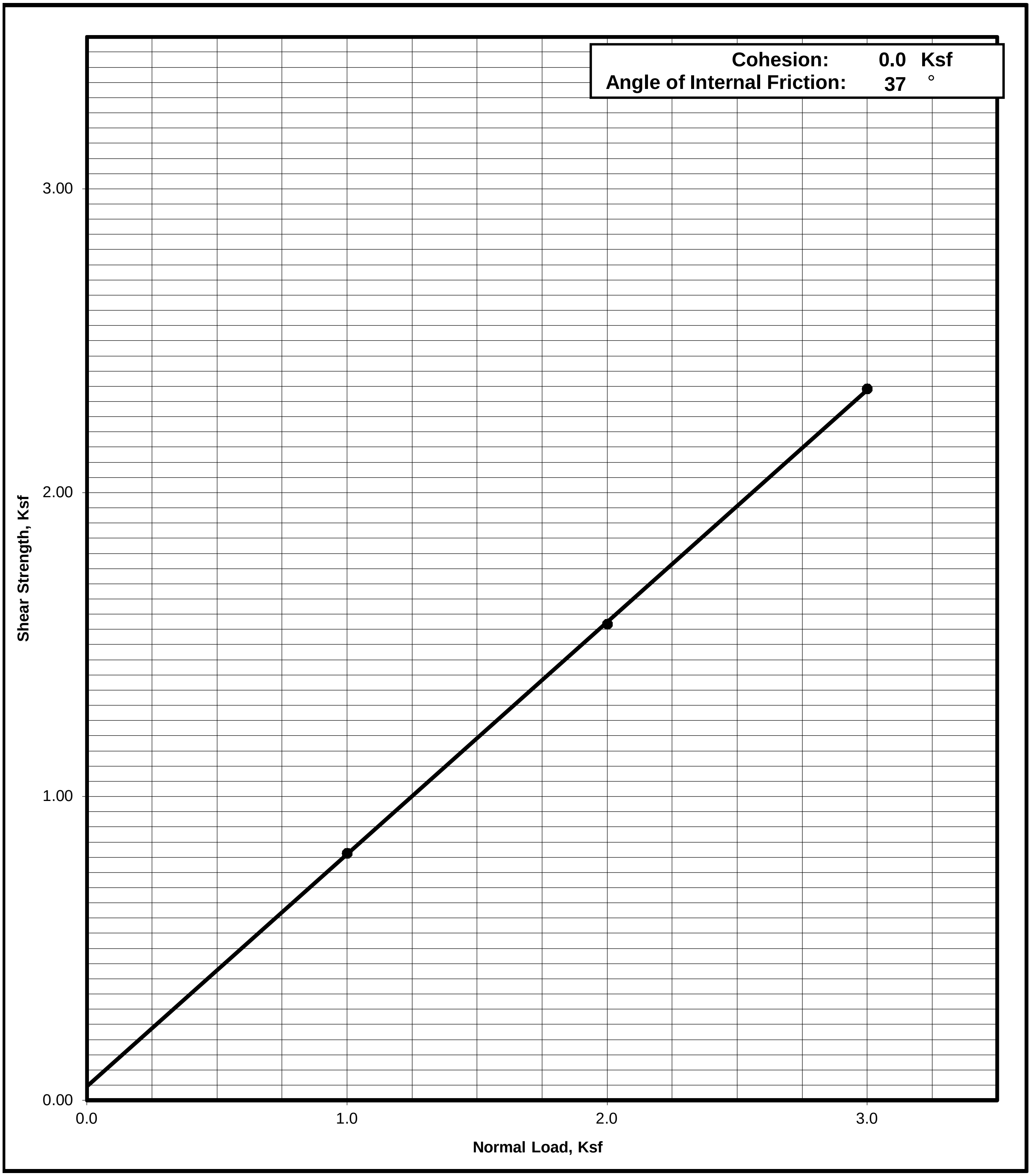
Normal Load psf	Shear force lbs	Shear Stress psf
1000	23.5	814
2000	45.3	1567
3000	67.7	2342



