APPENDIX E1

GEOTECHNICAL REPORT

GEOTECHNICAL DESIGN REPORT
IBC MULTI-USE TRAIL ALONG THE BARRANCA CHANNEL BETWEEN BARRANCA PARKWAY AND JAMBOREE ROAD (CIP 371302) CITY OF IRVINE, CALIFORNIA

Prepared for

IBI GROUP
18401 VON KARMAN AVENUE, SUITE 300
IRVINE, CALIFORNIA 92612

Prepared by

LEIGHTON CONSULTING, INC.
17781 COWAN
IRVINE, CALIFORNIA 92614

Project Number 13544.001

December 21, 2022

(Revised January 27, 2023)

Leighton Consulting, Inc.
A Leighton Group Company

December 21, 2022
(Revised January 27, 2023)

Project No. 13544.001

IBI Group
18401 Von Karman Avenue, Suite 300
Irvine, California 92612

Attention: Ms. Lydia La Point

Subject: Geotechnical Design Report
IBC Multi-Use Trail along the Barranca Channel
Between Barranca Parkway and Jamboree Road (CIP 371302)
City of Irvine, California

In accordance with your request and authorization, Leighton Consulting, Inc. (Leighton) has conducted a geotechnical engineering exploration as your subconsultant for the proposed Irvine Business Complex (IBC) Multi-Use Trail along the Barranca Channel between Barranca Parkway and Jamboree Road (CIP 371302) for the City of Irvine. Improvements within the project limits will consist of construction of new pavement for new trails, improvements for at-grade crossings, roadway signs, sidewalks, lighting, fencing, curbs, and gutters. Our geotechnical study has been performed based on the scope of work in our proposal dated December 21, 2021.

This report presents the results of our field exploration, laboratory testing and geotechnical analyses, and provides our and recommendations for the proposed IBC Multi-Use Trail project (Project). Our field exploration consisted of twelve borings and the laboratory testing program included tests on representative samples for moisture content, sieve analysis, expansion index, direct shear, corrosion, and R-value. Pavement design was performed using results of the field exploration and laboratory testing.

Based on the results of our exploration, the development is feasible from a geotechnical standpoint. Presented in this report are our findings and recommendations for the proposed project. Field observation and testing by a geotechnical engineer at the time of

construction is recommended to verify adequate compaction of subgrade, aggregate base and asphalt concrete is achieved.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Christian Delgadillo, PE, GE 3144
Associate Engineer

EDB/CD/lr

Distribution: (1) Addressee (PDF via email)

TABLE OF CONTENTS

Figures and Appendices

1.0 INTRODUCTION

1.1 Site Location and Project Description

The project consists of the design and construction of a multi-use paved trail along approximately 7,000 feet segment of Barranca Channel between Barranca Parkway and Jamboree Road in the City of Irvine, California. The Barranca Channel is owned and maintained by Orange County Flood Control District (OCFCD). Within the project limits, the Barranca Channel is generally trapezoidal shape with 1½ to 1 (H:V) side slopes and 12½ feet deep. The slopes are locally lined with riprap and there is an existing maintenance road along either one or both sides of the channel that is mostly unpaved. There are signs of erosion on the face of the slopes, except where protected with riprap. The proposed trail will intersect two at-grade street crossings: one at Alton Parkway, and one at McGaw Avenue. There is an existing overcrossing for vehicles southwest of Alton Parkway used by B. Braun Medical, Inc., and an existing overcrossing southwest of McGaw Avenue used by an active railroad owned by BNSF Railway. In addition, there is a pedestrian/bicycle bridge crossing the channel (Kelvin Bridge) northwest of Jamboree Road that connects the Kelvin Court Apartments and the driveway near the Main Street Village Apartments. The approximate limits of the project are shown on Figure 1, *Site Location Map*.

The project proposes development of an 11-foot wide paved trail with 2 foot wide shoulders on each side, associated improvements for the at-grade crossings, and connection with the Kelvin Bridge entrance. The project also proposes safety lighting, wayfinding signage and other potential improvements including, but not limited to: landscaping, benches, trash receptacles, and paved trail entrances where feasible. The trail will be located on the west side of the channel between Barranca Parkway and Alton Parkway; and both sides of the channel are being considered between Alton Parkway and Jamboree Road but only one side will be selected.

The proposed project will be used as a multi-use trail for bicycle and pedestrian (non-motorized) use. Only maintenance vehicles or safety vehicles will be allowed.

1.2 Purpose and Scope

The purpose of our geotechnical exploration was to evaluate the soil conditions at the site through review of available data, exploratory borings, and laboratory

testing in order to develop geotechnical recommendations for design and construction of the project. The scope of our work included the following tasks:

- *Background Review* – A background review was performed of readily available, relevant geotechnical and geological literature pertinent to the site to obtain necessary information for our field exploration and analyses.

- *Pre-Field Exploration Activities* – A site visit was performed by a member of our technical staff to mark the boring locations. Underground Service Alert (DigAlert) was notified to locate and mark existing underground utilities prior to our subsurface exploration. An encroachment permit was obtained from Orange County Public Works for drilling within OCFCD's right-of-way.

- *Field Exploration* – We advanced twelve borings (LB-1 through LB-12) on September 7, 2022, within the project limits. The borings were drilled using a hollow-stem auger drill rig to depths of 5 to 16½ feet below existing surface. The borings were geotechnically logged and representative bulk soil samples were collected from the borings. Each soil sample collected was described in general conformance with the Unified Soil Classification System (USCS). The samples were sealed, packaged, and transported to our soil laboratory. The soil descriptions and depths are noted on the boring logs included in Appendix A, *Geotechnical Boring Logs*. The field exploration program, including final locations of the borings, was adjusted in the field due to potential underground utility conflict. The approximate locations of the borings are shown on Figure 2, *Boring Location Map*.

- *Laboratory Tests* – Laboratory tests were performed on selected soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the physical and engineering characteristics of the onsite soil. Tests performed during this exploration included in-place moisture content, sieve analysis, direct shear, expansion index, corrosion, and R-value. Results of the moisture content testing are presented on the boring logs in Appendix A. Other laboratory test results are presented in Appendix B, *Laboratory Test Results*. Laboratory test results from the available borings mentioned above are also included in Appendix B.

- *Engineering Analysis* - The data obtained from our background review, field exploration, and laboratory testing program were evaluated and analyzed to develop the recommendations for the project.

- ***Report Preparation*** - The results of the exploration are summarized in this report presenting our findings and recommendations.

2.0 GEOTECHNICAL FINDINGS

2.1 Subsurface Soil and Groundwater Conditions

The surface at the boring locations generally consisted of gravel and silty sand except at boring LB-12 where the surface was paved. The pavement section in boring LB-12 consisted of 5 inches of asphalt concrete over 8 inches of aggregate base Our subsurface exploration indicates that the site is underlain by manmade fill associated with construction of the channel at the site and young alluvial deposits (Qya). The fill is up to 10 feet thick and consisted mainly of stiff lean clay and sandy lean clay. Below the fill, the alluvium generally consisted of medium stiff to stiff lean clay, silty clay, and clay with sand. A detailed description of the soils is included in the boring logs in Appendix A. Results of the in-place moisture content test results are included in the boring logs in Appendix A.

Groundwater was not encountered in our borings drilled to a maximum depth of 16½ feet measured from the top of the channel slopes. The historically high groundwater in the area is estimated to be approximately 10 feet below the ground surface (taken from the top of the channel slopes) according to *Seismic Hazard Zone Report for the Tustin 7.5-Minute Quadrangle* by California Geological Survey (1998). Considering that the planned excavations for the project will generally be less than 5 feet, groundwater is not anticipated to adversely impact the proposed improvements.

2.2 Soil Corrosivity

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Soils with chloride content greater than 500 parts per million (ppm) per California Test 532 are considered corrosive to steel, either in the form of reinforcement protected by concrete cover or plain steel substructures, such as steel pipes. Additionally, soils with a minimum resistivity of less than 1,000 Ohm-cm are considered corrosive to ferrous metal. The test results are included in Appendix B and summarized in Table 1.

Table 1 – Corrosivity Test Results

Boring No.	Depth (feet)	USCS Soil Type	Minimum Resistivity CTM 643 (Ohm-cm)	pH CTM 643	Soluble Sulfate Content CTM 417 (ppm)	Soluble Chloride Content CTM 442 (ppm)
LB-3	0-5	CL	149 (1)	8.35	4,543 (2)	400
LB-7	0-5	CL	230 (1)	8.08	7,559 (2)	220
LB-11	0-5	CL	250 (1)	8.11	5,098 (2)	160

Notes: (1) Corrosive to ferrous metal
(2) "Very severe" sulfate exposure per ACI 318-19

Notes: (1) Corrosive to ferrous metal

In accordance with ACI 318-19, concrete in contact with soil containing sulfate concentrations of less than 0.10 percent by weight are considered to have "negligible" sulfate exposure. Sulfate exposure is considered as "moderate", "severe", and "very severe" if the soluble sulfate content is between 0.1 to 0.2, 0.2 to 2.0, and over 2.0 percent, respectively. Based on the test results, the onsite soils are considered to have "very severe" sulfate exposure to buried concrete. Additionally, the onsite soils are considered to be corrosive to ferrous metal.

2.3 Expansive Soil

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result.

Based on our exploration, the near surface onsite soils consist predominantly of lean clay and sandy clay. Expansion Index (EI) laboratory tests were performed on representative samples of the near surface soils. The test results yielded EIs ranging from 79 to 117, which indicates that the tested soils have "medium" to "high" expansion potential.

2.4 Seismic Hazards

Our review of available in-house literature indicates that the project site is not located within an Alquist-Priolo (AP) Earthquake Fault Zone (Hart and Bryant, 2007). The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along any one of several major active faults in the region. The known regional faults that could produce the most significant ground shaking at the project site include the San Joaquin Hills Blind Thrust, Newport-Inglewood, and Compton faults located approximately 2.5, 7.7, and 11.7 miles, respectively, from the site.

Review of the Seismic Hazard Zone Map for the Tustin Quadrangle (CGS, 2001) indicates the subject site is located within an area that has been identified by the State of California as being potentially susceptible to the occurrence of liquefaction. Detailed evaluation of the potential for liquefaction to occur and the effect on the proposed multi-use trail was beyond the scope of this exploration and was not considered to be warranted for the proposed project.

Due to the absence of dams or other water-retaining structures near the site, the potential for earthquake-induced flooding of the site in considered low. Additionally, the channel reduces the risk for flooding. In addition, based on the inland location of the site, tsunami risk at the site is considered negligible.

3.0 RECOMMENDATIONS

Our recommendations for the proposed project are presented in this section. The recommendations are considered minimum and may be superseded by more restrictive requirements of the civil engineer, local building code, or governing agencies.

3.1 Pavement Design

Pavement design and analysis were performed using the methodology described in the Caltrans *Highway Design Manual*. Based on the laboratory test results, we have selected an R-value of 5 for our pavement design.

Up to a 20-year life expectancy may be assumed for a new pavement. The actual service life of the pavement is dependent on several factors. Major factors include frequency of vehicle traffic, pavement maintenance, adequate drainage of surface and subsurface water, and inhibition of subsurface water from entering the subgrade and pavement layers. Regular pavement maintenance, including treating cracks and repairing localized areas of pavement distress, will extend the service life.

3.2 New Pavement Section

New pavement will be required for construction of the proposed IBC Multi-Use Trail. We have designed the pavement sections using the design R-value based on anticipated subgrade soils for various Traffic Indices. The final Traffic Index should be determined by the civil engineer. The recommended pavement section is presented in Table 1.