Krazan Testing Laboratory

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

Project Number	Boring No. & Depth	Soil Type	Date
11223065	B-2 @ 5'	SP	6/15/2023



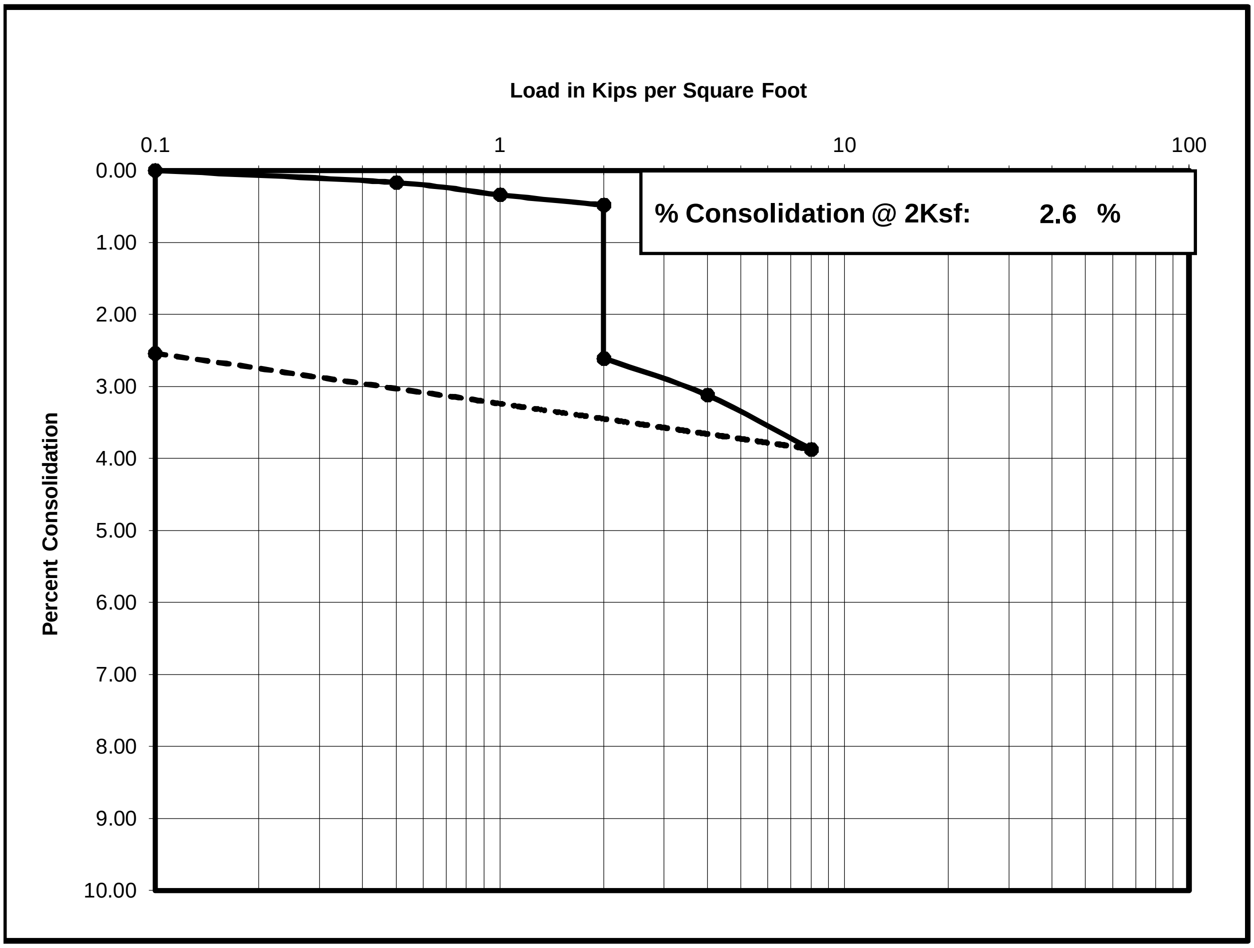
Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil

ASTM D - 2435 / AASHTO T - 216

Project Number	: 11223065
Project Name	: O'Reilly Auto Parts Phelan
Date	: 6/15/2023
Sample Location	: B-3 @ 2'
Soil Classification	: SP
Sample Condition	: Undisturbed