Table 1 – Recommended Pavement Sections

Design Traffic Index	Option 1: AC over AB (inches)	Option 2: Full-Depth AC (inches)
4.0	3½ over 6	7
5.0	4 over 8	7½
6.0	4½ over 11	9
Note: AC = Asphalt Concrete; AB = Crushed Aggregate Base		

3.3 Subgrade Preparation

Vegetation, debris, and other deleterious materials should be removed and disposed of offsite prior to the commencement of grading operations. Subgrade for pavement areas and concrete flatwork should be overexcavated to a minimum depth of 12 inches and recompacted. Overexcavation in this manner is expected to encounter soils with high in-situ moisture content which may require air drying or mixing with dryer soils prior to reusing as compacted fill materials.

Prior to placing fill materials, the subgrade should be scarified to a minimum depth of 6 inches, moisture conditioned or dried out, and proofrolled. Local conditions may be encountered which may require additional removals and recompaction. The exact extent of removals can best be determined during grading by the geotechnical engineer when direct observation and evaluation of materials are possible. Soft/loose and wet subgrade conditions may require stabilization using rock and/or geotextiles prior to fill placement.

3.4 Fill Placement and Compaction

The onsite soils to be used as compacted fill should be free of organic material or construction debris. Any imported fill soil should be approved by the geotechnical engineer prior to placement as fill.

Fill soils and aggregate base should be placed in loose lifts not exceeding 8 inches, moisture-conditioned as necessary to slightly above optimum moisture content, and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D 1557. Onsite soils to be used as compacted

fill should be moisture-conditioned to at least 2 to 4 percentage points above optimum moisture content.

All pavement construction should be performed in accordance with the *Standard Specifications for Public Works Construction* (*Greenbook*). Field inspection and periodic testing, as needed during placement of the base course materials and asphalt concrete, should be undertaken to ensure that the requirements of the standard specifications are fulfilled.

3.5 Material Recommendations

Aggregate base should consist of Crushed Aggregate Base (CAB) or Crushed Miscellaneous Base (CMB) conforming to Section 200-2 of *Greenbook*. Existing aggregate base to be removed, if any, may be reused as CMB for the pavement reconstruction if it meets the requirements of Section 200-2.4 of the *Greenbook*. Existing asphalt concrete may also be pulverized and mixed with soils and/or aggregate to meet the same requirements for reuse as CMB. Asphalt materials should conform to Section 203 of the *Greenbook*.

3.6 Foundation Design

Proposed ancillary structures, if any, may be supported on a shallow foundation system. The proposed light posts and/or traffic signals may be supported on cast-in-place piles (i.e. pole foundations).

3.6.1 Overexcavation and Recompaction

To provide a uniform support, new shallow footings should be underlain by a minimum two feet of compacted fill. The compacted fill should extend horizontally a minimum two feet from the footing edges. No overexcavation and recompaction is required for pole foundations. The footing excavations should be observed by the geotechnical engineer prior to placement of reinforcement and concrete. Loose soils, if encountered at the removal bottom, should be removed to competent material and recompacted.

3.6.2 Allowable Bearing Capacity

An allowable bearing capacity of 1,500 psf may be used for foundation design. Footings should have a minimum embedment of 18 inches and a minimum width of 12 inches. The allowable bearing capacity may be

increased by 250 psf for each additional foot of embedment depth or footing width to a maximum value of 2,000 psf. The bearing capacity may be increased by one third when considering loads of short duration, such as those imposed by wind and seismic forces. The recommended allowable bearing capacity for the foundation is generally based on a total settlement of 1 inch, with differential settlement taken as ½ inch over 30 feet.

3.6.3 Lateral Load Resistance

Resistance to lateral loads will be provided by a combination of friction between the soils and foundation interface and passive pressure acting against the vertical portion of the foundation. A friction coefficient of 0.30 may be used at the soil-concrete interface for calculating the sliding resistance. A passive pressure based on an equivalent fluid pressure of 300 pounds per cubic foot (pcf) may be used for calculating the lateral passive resistance. The lateral passive resistance can be taken into account only if it is ensured that the soils against embedded structures will remain intact with time. The above values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

3.7 Cement Type and Corrosion Protection

Laboratory test results indicate that near-surface soils have “very severe” soluble sulfate content (per Section 4.3 of ACI 318 by American Concrete Institute). The concrete should be designed for Exposure Class “S3” in accordance with the requirements of ACI 318-19 and the 2019 CBC.

Based on the available laboratory test results, the onsite soils are generally considered corrosive to ferrous metals. Ferrous pipe should be avoided by using high-density polyethylene (HDPE), polyvinyl chloride (PVC) or other non-ferrous pipe when possible. Ferrous pipe, if used, should be protected by polyethylene bags, tape or coatings, di-electric fittings or other means to separate the pipe from onsite soils. The corrosion information presented in this report should be provided to your underground utility subcontractors.

3.8 Concrete Flatwork

Concrete sidewalks, ramps, curbs and gutters often crack. Inclusion of joints at frequent intervals and reinforcement will help control the locations of the cracks, and thus reduce the unsightly appearance. When cracking occurs, repairs may be needed to mitigate the trip hazard and/or improve the appearance.

A number of well-known steps can be taken during construction to reduce the amount of cracking or its consequences. As a minimum, concrete slabs should be at least 4 inches thick and provided with construction or weakened plane joints spaced at intervals of 8 feet or less. We suggest that the concrete slabs be reinforced using No. 3 rebar, 18 inches on center in both directions, placed at mid-thickness.

Cracking of concrete is often not due to settlement or heave of soils, but often due to other factors such as the use of too high a water/cement ratio and/or inadequate steps taken to prevent moisture loss during curing. These causes of concrete distress can be reduced by proper design of the concrete mix and by proper placement and curing of the concrete.

3.9 Erosion

Slope faces are inherently subject to erosion, particularly if exposed to rainfall and irrigation (i.e. surface water runoff). If the proposed development alters the drainage pattern of the site such that the surface water runoff flow is increased, measures should be taken to direct water away from the top of the slopes such that surface runoff on the slope face is minimized.

3.10 Temporary Excavations

All temporary excavations should be performed in accordance with project plans, specifications, and all OSHA requirements. Excavations 5 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter. During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor should be responsible for providing the “competent person” required by OSHA standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.11 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Section 306.12 of *Greenbook*. The trenches can be backfilled with onsite soils free of debris, organic and oversized material. All backfill should be placed in thin lifts (appropriate for the type of compaction equipment), moisture conditioned above optimum, and mechanically compacted to at least 90 percent relative compaction per ASTM D 1557. The upper one foot of the trench backfill in pavement area should be compacted to at least 95 percent relative compaction.

3.12 Plan Review

The final grading and construction plans should implement the recommendations presented in this report and should be reviewed by Leighton to comment on the geotechnical aspects.

3.13 Geotechnical Observation and Testing

Grading and construction of the proposed project should be performed under the observation and testing of the geotechnical engineer at the following stages:

- Upon completion of site clearing, where applicable;
- During subgrade scarification and recompaction;
- During fill placement;
- During installation of temporary shoring, wherever needed;
- After foundation excavations and prior to placement of concrete;
- Utility trench backfilling and compaction;
- Pavement subgrade and base preparation;
- During compaction of aggregate base and asphalt concrete; and
- When any unusual or unexpected geotechnical conditions are encountered.

4.0 REFERENCES

American Concrete Institute, 2019, Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary, 2019.

American Society of Civil Engineers (ASCE), 2017, Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-16, with Supplement 1, 2, and 3, Effective December 12, 2018.

California Building Standards Commission, 2019 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Based on 2015 International Building Code, Effective January 1, 2020.

California Geological Survey, 2000, CD-ROM containing digital images of Official Maps of Alquist-Priolo Earthquake Fault Zones that affect the Southern Region, DMG CD 2000-003 2000.

_____, 1998, Seismic Hazard Zone Report for the Tustin, California 7.5-Minute Quadrangle Map, Seismic Hazard Zone Report No. 12 (Revised 2001).

_____, 2001, State of California Seismic Hazard Zones Map – Tustin Quadrangle, Revised Official Map, Released January 17, 2001.

Hart, E.W. and Bryant, W.A., Interim Revision 2007, Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Geological Survey, Special Publications 42, 42p.

Public Works Standards, Inc., 2021, *Standard Specifications for Public Works Construction, 2021 Edition,* published by BNI Building News.

United States Geological Survey (USGS), 2014, National Seismic Hazard Maps – Source Parameters, https://earthquake.usgs.gov/cfusion/hazfaults_2014_search/query_main.cfm

_____, 2022a, Earthquake Hazards Program - Unified Hazard Tool, https://earthquake.usgs.gov/hazards/interactive/

_____, 2022b, Interactive Fault Map, http://earthquake.usgs.gov/hazards/qfaults/map/

5.0 LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples, and tests. Such information is, by nature, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report are only valid if Leighton has the opportunity to observe the subsurface conditions during grading and construction in order to confirm that our preliminary data are representative for the site.

Our professional services were performed in accordance with the prevailing standard of professional care as practiced by other geotechnical engineers in the area. We do not make any warranty, either expressed or implied. The report may not be used by others or for other projects without the expressed written consent of our client and our firm.

Project: 13544.001	Eng/Geol: CD
Scale: 1 " = 2,000 '	Date: October 2022

Reference: © 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus

SITE LOCATION MAP

Barranca Channel Multi-Use Trail Project
Between Barranca Parkway and Jamboree Road
Irvine, California

FIGURE 1

Leighton

Map Saved as J:\Drafting\13544\001\Maps\13544-001_F01_SLM_2022-10-24.mxd on 10/24/2022 9:32:29 AM Author: KVM (btran)

LEGEND

LB-12 — Approximate location of boring

Approximate Project Alignment

LB-1, LB-2, LB-3, LB-4, LB-5, LB-6, LB-7, LB-8, LB-9, LB-10, LB-11, LB-12

N

0 500 1,000

Feet

Project: 13544.001	Eng/Geol: CD
Scale: 1 " = 500 '	Date: October 2022

Reference: Service Layer Credits: © 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS © 2022 TomTom

BORING LOCATION MAP

Barranca Channel Multi-Use Trail Project
Between Barranca Parkway and Jamboree Road
Irvine, California

FIGURE 2

Leighton

Map Saved as J:\Drafting\13544\001\Maps\13544-001_F02_BLM_2022-10-24.mxd on 10/24/2022 9:33:37 AM (btran)

APPENDIX A

GEOTECHNICAL BORING LOGS

Leighton

GEOTECHNICAL BORING LOG LB-1

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	39'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
39	0			B-1			14		Surface: 5-inch thick Asphalt Concrete over 8-inch Aggregate Base	-200
								SC	**Artificial Fill (Af)** @13": CLAYEY SAND; dark brown, moist, fine sand, trace rootlets, fabric noted	
35	5							CL	@2.5': Lean CLAY with SAND; brown, moist, low plasticity, fine sand, trace coarse gravel	
									Total Depth = 5 feet **No groundwater encountered during drilling** **Backfilled with soil cuttings** **Patched with cold-patch asphalt**	
30	10									
25	15									
20	20									
15	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-2

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	40'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
40	0							SP	**Artificial Fill (Af)** @0': Poorly Graded SAND with GRAVEL; brown, slightly moist, fine and medium sand, fine and coarse gravel, trace rootlets	
								SC	@1': CLAYEY SAND with GRAVEL; light brown, moist, fine sand, coarse gravel	
35	5			R-1	5 7 6	97	29	CL	@5': Lean CLAY; brown, moist, low plasticity, trace silt, streaks of calcium carbonate	
30	10			R-2	2 2 2	97	28	CH	**Quaternary-Aged Alluvial Deposits (Qya)** @10': Lean CLAY; brown, very moist, low to medium plasticity, calcium carbonate and magnesium oxide stains	
25	15			R-3	4 5 5	99	26	CL	@15': Lean CLAY with SAND; mottled dark brown and orangish brown, very moist, low to medium plasticity, fine and medium sand	
									Total Depth = 16.5 feet **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
20	20									
15	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-3

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	37'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0			B-1			12	SP SC CL	**Artificial Fill (Af)** @0': Poorly Graded SAND with GRAVEL; brown, slightly moist, fine and medium sand, fine and coarse gravel, trace rootlets @0.5': CLAYEY SAND; light brown, moist, fine sand, trace coarse gravel @1.5': Lean CLAY; light brown, moist, low plasticity, trace fine sand	CR, EI, RV
	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
30	10									
25	15									
20	20									
15	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-4

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	38'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0			B-1			17	GP CL	**Artificial Fill (Af)** @0': Poorly Graded GRAVEL with SAND; brownish gray, slightly moist, fine gravel, fine and medium sand @0.25': Lean CLAY with SAND; brown, moist, low plasticity, fine sand, trace fine gravel	
	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
30										
	10									
25										
	15									
20										
	20									
15										
	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-5

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	38'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0							GP CL	**Artificial Fill (Af)** @0': Poorly Graded GRAVEL with SAND; gray, slightly moist, fine gravel, trace fine and coarse sand @0.5': Lean CLAY with SAND; dark brown, moist, low plasticity, fine sand	
30	5			R-1	4 6 6	91	30	ML CL	@5': SILT; mottled brown and gray, moist, low plasticity, fine sand, asphalt debris @5.25': Lean CLAY with SAND; stiff, dark brown, moist, low plasticity, fine sand, streaks of calcium carbonate	DS
25	10			R-2	3 4 5	102	26	CL-ML	**Quaternary-Aged Alluvial Deposits (Qya)** @10': SILTY Lean CLAY; medium stiff, mottled dark brown and gray, very moist, low plasticity, slightly micaceous	
20	15			R-3	2 2 2	81	49	CL	@15': Lean CLAY; soft, dark brown, very moist, medium plasticity	
15	20								**Total Depth = 16.5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-6

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	35'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0			B-1			25	SP CL	**Artificial Fill (Af)** @0': Poorly Graded SAND with GRAVEL; brown, slightly moist, fine and medium sand, fine gravel @0.25': Lean CLAY with SAND; grayish brown, moist, low plasticity, fine sand, trace silt	
30	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
25	10									
20	15									
15	20									
10	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-7

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	37'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0			B-1				GP CL	**Artificial Fill (Af)** @0': Poorly Graded GRAVEL with SAND; brownish gray, slightly moist, fine gravel, fine and medium sand @0.25': Lean CLAY with SAND; light brown, moist, low plasticity, fine sand	CR, EI, RV
30	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
25	10									
20	15									
15	20									
	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-8

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	34'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Artificial Fill (Af)** @0': SILTY SAND with GRAVEL; gray, slightly moist, fine sand, fine gravel	
								CL	@0.25': Lean CLAY; light brown to brown, slightly moist, low plasticity, fine sand	
30										
	5			R-1	5 8 7	88	33	SC CL	@5': CLAYEY SAND with GRAVEL; medium dense, grayish brown, moist, fine sand, coarse gravel @5.25': Lean CLAY; stiff, dark brown, moist, low plasticity, trace fine sand, streaks of caclium carbonate	
25										
	10			R-2	3 5 6	102	23		**Quaternary-Aged Alluvial Fan Deposits (Qyf)** @10': Lean CLAY; stiff, mottled dark brown and brownish gray, medium plasticity	DS
20										
	15			R-3	9 9 10				@15': No sample recovery	
15									**Total Depth = 16.5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
	20									
10										
	25									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-9

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	35'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0							GP CL	**Artificial Fill (Af)** @0': Poorly Graded SAND with GRAVEL; brown, slightly moist, fine and medium sand, fine and coarse gravel, trace rootlets @1': Lean CLAY with SAND; light brown, moist, low plasticity, fine sand	
30	5			R-1	2 4 4	97	23	SP CL	@5': Poorly Graded SAND; gray, slightly moist, fine sand, trace fine gravel @5.25': Lean CLAY with SILT; medium stiff, dark brown, moist, low plasticity, trace fine gravel	
25	10			R-2	7 10 12	118	16		**Quaternary-Aged Alluvial Fan Deposits (Qyf)** @10': Lean CLAY with SILT; very stiff, mottled reddish brown and dark brown, moist, low plasticity, trace fine sand	
20	15			R-3	2 3 4	106	23		@15': Medium stiff, mottled tannish brown and orangish brown	DS
									Total Depth = 16.5 feet **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
15	20									
10	25									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

Leighton

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-10

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	35'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
35	0			B-1			29	SP SC CL	**Artificial Fill (Af)** @0': Poorly Graded SAND with GRAVEL; brown, slightly moist, fine and medium sand, fine and coarse gravel, trace rootlets @0.25': CLAYEY SAND; dark brown, moist, fine sand, trace rootlets @1': Lean CLAY with SAND; brown, moist, low plasticity, fine sand, trace fine gravel	-200, RV
30	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
25	10									
20	15									
15	20									
10	25									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-11

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	36'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0			B-1			19	SM CL	**Artificial Fill (Af)** @0': SILTY SAND with GRAVEL; brown, slightly moist, fine sand, fine gravel, trace rootlets @0.33': Lean CLAY; light brown to brown, slightly moist, low plasticity, fine sand	CR, EI, RV
30	5								**Total Depth = 5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
25	10									
20	15									
15	20									
	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

GEOTECHNICAL BORING LOG LB-12

Project No.	13544.001	**Date Drilled**	9-7-22
Project	IBC Barranca Channel Multi-Use Trail	**Logged By**	EDB
Drilling Co.	2R Drilling Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	36'
Location	*See Figure 2 - Exploration Location Map*	**Sampled By**	EDB

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0							GP CL	**Artificial Fill (Af)** @0': Poorly Graded GRAVEL with SAND; gray, slightly moist, fine gravel, fine and medium sand @0.25': Lean CLAY with SAND; light brown, moist, low plasticity, fine sand	
30	5			R-1	4 5 5	85	35		@5': Stiff, dark brown, calcium carbonate stains	
25	10			R-2	2 3 3	97	26		**Quaternary-Aged Alluvial Deposits (Qya)** @10': Lean CLAY with SAND; medium stiff, brown, moist, medium plasticity, fine sand, trace silt	
20	15			R-3	3 4 6	114	18		@15': Stiff, mottled orangish brown and gray, fine and medium sand, iron oxide stains	
15	20								**Total Depth = 16.5 feet** **No groundwater encountered during drilling** **Backfilled with soil cuttings**	
	25									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

APPENDIX B

LABORATORY TEST RESULTS

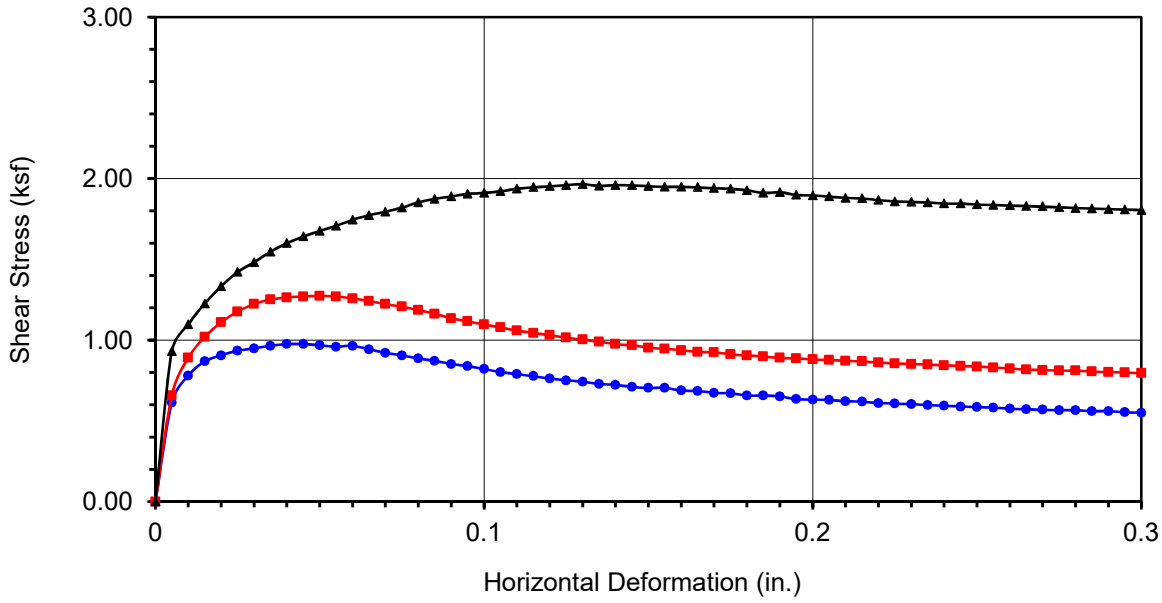
Boring No.	LB-1	LB-10						
Sample No.	B-1	B-1						
Depth (ft.)	0-5	0-5						
Sample Type	Bulk	Bulk						
Soil Identification	Brown clayey sand (SC)	Brown lean clay with sand (CL)s						
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00						
Dry Weight of Soil + Container (g)	0.00	0.00						
Weight of Container (g)	1.00	1.00						
Moisture Content (%)	0.00	0.00						
Sample Dry Weight Determination								
Weight of Sample + Container (g)	821.50	798.60						
Weight of Container (g)	108.50	107.40						
Weight of Dry Sample (g)	713.00	691.20						
Container No.:								
After Wash								
Method (A or B)	B	B						
Dry Weight of Sample + Cont. (g)	488.70	226.10						
Weight of Container (g)	108.50	107.40						
Dry Weight of Sample (g)	380.20	118.70						
% Passing No. 200 Sieve	**46.7**	**82.8**						
% Retained No. 200 Sieve	53.3	17.2						

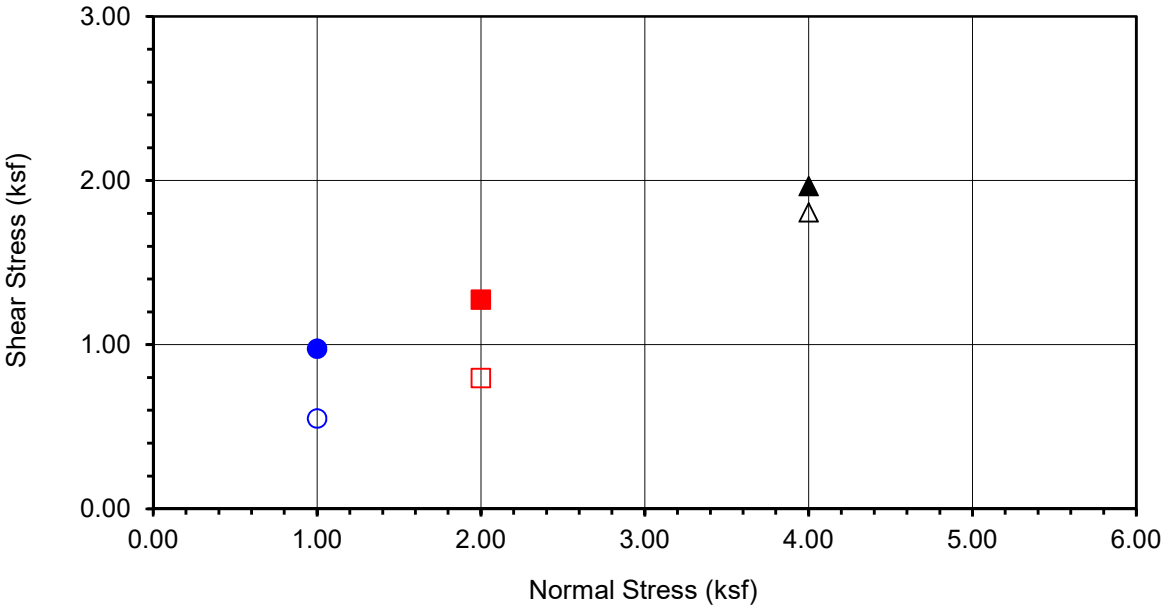
Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Barranca Channel Multi-Use Trail
Project No.: 13544.001