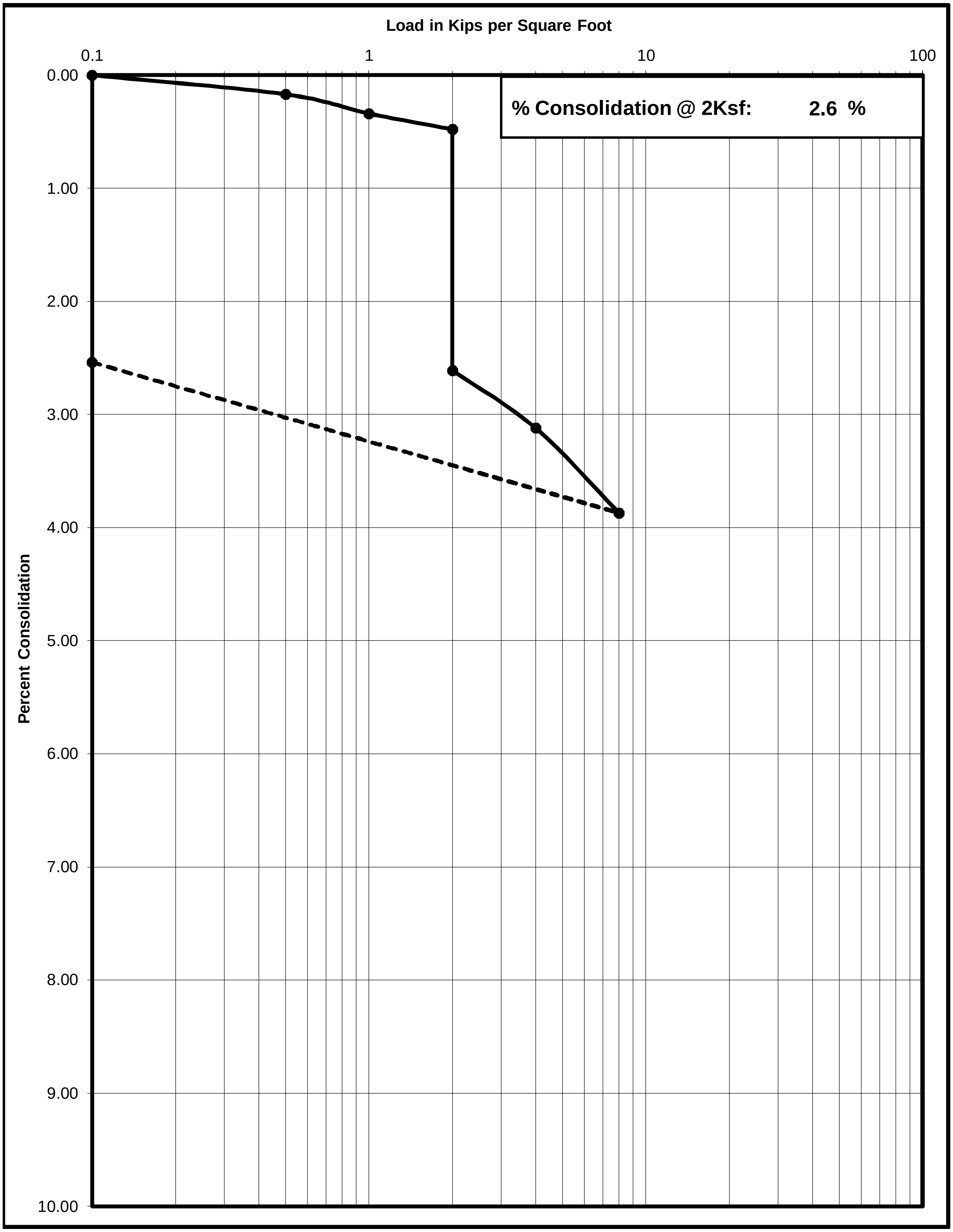
LOAD (ksf)	Reading	% Consolidation
0.1	0.0005	--
0.5	0.0017	0.17
1	0.0034	0.34
2	0.0048	0.48
Satur.	0.0261	2.61
4	0.0312	3.12
8	0.0387	3.87
0.1	0.0254	2.54



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11223065	B-3 @ 2'	6/15/2023	SP



% Consolidation @ 2Ksf: 2.6 %

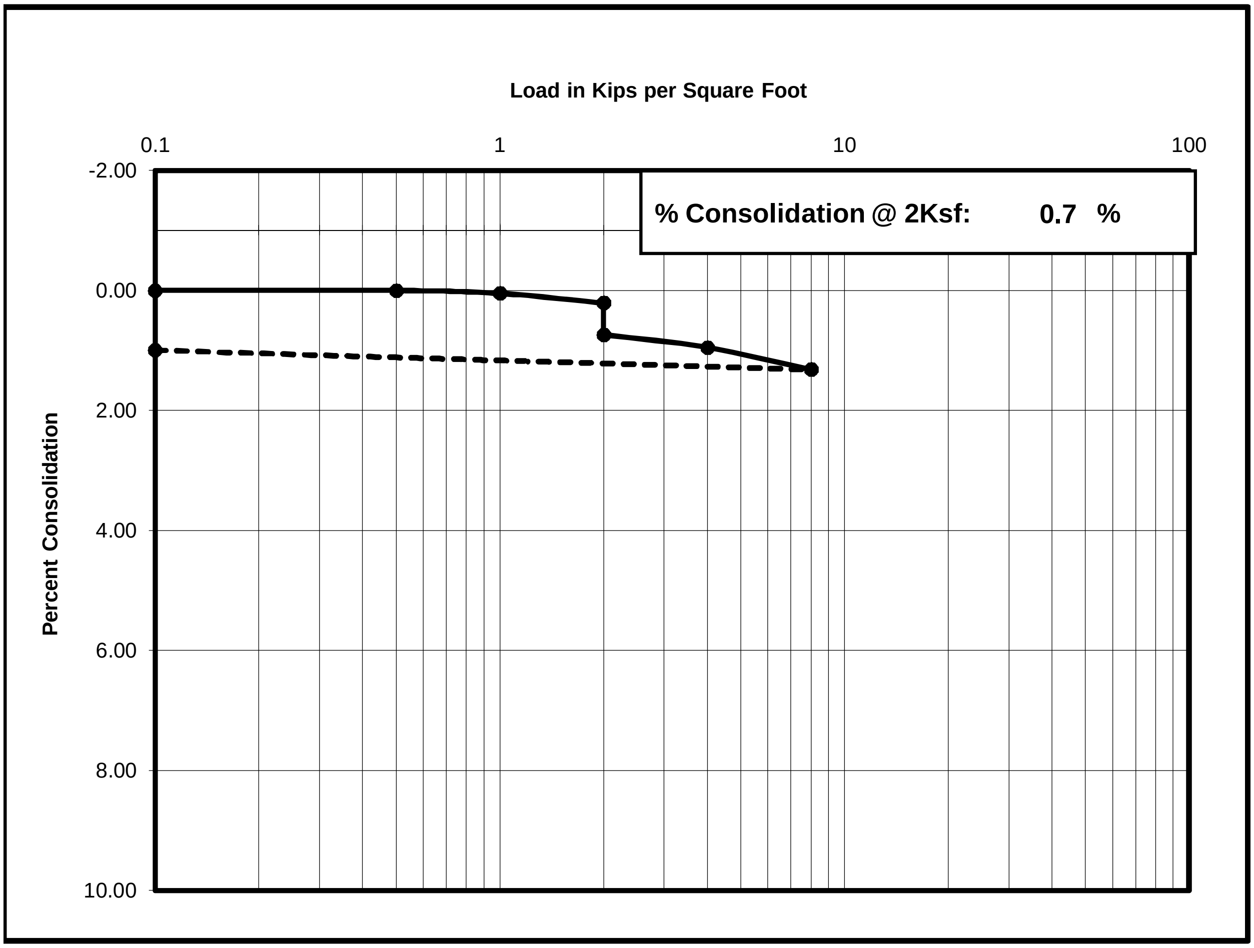
Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil

ASTM D - 2435 / AASHTO T - 216

Project Number	: 11223065
Project Name	: O'Reilly Auto Parts Phelan
Date	: 6/15/2023
Sample Location	: B-4 @ 5'
Soil Classification	: SP
Sample Condition	: Undisturbed