Tested By: O. Figueroa Date: 09/20/22





Boring No.	**LB-5**
Sample No.	**R-1**
Depth (ft)	**5**
Sample Type: Ring	
Soil Identification: Olive brown lean clay (CL)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.975	■ 1.273	▲ 1.965
Shear Stress @ End of Test (ksf)	○ 0.550	□ 0.795	△ 1.805
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	30.12	30.12	30.12
Dry Density (pcf)	90.0	90.9	92.2
Saturation (%)	93.2	95.3	98.3
Soil Height Before Shearing (in.)	0.9930	0.9823	0.9425
Final Moisture Content (%)	37.0	35.2	28.2

Leighton

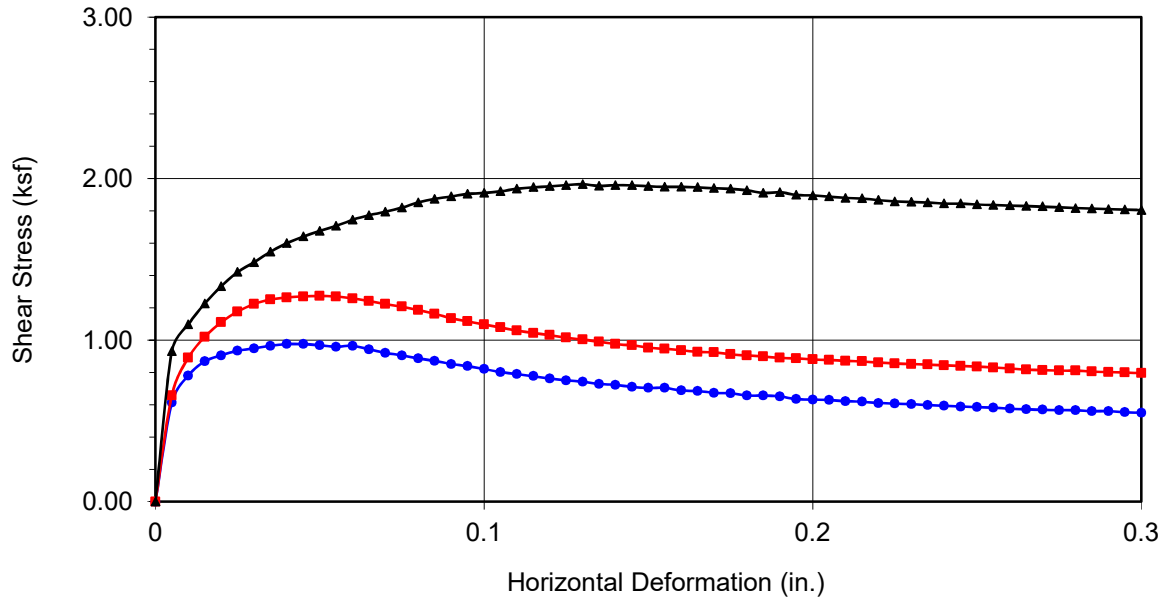
DIRECT SHEAR TEST RESULTS

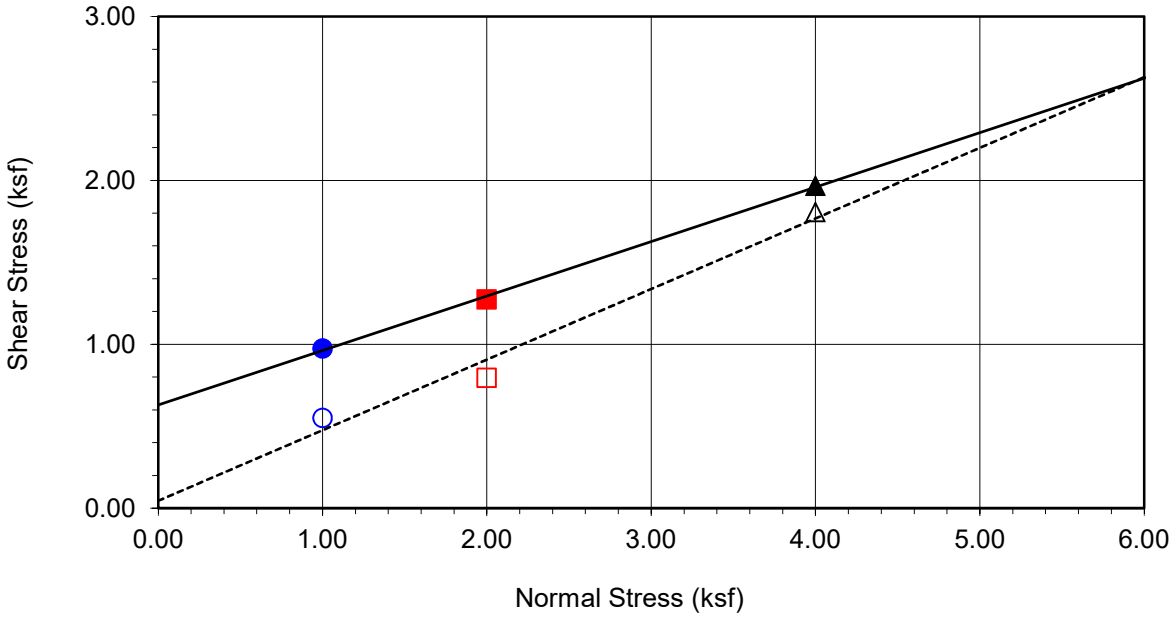
Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22





Boring No.	**LB-5**
Sample No.	**R-1**
Depth (ft)	**5**
Sample Type:	Ring
Soil Identification: Olive brown lean clay (CL)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	629	18
Ultimate	45	23

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.975	■ 1.273	▲ 1.965
Shear Stress @ End of Test (ksf)	○ 0.550	□ 0.795	△ 1.805
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	30.12	30.12	30.12
Dry Density (pcf)	90.0	90.9	92.2
Saturation (%)	93.2	95.3	98.3
Soil Height Before Shearing (in.)	0.9930	0.9823	0.9425
Final Moisture Content (%)	37.0	35.2	28.2

Leighton

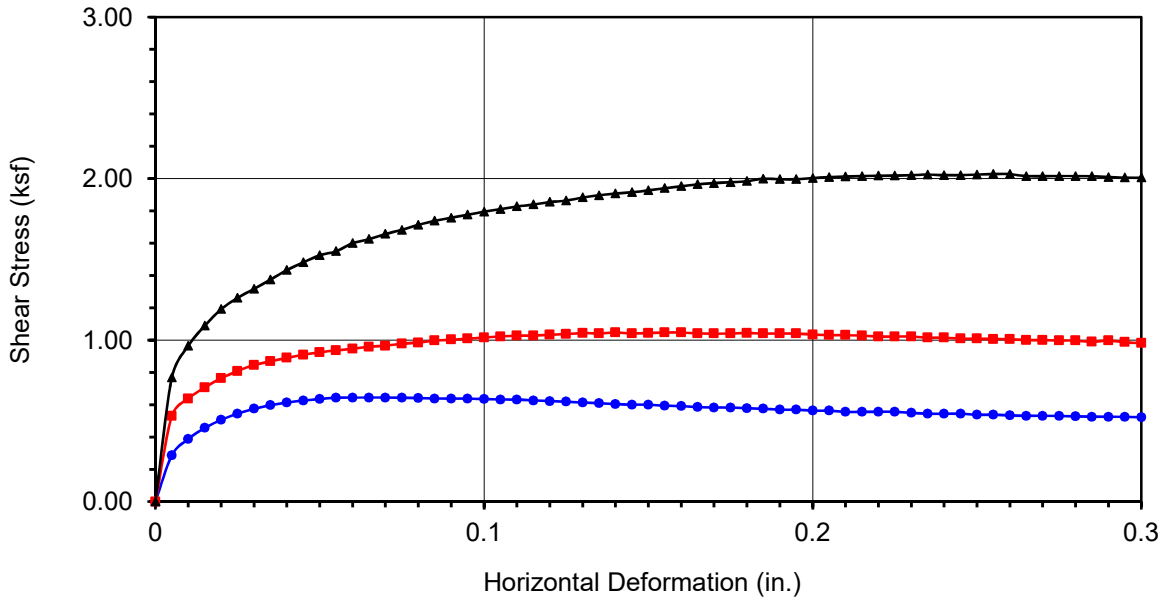
DIRECT SHEAR TEST RESULTS

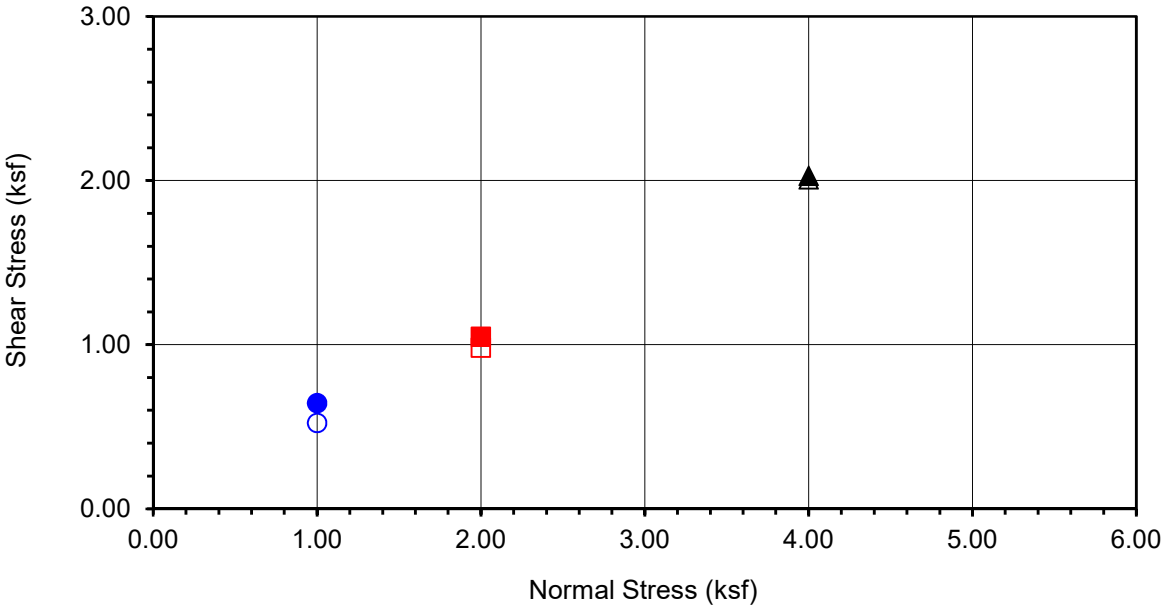
Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22





Boring No.	**LB-8**
Sample No.	**R-2**
Depth (ft)	**10**
Sample Type:	
Ring	
Soil Identification:	
Yellowish brown lean clay (CL)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.644	■ 1.047	▲ 2.028
Shear Stress @ End of Test (ksf)	○ 0.522	□ 0.981	△ 2.006
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.74	22.74	22.74
Dry Density (pcf)	100.9	102.1	102.9
Saturation (%)	91.6	94.4	96.3
Soil Height Before Shearing (in.)	0.9809	0.9697	0.9402
Final Moisture Content (%)	26.5	25.4	20.9

Leighton

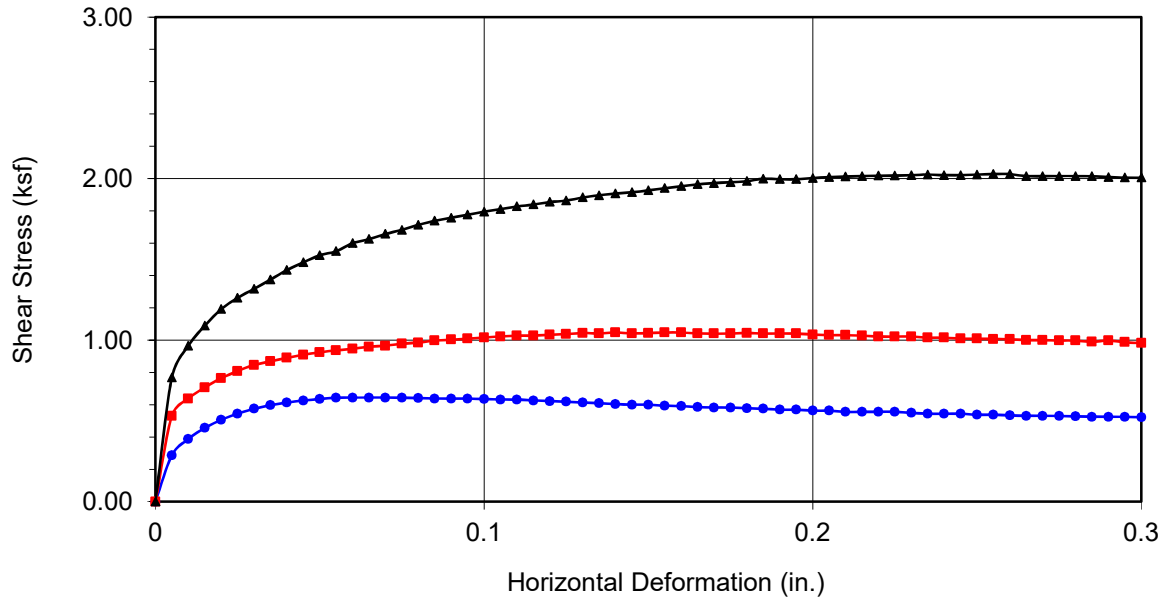
DIRECT SHEAR TEST RESULTS

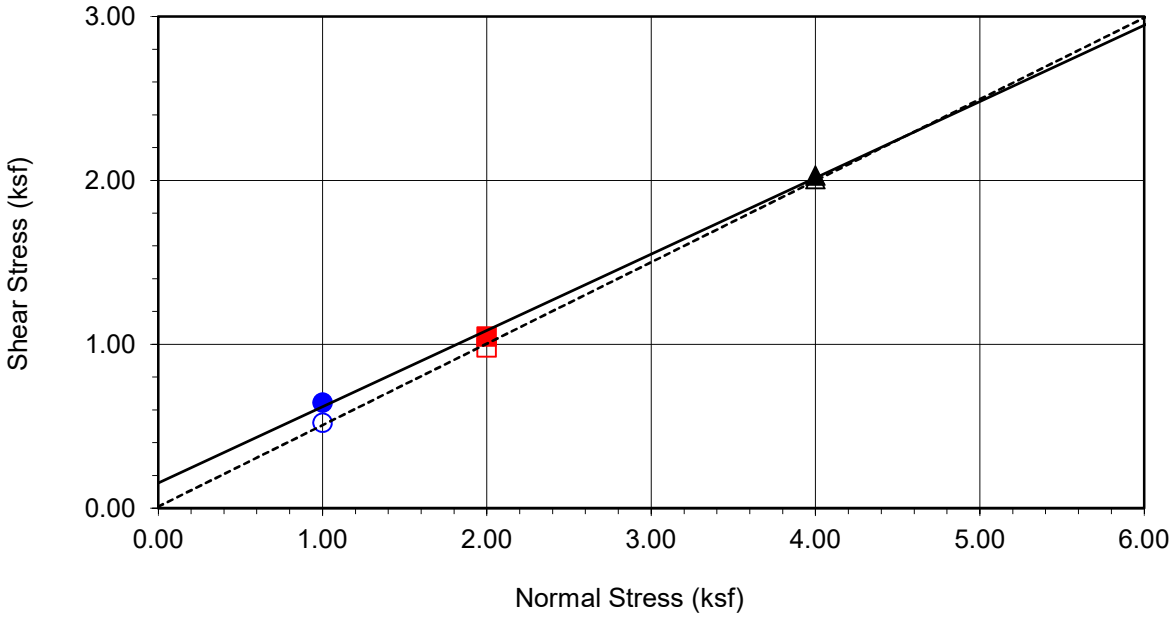
Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22





Boring No.	**LB-8**
Sample No.	**R-2**
Depth (ft)	**10**
Sample Type:	Ring
Soil Identification: Yellowish brown lean clay (CL)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	154	25
Ultimate	10	26

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.644	■ 1.047	▲ 2.028
Shear Stress @ End of Test (ksf)	○ 0.522	□ 0.981	△ 2.006
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.74	22.74	22.74
Dry Density (pcf)	100.9	102.1	102.9
Saturation (%)	91.6	94.4	96.3
Soil Height Before Shearing (in.)	0.9809	0.9697	0.9402
Final Moisture Content (%)	26.5	25.4	20.9

Leighton

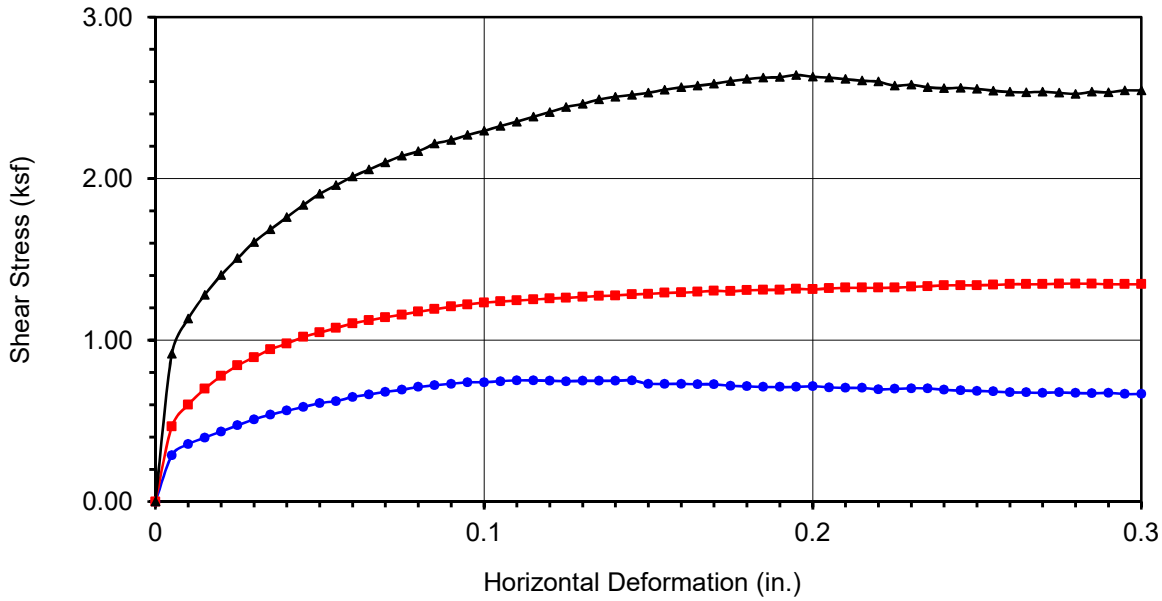
DIRECT SHEAR TEST RESULTS

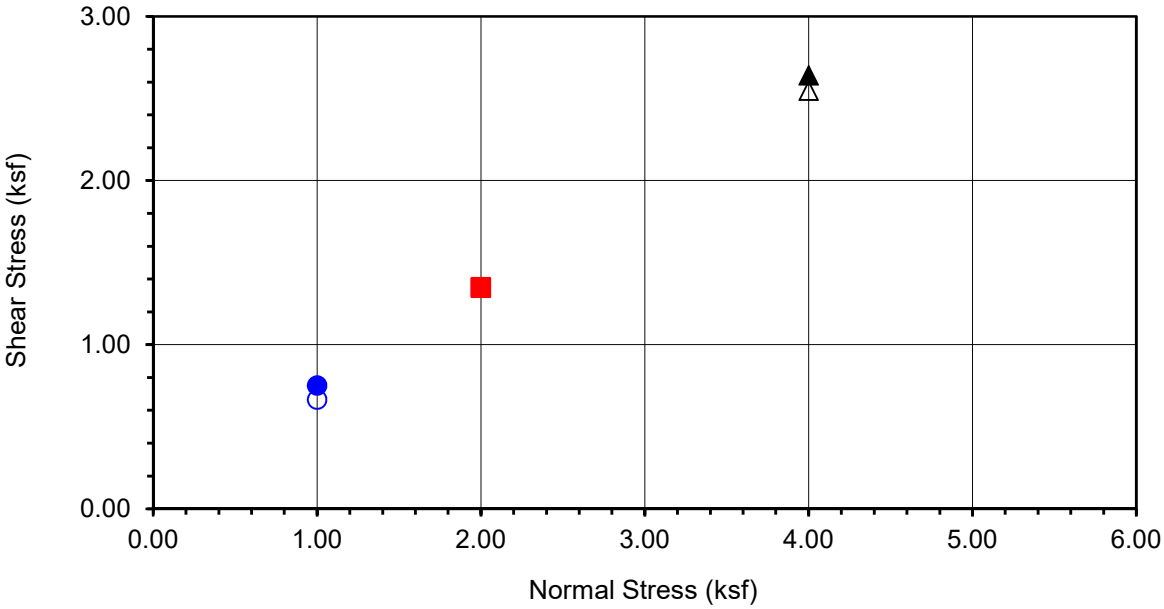
Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22





Boring No.	**LB-9**
Sample No.	**R-3**
Depth (ft)	**15**
Sample Type:	
Ring	
Soil Identification:	
Yellowish brown lean clay (CL)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.751	■ 1.349	▲ 2.641
Shear Stress @ End of Test (ksf)	○ 0.666	□ 1.346	△ 2.546
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.51	22.51	22.51
Dry Density (pcf)	104.2	106.4	108.2
Saturation (%)	98.4	104.1	108.9
Soil Height Before Shearing (in.)	0.9785	0.9610	0.9368
Final Moisture Content (%)	22.4	19.8	18.8