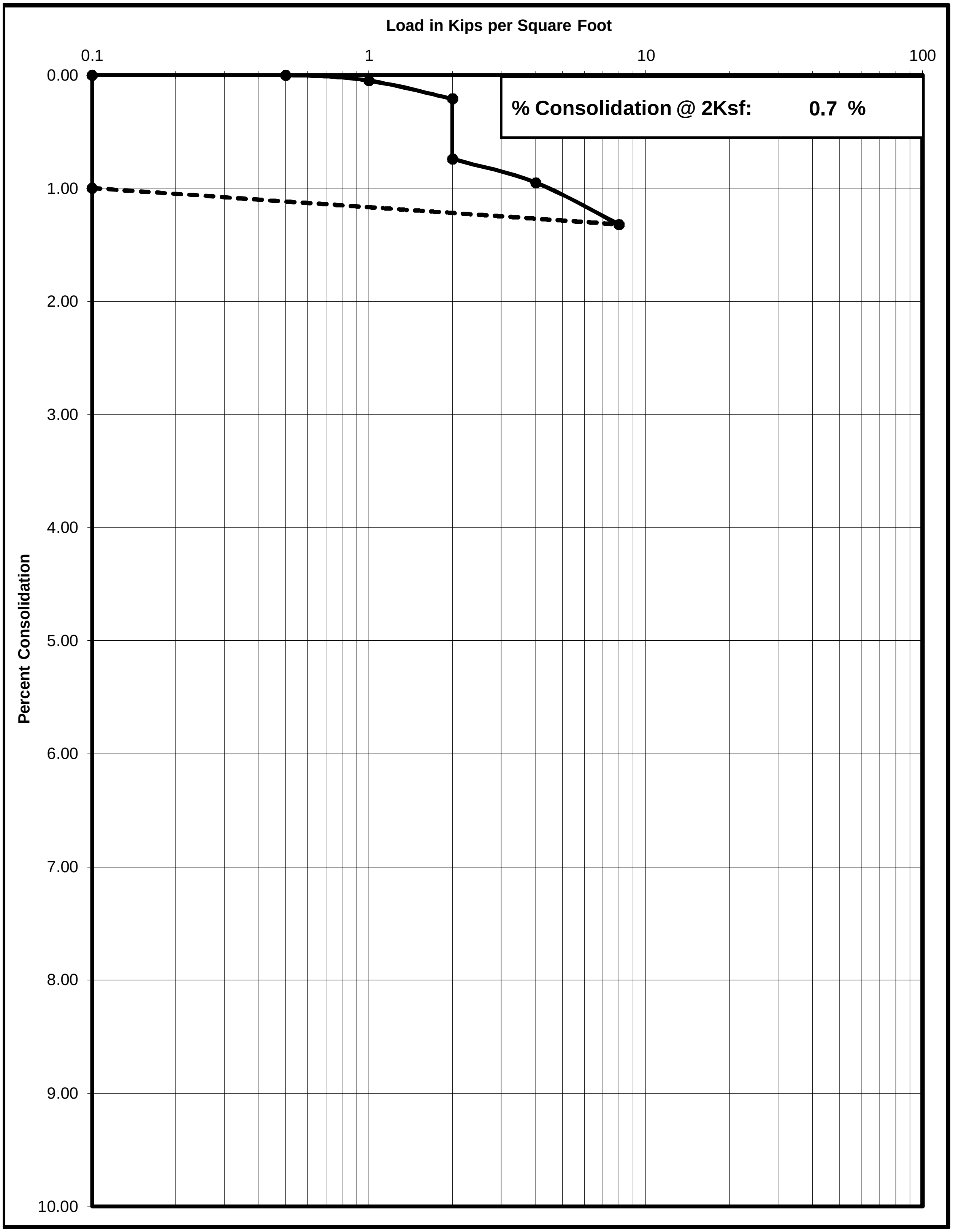
LOAD (ksf)	Reading	% Consolidation
0.1	0	--
0.5	0	0.00
1	0.0005	0.05
2	0.0021	0.21
Satur.	0.0074	0.74
4	0.0095	0.95
8	0.0132	1.32
0.1	0.01	1.00