Leighton

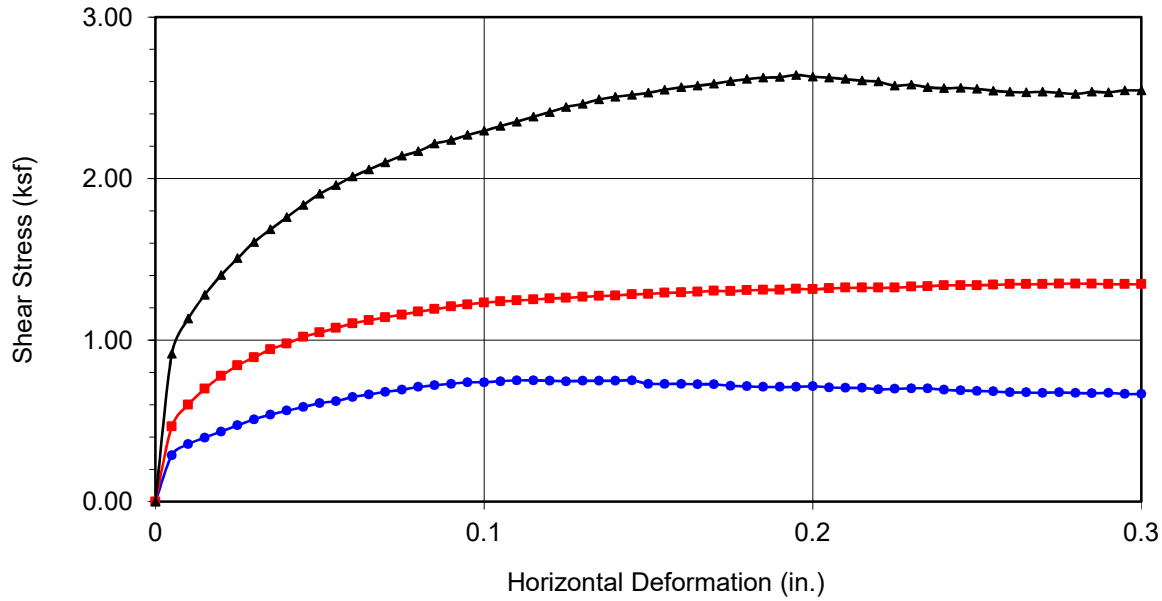
DIRECT SHEAR TEST RESULTS

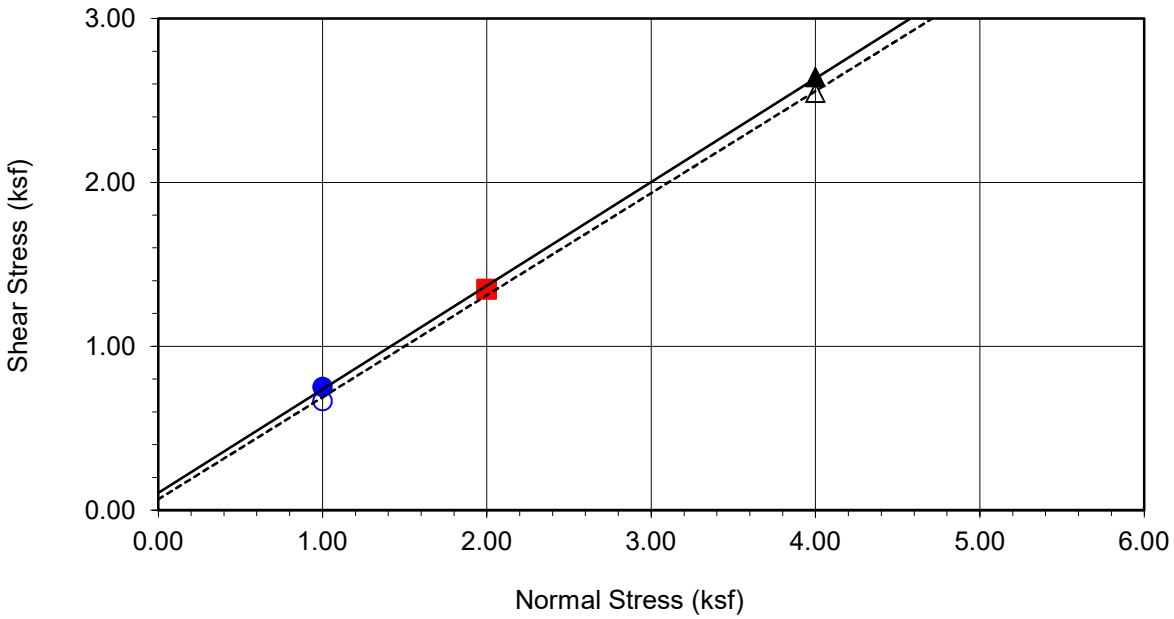
Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22





Boring No.	**LB-9**
Sample No.	**R-3**
Depth (ft)	**15**
Sample Type:	Ring
Soil Identification: Yellowish brown lean clay (CL)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	105	32
Ultimate	66	32

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.751	■ 1.349	▲ 2.641
Shear Stress @ End of Test (ksf)	○ 0.666	□ 1.346	△ 2.546
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.51	22.51	22.51
Dry Density (pcf)	104.2	106.4	108.2
Saturation (%)	98.4	104.1	108.9
Soil Height Before Shearing (in.)	0.9785	0.9610	0.9368
Final Moisture Content (%)	22.4	19.8	18.8

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 13544.001

Barranca Channel Multi-Use Trail

09-22

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Barranca Channel Multi-Use Trail		Tested By :	J. Domingo	Date: 09/29/22
Project No. :	13544.001		Checked By:	A. Santos	Date: 10/10/22
Boring No.:	LB-3		Depth (ft.) :	0-5	
Sample No. :	B-1				

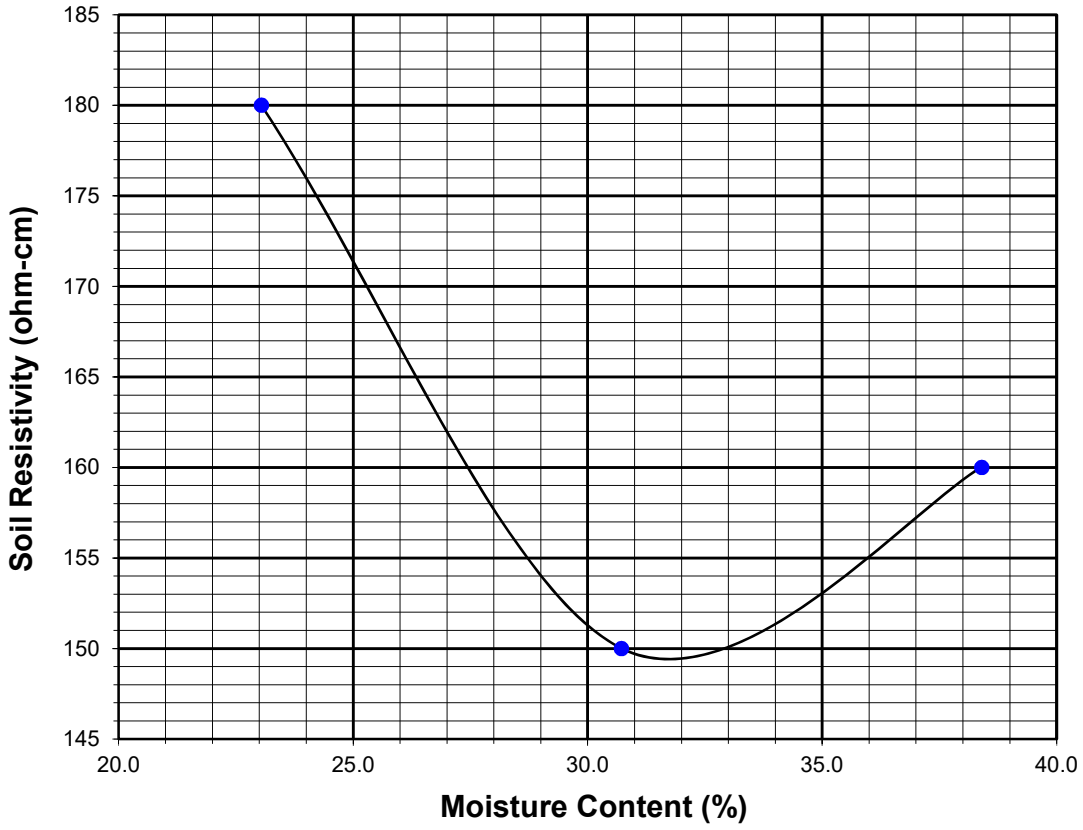
Soil Identification:* Dark brown (CL)

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	23.04	180	180
2	40	30.72	150	150
3	50	38.40	160	160
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.20
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
149	**31.8**	**4543**	**400**	**8.35**	**20.5**



SOIL RESISTIVITY TEST

DOT CA TEST 643

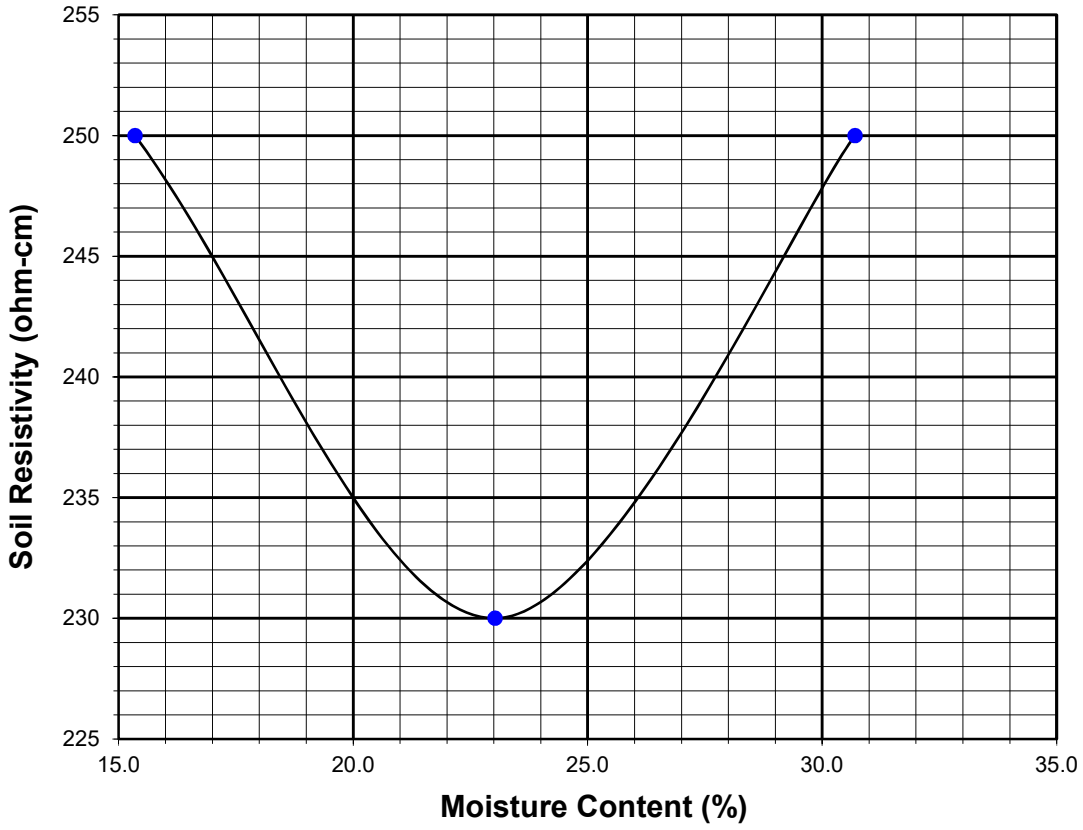
Project Name:	Barranca Channel Multi-Use Trail		Tested By :	J. Domingo	Date: 09/29/22
Project No. :	13544.001		Checked By:	A. Santos	Date: 10/10/22
Boring No.:	LB-7		Depth (ft.) :	0-5	
Sample No. :	B-1				
Soil Identification:*	Brown (CL)				

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	15.35	250	250
2	30	23.02	230	230
3	40	30.70	250	250
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.30
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
230	**23.0**	**7559**	**220**	**8.08**	**20.5**



SOIL RESISTIVITY TEST

DOT CA TEST 643

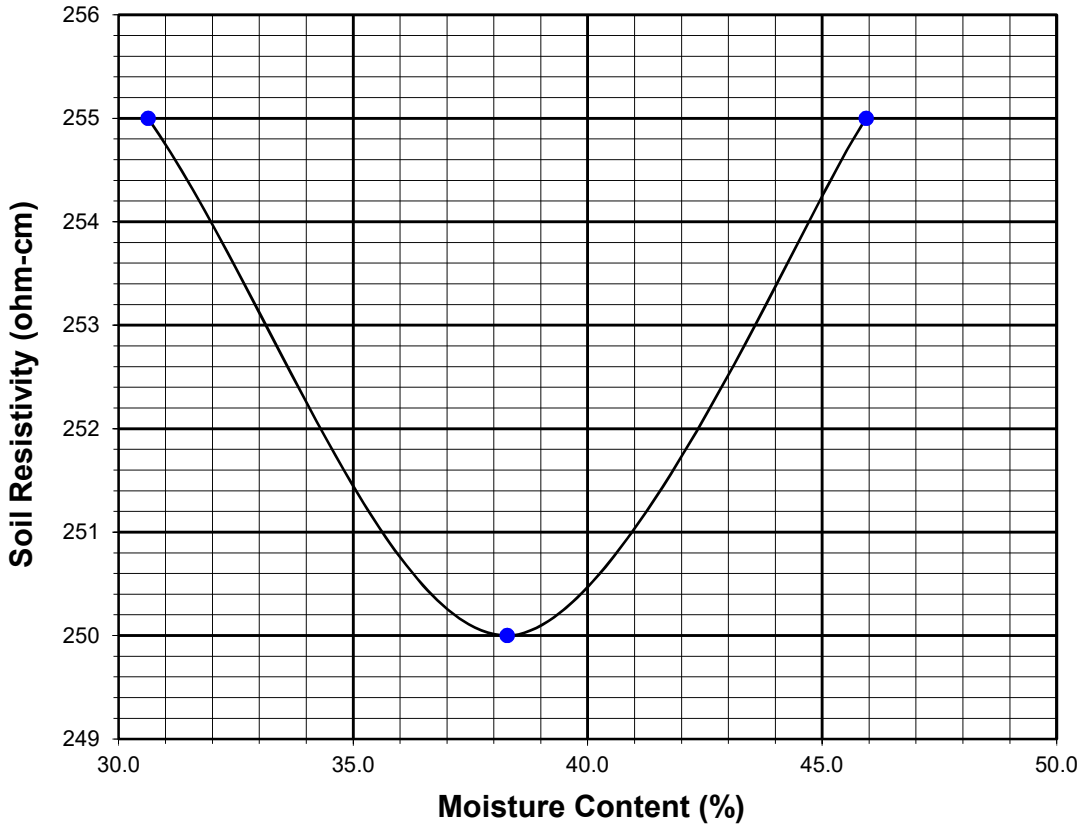
Project Name:	Barranca Channel Multi-Use Trail		Tested By :	J. Domingo	Date: 09/29/22
Project No. :	13544.001		Checked By:	A. Santos	Date: 10/10/22
Boring No.:	LB-11		Depth (ft.) :	0-5	
Sample No. :	B-1				
Soil Identification:*	Brown (CL)				

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	40	30.63	255	255
2	50	38.28	250	250
3	60	45.94	255	255
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.60
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
250	**38.3**	**5098**	**160**	**8.11**	**20.7**



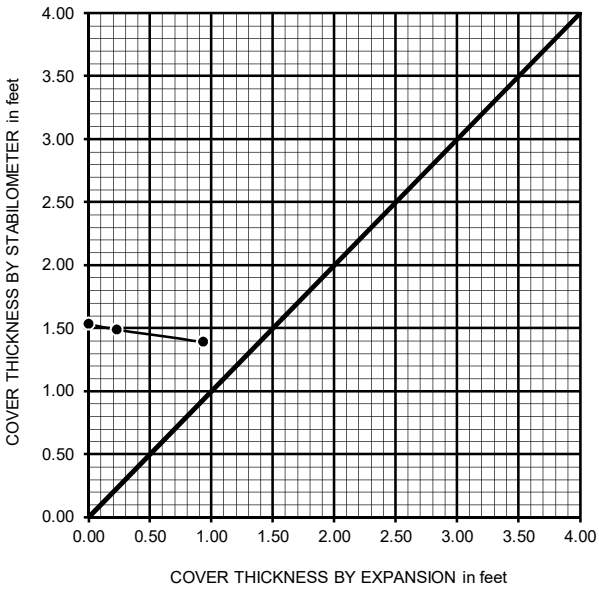
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Barranca Channel Multi-Use Trail	PROJECT NUMBER:	13544.001
BORING NUMBER:	LB-3	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Dark brown lean clay (CL)	DATE COMPLETED:	9/19/2022

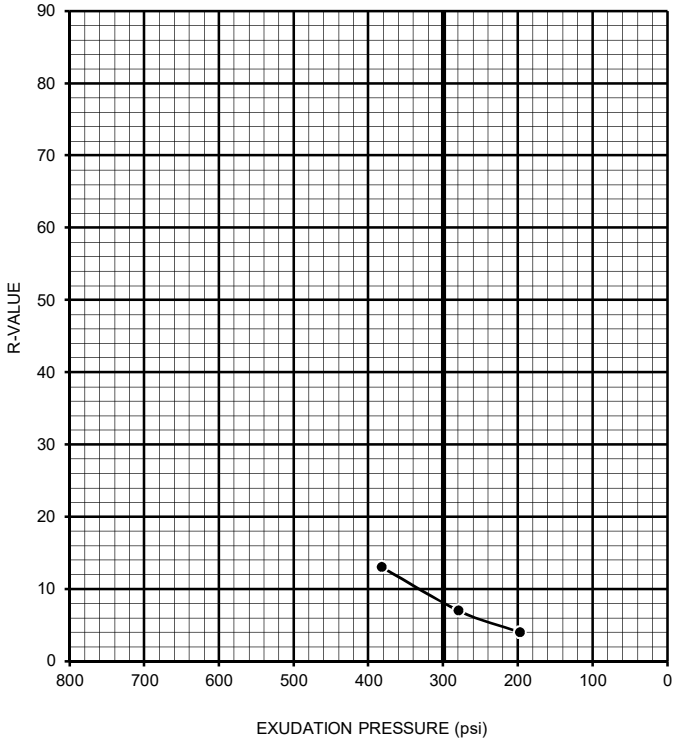
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	19.2	20.6	22.0
HEIGHT OF SAMPLE, Inches	2.50	2.53	2.53
DRY DENSITY, pcf	111.5	107.8	105.7
COMPACTOR PRESSURE, psi	100	80	60
EXUDATION PRESSURE, psi	382	279	196
EXPANSION, Inches x 10exp-4	28	7	0
STABILITY Ph 2,000 lbs (160 psi)	127	141	148
TURNS DISPLACEMENT	4.35	4.43	4.65
R-VALUE UNCORRECTED	13	7	4
R-VALUE CORRECTED	13	7	4

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.39	1.49	1.54
EXPANSION PRESSURE THICKNESS, ft.	0.93	0.23	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	13
R-VALUE BY EXUDATION:	8
EQUILIBRIUM R-VALUE:	8

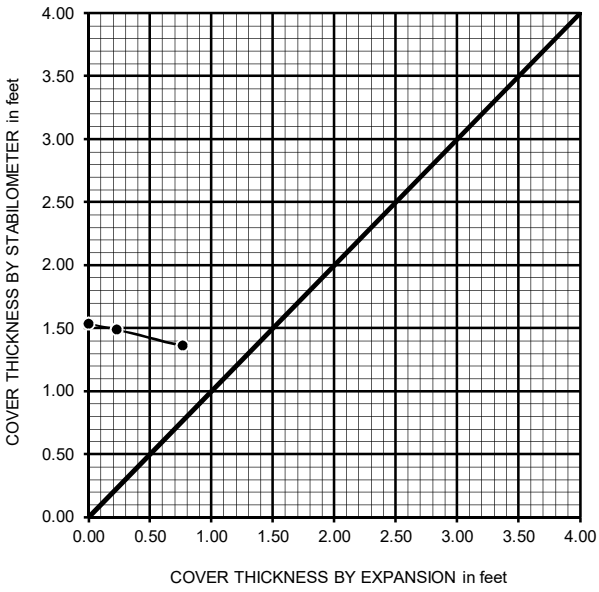
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Barranca Channel Multi-Use Trail	PROJECT NUMBER:	13544.001
BORING NUMBER:	LB-7	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Brown lean clay (CL)	DATE COMPLETED:	9/20/2022

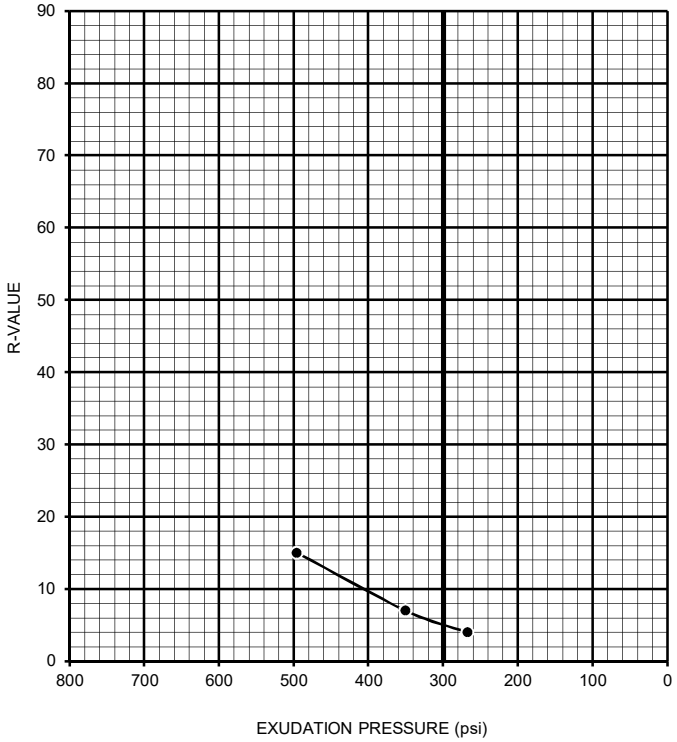
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	22.2	23.5	25.3
HEIGHT OF SAMPLE, Inches	2.49	2.50	2.52
DRY DENSITY, pcf	104.3	103.8	100.6
COMPACTOR PRESSURE, psi	100	70	60
EXUDATION PRESSURE, psi	496	350	267
EXPANSION, Inches x 10exp-4	23	7	0
STABILITY Ph 2,000 lbs (160 psi)	125	141	148
TURNS DISPLACEMENT	4.00	4.40	4.80
R-VALUE UNCORRECTED	15	7	4
R-VALUE CORRECTED	15	7	4