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11223065	B-4 @ 5'	6/15/2023	SP

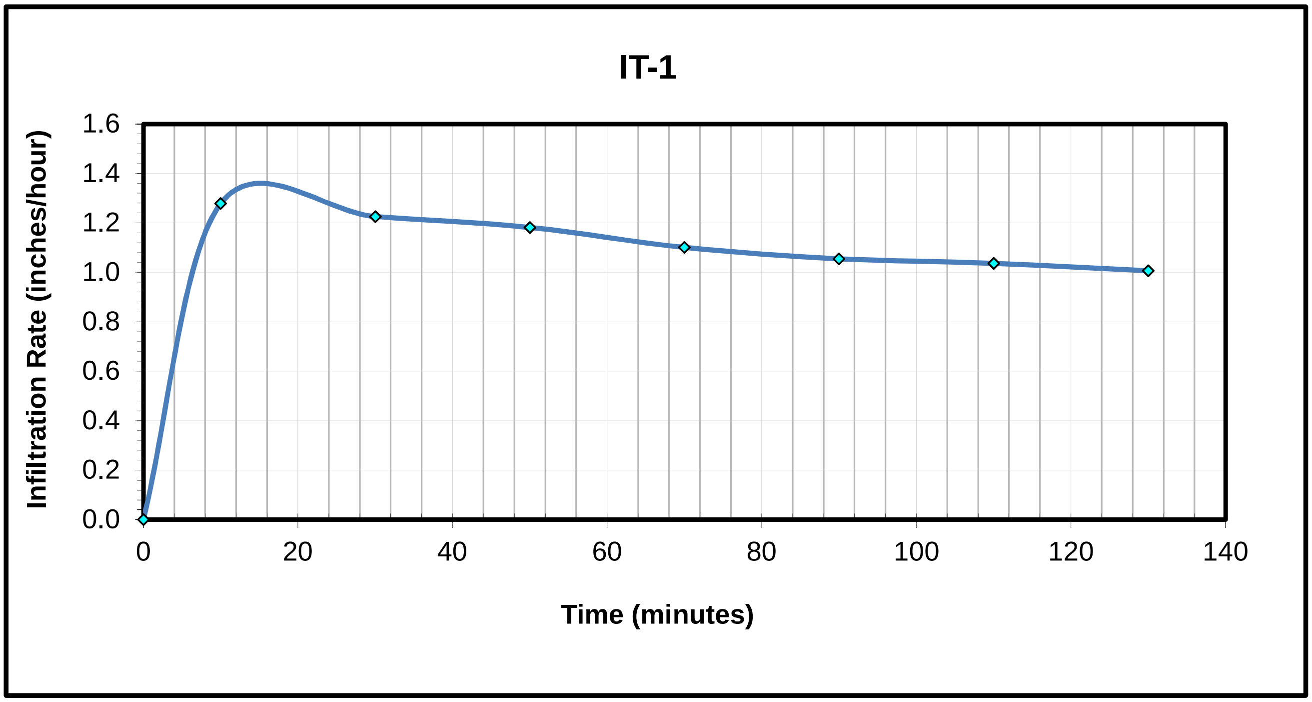


Krazan Testing Laboratory

RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE

Project #	**11223065**				**Date**	**6/15/2023**
Project Name	O'Reilly Auto Parts Store					
Project Address	3919 Phelan Road, Phelan, California					
Test No:	IT-1	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SP		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		24.00	--	--
1	10.00	10.00	24.00	33.00	9.00	1.28
2	30.00	20.00	33.00	49.50	16.50	1.23
3	50.00	20.00	49.50	62.50	13.00	1.18
4	70.00	20.00	62.50	72.50	10.00	1.10
5	90.00	20.00	72.50	80.50	8.00	1.05
6	110.00	20.00	80.50	87.10	6.60	1.04
7	130.00	20.00	87.10	92.50	5.40	1.01
	Infiltration Rate in Inches per Hour					**1.01**