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.36	1.49	1.54
EXPANSION PRESSURE THICKNESS, ft.	0.77	0.23	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	16
R-VALUE BY EXUDATION:	5
EQUILIBRIUM R-VALUE:	5

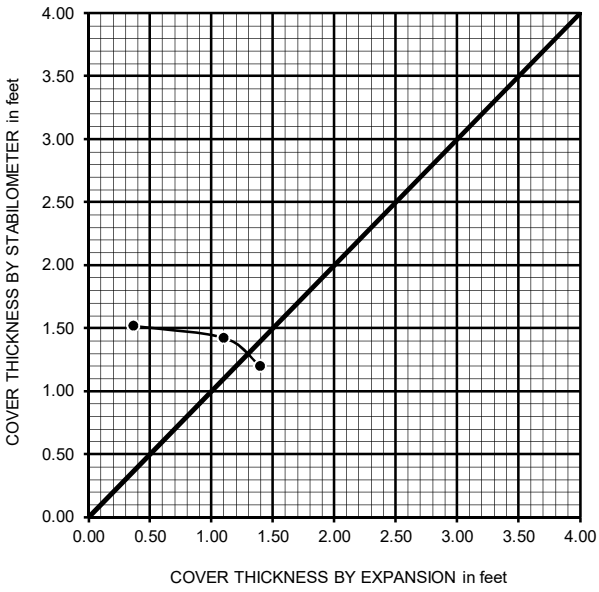
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Barranca Channel Multi-Use Trail	PROJECT NUMBER:	13544.001
BORING NUMBER:	LB-10	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Brown lean clay with sand (CL)s	DATE COMPLETED:	9/23/2022

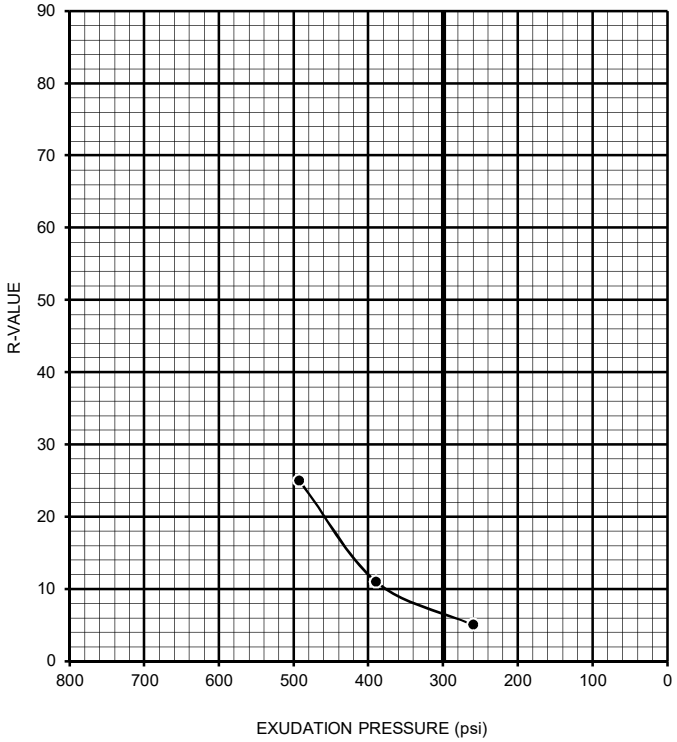
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	24.2	25.5	27.6
HEIGHT OF SAMPLE, Inches	2.47	2.47	2.46
DRY DENSITY, pcf	100.7	100.6	98.2
COMPACTOR PRESSURE, psi	100	80	60
EXUDATION PRESSURE, psi	492	390	259
EXPANSION, Inches x 10exp-4	42	33	11
STABILITY Ph 2,000 lbs (160 psi)	108	134	145
TURNS DISPLACEMENT	3.80	3.92	4.50
R-VALUE UNCORRECTED	24	11	5
R-VALUE CORRECTED	25	11	5

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.20	1.42	1.52
EXPANSION PRESSURE THICKNESS, ft.	1.40	1.10	0.37

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	19
R-VALUE BY EXUDATION:	6
EQUILIBRIUM R-VALUE:	6

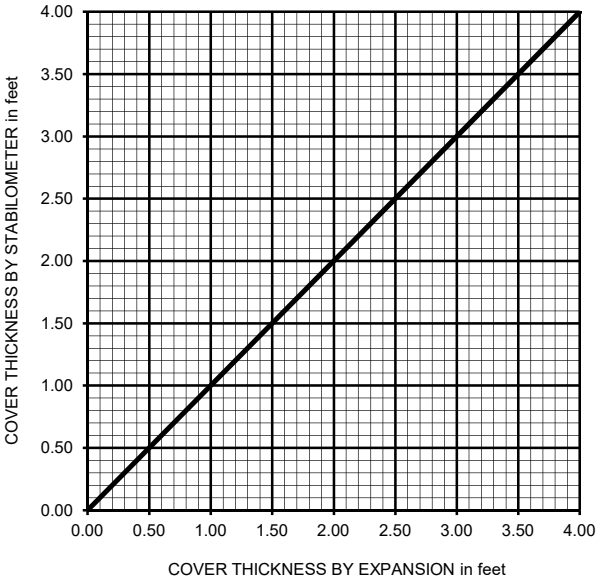
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Barranca Channel Multi-Use Trail	PROJECT NUMBER:	13544.001
BORING NUMBER:	13544.001	DEPTH (FT.):	0-5
SAMPLE NUMBER:	LB-11	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Brown lean clay (CL)	DATE COMPLETED:	9/23/2022

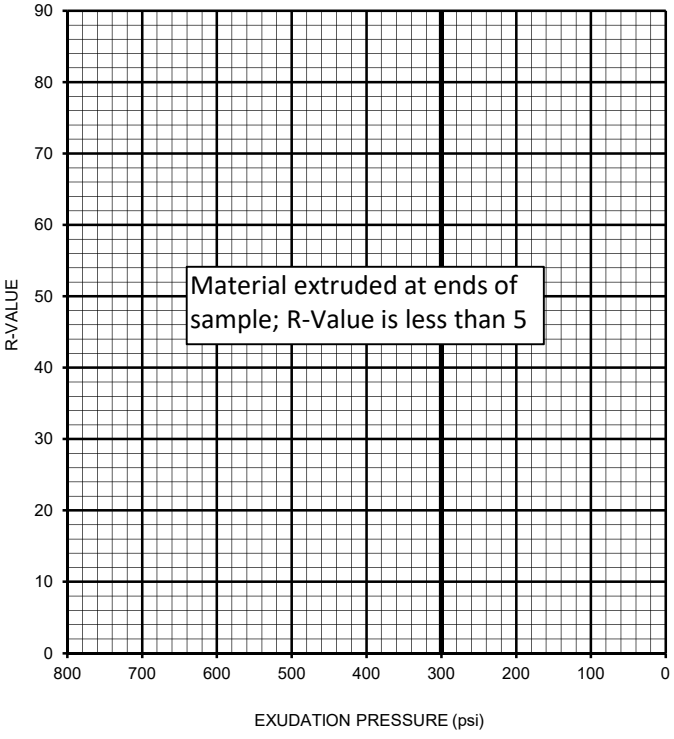
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %			
HEIGHT OF SAMPLE, Inches			
DRY DENSITY, pcf			
COMPACTOR PRESSURE, psi			
EXUDATION PRESSURE, psi			
EXPANSION, Inches x 10exp-4			
STABILITY Ph 2,000 lbs (160 psi)			
TURNS DISPLACEMENT			
R-VALUE UNCORRECTED	N/A	N/A	N/A
R-VALUE CORRECTED	N/A	N/A	N/A

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	N/A	N/A	N/A
EXPANSION PRESSURE THICKNESS, ft.	N/A	N/A	N/A

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	N/A
EQUILIBRIUM R-VALUE:	< 5

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	Barranca Channel Multi-Use Trail	Tested By:	G. Berdy	Date:	09/20/22
Project No.:	13544.001	Checked By:	A. Santos	Date:	10/10/22
Boring No.:	LB-3	Depth (ft.):	0-5		
Sample No.:	B-1				
Soil Identification:	Dark brown lean clay (CL)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0780
Wt. Comp. Soil + Mold (g)	596.00	442.50
Wt. of Mold (g)	203.30	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	787.90	645.80
Dry Wt. of Soil + Cont. (g)	713.10	558.68
Wt. of Container (g)	0.00	203.30
Moisture Content (%)	10.49	24.51
Wet Density (pcf)	118.5	123.8
Dry Density (pcf)	107.2	99.4
Void Ratio	0.572	0.695
Total Porosity	0.364	0.410
Pore Volume (cc)	75.4	91.5
Degree of Saturation (%) [S_{meas}]	**49.5**	95.2

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
09/20/22	14:19	1.0	0	0.5650
09/20/22	14:29	1.0	10	0.5640
Add Distilled Water to the Specimen				
09/20/22	14:48	1.0	19	0.5995
09/21/22	5:44	1.0	915	0.6425
09/21/22	10:03	1.0	1174	0.6430

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**79**

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	Barranca Channel Multi-Use Trail	Tested By:	G. Berdy	Date:	09/21/22
Project No.:	13544.001	Checked By:	A. Santos	Date:	10/10/22
Boring No.:	LB-7	Depth (ft.):	0-5		
Sample No.:	B-1				
Soil Identification:	Brown lean clay (CL)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.1055
Wt. Comp. Soil + Mold	(g)	587.00	440.60
Wt. of Mold	(g)	203.30	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	776.20	643.90
Dry Wt. of Soil + Cont.	(g)	698.60	548.66
Wt. of Container	(g)	0.00	203.30
Moisture Content	(%)	11.11	27.58
Wet Density	(pcf)	115.7	120.2
Dry Density	(pcf)	104.2	94.2
Void Ratio		0.618	0.789
Total Porosity		0.382	0.441
Pore Volume	(cc)	79.1	100.9
Degree of Saturation (%) [S_{meas}]		**48.5**	94.4

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
09/21/22	11:06	1.0	0	0.5200
09/21/22	11:16	1.0	10	0.5185
Add Distilled Water to the Specimen				
09/21/22	12:00	1.0	44	0.5745
09/22/22	5:38	1.0	1102	0.6255
09/22/22	7:20	1.0	1204	0.6255

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**107**

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	Barranca Channel Multi-Use Trail	Tested By:	G. Berdy	Date:	09/20/22
Project No.:	13544.001	Checked By:	A. Santos	Date:	10/10/22
Boring No.:	LB-11	Depth (ft.):	0-5		
Sample No.:	B-1				
Soil Identification:	Brown lean clay (CL)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.1160
Wt. Comp. Soil + Mold	(g)	578.20	443.50
Wt. of Mold	(g)	190.10	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	774.30	633.60
Dry Wt. of Soil + Cont.	(g)	696.30	539.11
Wt. of Container	(g)	0.00	190.10
Moisture Content	(%)	11.20	27.07
Wet Density	(pcf)	117.1	119.9
Dry Density	(pcf)	105.3	94.3
Void Ratio		0.601	0.787
Total Porosity		0.376	0.440
Pore Volume	(cc)	77.7	101.7
Degree of Saturation (%) [S_{meas}]		**50.3**	92.9

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
09/20/22	10:31	1.0	0	0.5740
09/20/22	10:41	1.0	10	0.5735
Add Distilled Water to the Specimen				
09/20/22	11:06	1.0	25	0.6260
09/21/22	5:29	1.0	1128	0.6900
09/21/22	7:13	1.0	1232	0.6900

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**117**