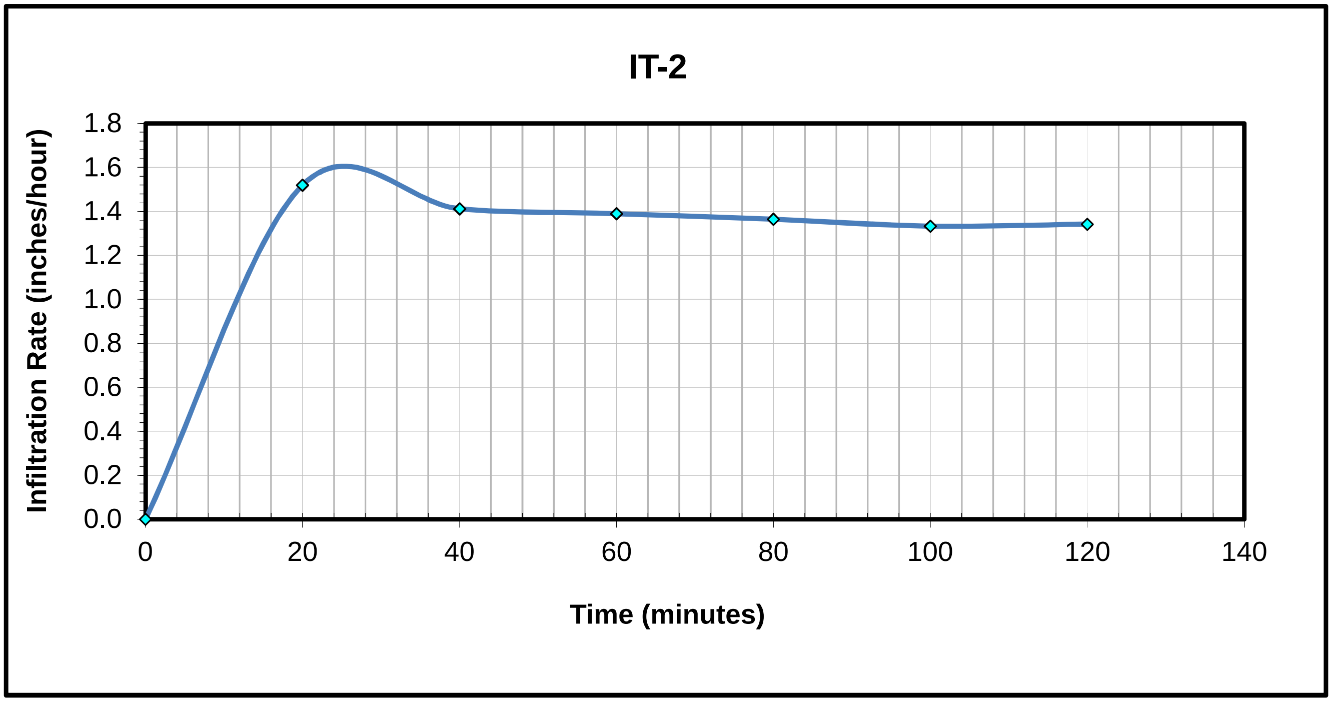


RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE

Project #	**11223065**	**Date**	**6/15/2023**
Project Name	O'Reilly Auto Parts Store		
Project Address	3919 Phelan Road, Phelan, California		

Test No:	IT-2	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SP		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		18.5	--	--
1	20.00	20.00	18.5	37.5	19.00	1.52
2	40.00	20.00	37.5	52.2	14.70	1.41
3	60.00	20.00	52.2	64.2	12.00	1.39
4	80.00	20.00	64.2	74.0	9.80	1.36
5	100.00	20.00	74.0	82.0	8.00	1.33
6	120.00	20.00	82.0	88.7	6.70	1.34
	Infiltration Rate in Inches per Hour					**1.33**



ANAHEIM TEST LAB, INC
196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

DATE: 6/7/2023

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

P.O. NO.: Verbal

LAB NO.: C-7104

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 11223065
Project: Phelan, CA
Sample ID: B-1 @ 0-5’

ANALYTICAL REPORT

CORROSION SERIES

SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.6	15,000	201	98

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ANAHEIM TEST LAB, INC
196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

DATE: 6/9/2023

P.O. NO.: Verbal

LAB NO.: C-7104

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand w. Gravel

Project No.: 11223065
Project: Phelan, CA
Sample ID: R-1 @ 0-3’

ANALYTICAL REPORT
“R” VALUE

BY EXUDATION	BY EXPANSION
77	N/A

RESPECTFULLY SUBMITTED

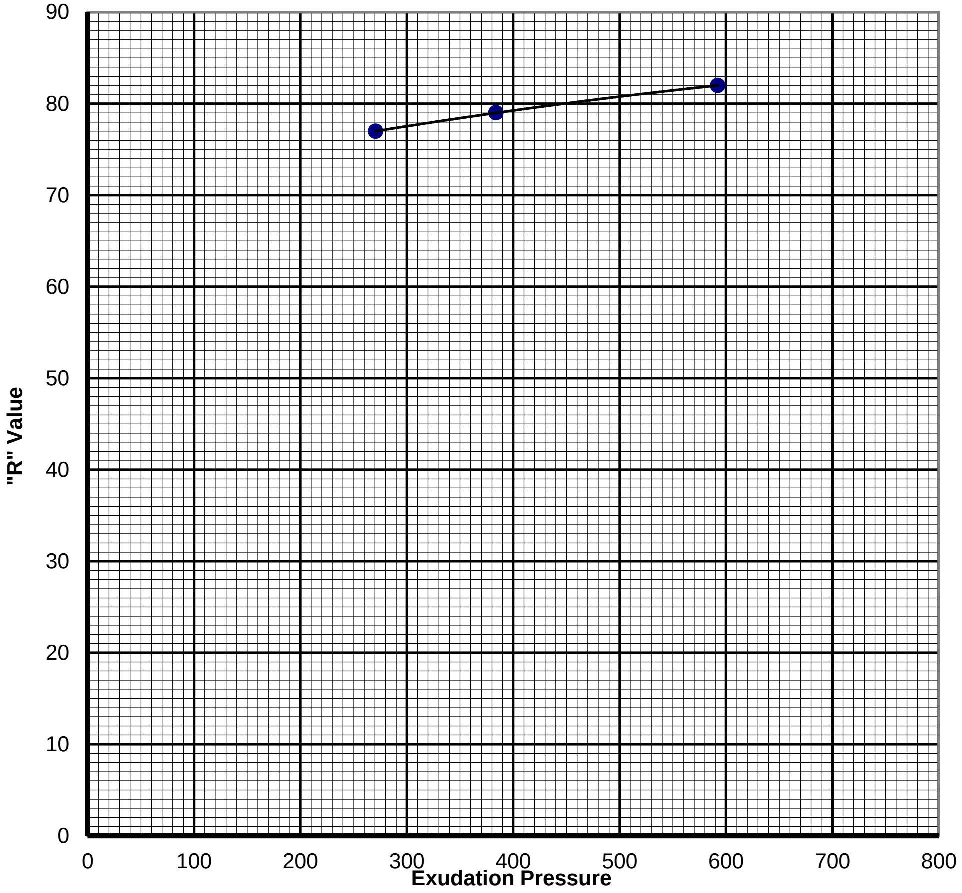
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Krazan & Associates, Inc. **ATL No.:** C 7104 **Date:** 6/9/2023
Client Reference No.: 11223065
Sample: R-1 @ 0-3' **Soil Type:** Brown, Silty Sand w. Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	2.0	2.0	2.0	
Moisture at Compaction	%	7.9	8.4	8.2	
Briquette Height	in.	2.52	2.52	2.49	
Dry Density	pcf	127.5	128.4	128.0	
EXUDATION PRESSURE	psi	592	271	384	
EXPANSION PRESSURE	psf	0	0	0	
Ph at 1000 pounds	psi	11	13	12	
Ph at 2000 pounds	psi	18	22	20	
Displacement	turns	4.46	4.8	4.72	
"R" Value		82	77	79	
CORRECTED "R" VALUE		82	77	79	

Final "R" Value	
BY EXUDATION: @ 300 psi	**77**
BY EXPANSION: TI = 5.0	**N/A**



General Earthwork Specifications

Appendix B

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 95 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 95 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 95 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

General Paving Specifications

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 notes 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 95 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 compacted to a minimum relative compaction of 95 percent. 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.

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 the 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 degrees F. The surfacing shall be rolled with a combination 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.
